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

Actuarial Valuation Report as of June 30, 2021

Produced by Cheiron

November 2021

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November 16, 2021

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, 2021 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 represents 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) 2023 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.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice, set out by the Actuarial Standards Board as well as applicable laws and regulations. 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's auditor may rely on this report solely for the purpose of completing an audit related to the matters herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to such other users.

Sincerely,
Cheiron

Elizabeth Wiley, FSA, FCA, MAAA, EA
Consulting Actuary

Brett Warren, FSA, CERA, MAAA, EA
Consulting 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, 2021. 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.

3) **Determine** the recommended employer contributions for Fiscal Year (FY) 2023.

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 identifies the primary risks to the System as well as provides background information and assessment of these risks.

Section III contains exhibits relating to the valuation of assets.

Section IV 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 V 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. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23.

The actuarial assumptions reflect our understanding of the likely future experience of the System, and the assumptions entirely represent our best estimate for the future experience of the System. Future results may differ significantly from the current results presented in this report due to such factors as the following: plan experience differing from that anticipated by the assumptions; changes in assumptions; and changes in plan provisions or applicable law.

SECTION I – SUMMARY

General Comments

This is the 10th 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 third complete experience study for the System this past year. The analysis covered both economic and demographic assumptions as well as actuarial methods. The Board adopted recommended changes, including:

- Recommended demographic assumption changes, including updates to the mortality rates, termination rates, retirement rates, disability rates, DROP/DROP2 exit rates, merit salary increases, and percent married,
- Decrease in rate of investment return assumption from 7.25% to 7.00%, and
- Change in the unfunded liability amortization method from a single closed 25-year period beginning on July 1, 2014 to a 20-year layered approach with an initial unfunded liability set as a closed 20-year period beginning on July 1, 2020.

The impact of these changes is reflected in the June 30, 2021 valuation and resulting Fiscal Year (FY) 2023 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 employer 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 or methods 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, 2021 actuarial valuation are as follows:

- The total recommended employer contribution for FY 2023 is $154.8 million, decreased from $162.0 million for FY 2022 as a reflection of the prior years' experience, and the assumptions and methods adopted as a result of the 2020 experience study. The City's portion of the total employer contribution for FY 2023 is $154.0 million compared to $161.1 million for FY 2022.

- The unfunded actuarial liability on an actuarial value of assets (AVA) basis [actuarial liability (AL) – AVA] decreased from $1,257.4 million on June 30, 2020 to $1,189.7 million on June 30, 2021 An actuarial experience gain of $91.3 million contributed to an decrease in the System's unfunded actuarial liability.

SECTION I – SUMMARY

- o Investments earned 29.77%, on a market value basis, for the year ending June 30, 2021, resulting in an investment gain on the market value of assets (MVA) of $585.7 million. Due to smoothing of investment gains and losses, the AVA return was 10.09%, producing a gain of $72.8 million to the System for the year on that basis. Both returns are measured against the prior year's 7.25% expected return.

- o On the liability side, the System experienced a gain of $18.5 million. The liability gain is primarily due to greater than expected withdrawals from employment and less than expected disability retirements.

- o A more detailed analysis of the current year and historical changes in the unfunded actuarial liability can be found in section II of this report.

- The Board adopted assumption changes as a result of the 2020 experience study which increased the liabilities by $46.0 million.

- The System's AVA funded ratio, the ratio of the actuarial value of assets over liabilities, increased from 69.1% as of June 30, 2020 to 71.6% as of June 30, 2021. On an MVA basis, the funded ratio also increased, from 65.0% as of June 30, 2020 to 79.5% as of June 30, 2021.

SECTION I – SUMMARY

Summary Tables

The tables below provide details on the development of the City's contribution, together with the corresponding figures from the June 30, 2020 report. Details of this development, along with the State contribution calculations, are provided in Section V.

	Table I-1 Valuation Summary of City Only Costs				
	2020 Valuation Applies to FY 2022		**2021 Valuation Applies to FY 2023**		
	Amount	**% of Pay**	**Amount**	**% of Pay**	
1. Contributions					
Total Normal Cost	$ 71,606,151	21.93%	$ 74,032,986	22.40%	
Expense Load	4,896,845	1.50%	4,957,641	1.50%	
Expected Member Conts. for FY	(32,645,636)	(10.00%)	(33,050,939)	(10.00%)	
Net Normal Cost	$ 43,857,360	13.43%	$ 45,939,688	13.90%	
Interest to Val. Date + One Year	$ 1,206,077	0.37%	$ 1,263,341	0.38%	
Amortization of Unfunded					
Actuarial Liability	$ 115,529,252	35.39%	$ 106,347,026	32.18%	
Net Plan Cost at Val. Date + One Year	$ 160,592,689	49.19%	$ 153,550,055	46.46%	
Adjustment to Payment Date*	$ 469,713	0.15%	$ 434,097	0.13%	
Net Plan Cost at Val. Date + One Year (with adjustment)	$ 161,062,402	49.34%	$ 153,984,152	46.59%	
2. Unfunded Liabilities					
Actuarial Liability					
Actives	$ 1,347,636,403		$ 1,405,676,104		
Retirees and Dependents	2,689,050,181		2,751,982,029		
Terminated Vested	1,298,874		1,859,453		
Total	$ 4,037,985,458		$ 4,159,517,586		
Allocated Actuarial Value of Assets	$ 2,790,232,405		$ 2,978,399,141		
Unfunded Actuarial Liability	$ 1,247,753,053		$ 1,181,118,445		

* FY 2022 and 2023 contribution assumed to be made 49.86% at July 1 and 50.14% at August 1

SECTION I – SUMMARY

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

Table I-2 Active Membership Summary			
	Active Members (City & State)		
	2020	**2021**	**% Increase**
Active Members	3,927	3,839	(2.24%)
Total Pensionable Payroll	$ 312,258,826	$ 314,488,595	0.71%
Average Pensionable Payroll	$ 79,516	$ 81,919	3.02%
Total Projected Current Payroll	$ 326,639,940	$ 330,599,791	1.21%
			Absolute Difference
Average Age	41.26	41.38	0.12
Average Service	14.30	14.31	0.01

Table I-3 Inactive Membership Summary						
	Number of Retirees			**Average Annual Benefit Amount**		
	2020	**2021**	**% Increase**	**2020**	**2021**	**% Increase**
Normal Service Retirement	3,830	3,835	0.1%	$ 46,054	$ 47,255	2.6%
Early Retirement	54	78	44.4%	37,942	39,289	3.5%
Discontinued Service	13	14	7.7%	32,101	32,885	2.4%
Non-Line-of-Duty Disability	226	217	(4.0%)	21,170	21,534	1.7%
Line-of-Duty Disability	713	701	(1.7%)	39,538	40,329	2.0%
Beneficiaries of Above	1,346	1,350	0.3%	19,717	20,098	1.9%
Non-Line-of-Duty Death	116	117	0.9%	27,318	27,746	1.6%
Line-of-Duty Death	53	48	(9.4%)	50,566	51,828	2.5%
Total	**6,351**	**6,360**	**0.1%**	**$ 38,453**	**$ 39,396**	**2.5%**

SECTION I – SUMMARY

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 24 years.

Assets and Liabilities
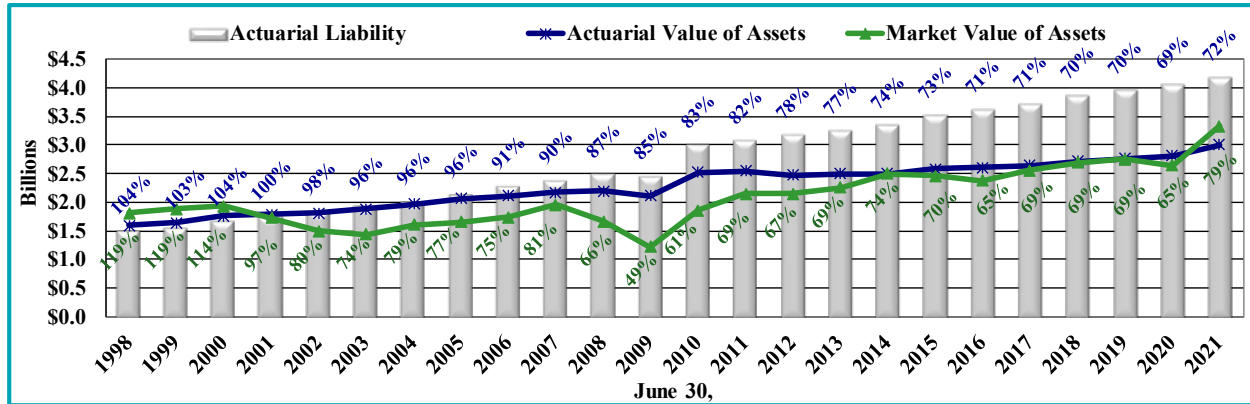
The bars represent the actuarial liability (AL) as measured for funding purposes in the valuations. We compared this liability measure to the actuarial value of assets (AVA) in each report to develop the AVA funded ratios for each year; these are the blue percentages shown in the graph along the top 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. Since 2015, the AVA funded ratio has remained relatively flat (within 69%-73%) despite changes to the actuarial assumptions that increased liabilities (2015, 2018, and 2021). The MVA ratio has been more volatile, reflecting the investment returns not being smoothed in this measure. However, it stayed within a 65-70% from 2015-2020 before increasing to 79% in 2021 due to investment returns higher than expected.
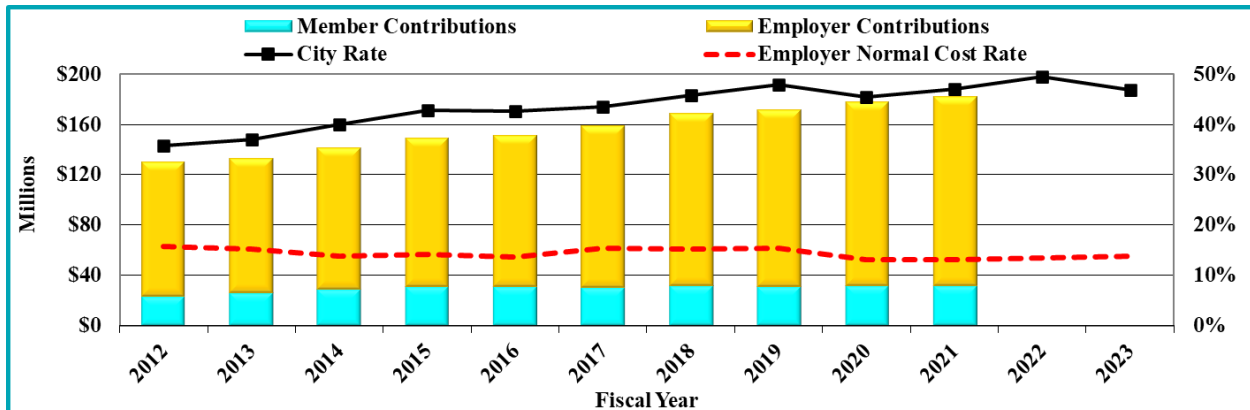
SECTION I – SUMMARY

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 2022 and 2023. 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 normal cost, the portion of the total normal cost rate that is paid by the employers rather than by the members. The total normal cost measures the value of benefits to be accrued in the coming year taking into consideration future salary increases. The net employer normal cost also reflects a provision for expenses, which represents 1.5% of the approximately 13.9% employer normal cost rate shown for FY 2023 as an example. The employer normal cost rate decreased over the period FY 2012 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, decreased in FY 2020 due to the changes in assumptions, and finally increased in FY 2023 due to changes in assumptions. Over the 12-year period shown, the employer net normal cost rate has decreased 1.9%, 12% in relative terms, with the majority of this decrease coming from the increases in the member contribution rate.
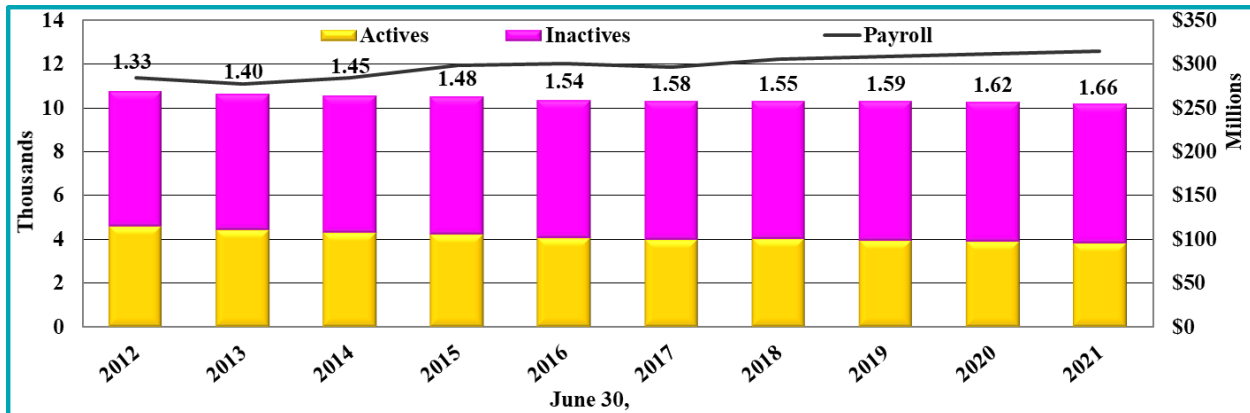
SECTION I – SUMMARY

Member Trends

The following chart 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 generally steadily increasing during the period shown. 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. This maturity risk is discussed further in Section II of this report.

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.

SECTION I – SUMMARY

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 System is ongoing.

The baseline projections include the adopted Board changes including demographic changes, the 7.00% rate of return assumption, and the unfunded liability amortization method change. 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 of 7.00% investment returns, we provide additional stress testing in Section II based on varying returns in the future, as variation in this assumption is typically the most significant driver of variation in results.

For purposes of these projections, it is assumed that the initial unfunded liability will be amortized over a 20-year closed period beginning on July 1, 2020. After that date, each year's gains and losses will be amortized over its own 20-year period in addition to the remaining amortization of the prior gains and losses.

Finally, the projections, both the baseline in this section and the varying returns in Section II, assume there will be no future gains or losses on the liability, and that the System pays the actuarially determined contribution each year. As such, these projections 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 scenarios.

SECTION I – SUMMARY

Baseline Returns of 7.00% per year

1. Asset and Liability Projections

This first projection chart 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.

The chart below shows that if all actuarial assumptions, including the rate of investment 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 72% to 100% by the 2039 valuation. This is due to the current funding policy of paying down the initial UAL over a 20-year period that ends with the 2040 valuation. The reason 100% is achieved a year earlier is due to the amortization of the gain basis from the 2021 layer. While we are assuming, for the purposes of these projections, new UAL amounts will be amortized over individual 20-year periods beginning in 2021, no future gains or losses are assumed in this baseline scenario.
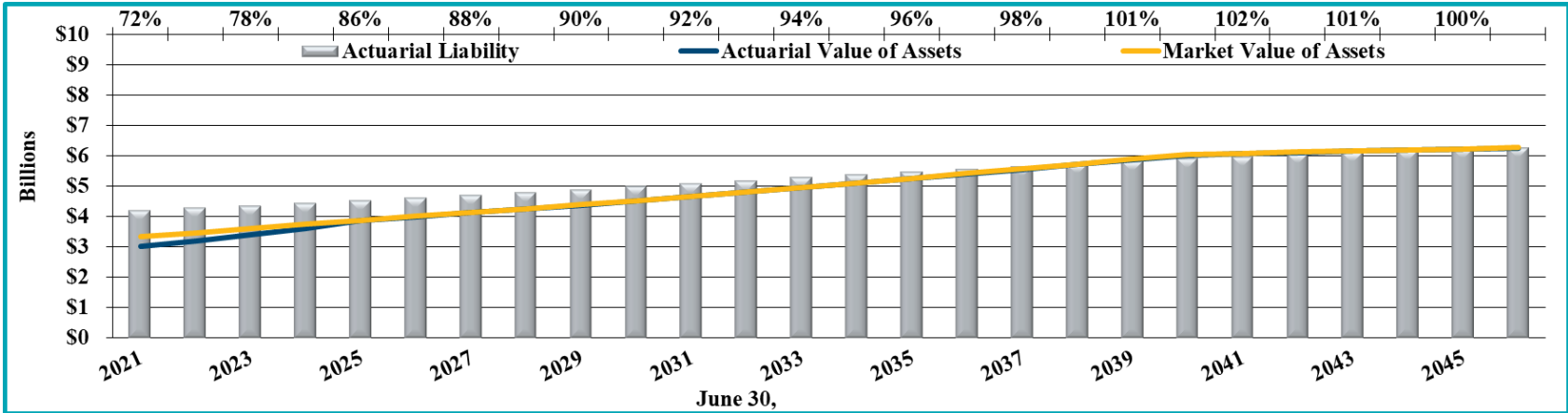
SECTION I – SUMMARY

2. Contribution Rate Projections

The next chart shows a 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 the rate of investment return levels assumed, 7.00% in this baseline projection 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.

The chart below shows that the total employer contribution rate is projected to decrease as the unfunded actuarial liability (UAL) is paid down under this baseline scenario where the rate of return assumption is exactly met. The initial decrease in the UAL rate is due to continued recognition of investment gains into the AVA. The expected decrease in the UAL rate that then follows 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 2040 payment. In FY 2041, the contribution then drops to only $35 million, or 6% of pay, as of that year as a result of prior amortization gain bases creating negative unfunded liability. Then, the contribution steadily increases through FY 2045 as the prior amortization gain bases drop off. Finally, in FY 2046, the contribution includes only the employer normal cost (including administrative expenses) portion, which is $86 million as of that year or 14% of pay.

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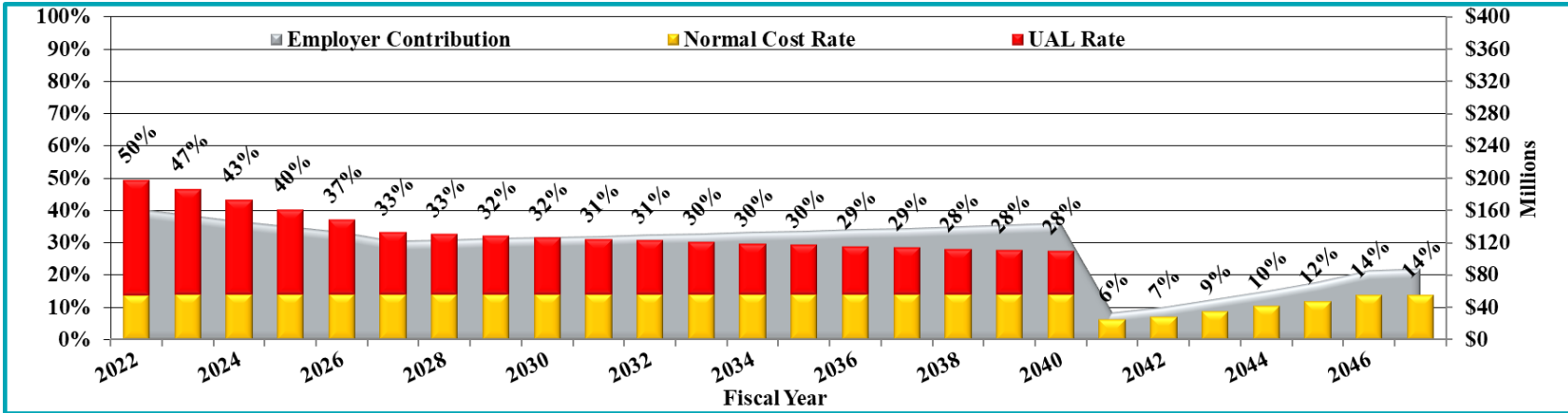
SECTION II – IDENTIFICATION AND ASSESSMENT OF RISK

Actuarial valuations are dependent on assumptions about future economic and demographic experience. Based on actuarial standards of practice, these assumptions represent a reasonable estimate of future experience. However, actual future experience will never conform exactly to the assumptions and may differ significantly different. This deviation is the risk that pension plan sponsors undertake in relying on a pension plan's actuarial valuation results.

This section of the report is intended to identify the primary drivers of these risks to the System, provide background information and assessments about these risks and drivers, and communicate the significance of these risks to the System and its sponsors.

Identification of Risks

As we have discussed with the Board, the fundamental risk to the System is that the contributions needed to pay the benefits become unaffordable. Further, the System faces the risk that while current valuation results may project contributions that are not affordable, deviations from the assumptions may result in actual contributions that are unaffordable. While there are a number of factors that could lead to contribution amounts becoming unaffordable, we believe the primary risks are:

- Investment risk
- Interest rate risk
- Longevity and other demographic risks
- Assumption change risk

Other risks that we have not identified may also turn out to be important.

## SECTION II – IDENTIFICATION AND ASSESSMENT OF RISK

Investment Risk is the potential for investment returns to deviate from what is expected. When actual investment returns are lower than the investment return assumption used in the actuarial valuation, the unfunded actuarial liability will increase from what was expected and will require higher contributions than otherwise anticipated. But when actual returns exceed the assumption, the resulting unfunded liability measurements and actuarially determined contributions will be lower than anticipated. The potential volatility of future investment returns is determined by the System's asset allocation and the affordability of the investment risk is determined by the amount of assets invested relative to the size of the plan sponsor or other contribution base.

As seen in the historical section that follows, this risk has been a very significant driver of deviations in the actual measurements for this System from those expected by the prior valuations, with investment losses on an actuarial basis for nine out of the ten years shown. While the System has had market value of assets returns for given years that exceed the assumption, the smoothing of the actuarial value of assets that recognizes the returns for a given year over a number of years combined with the relative magnitude and timing of the market value losses has resulted in a loss on this smoothed basis for each of those nine years.

Interest Rate Risk is the potential for interest rates to be different than expected. For public plans, short term fluctuations in interest rates have little or no effect as the system's liability is usually measured based on the expected return on assets. Longer-term trends in interest rates however can have a powerful effect. The chart that follows shows the yield on a 10-year Treasury security compared to the System's assumed rate of return. The difference is a simple measure of the amount of investment risk taken. As interest rates have declined, plans face a choice: maintain the same level of risk and reduce the expected rate of return; maintain the same expected rate of return and take on more investment risk; or some combination of the two strategies. The System has reduced their discount rate from 8.25% to 7.00% over the period shown, which has reduced this risk premium some, but the decline in the 10-year Treasury has been greater than the discount rate reduction. This results in the risk premium for the System increasing over the period shown, from 3.14% in 2006 to 5.48% in 2021, which indicates more exposure to interest rate risk now than at the beginning of the period.

SECTION II – IDENTIFICATION AND ASSESSMENT OF RISK
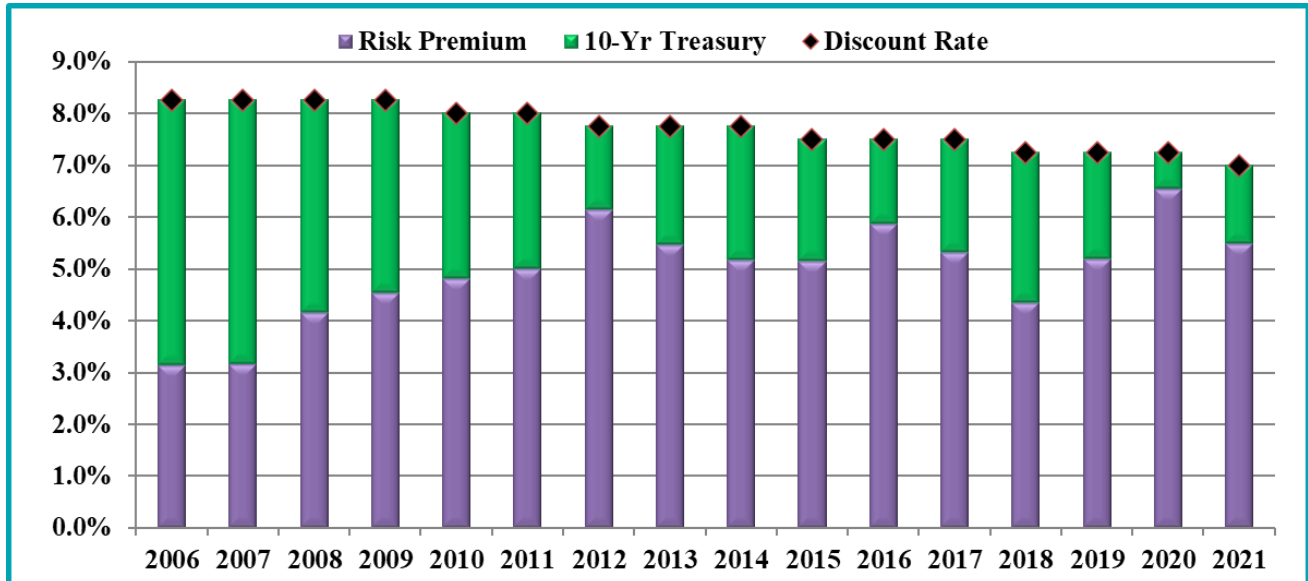
Longevity and Other Demographic Risks is the potential for mortality or other demographic experience to be different than expected. Generally, longevity and other demographic risks emerge slowly over time as the actual experience deviates from expected. In addition, the extensive number of assumptions related to longevity and other demographic experience often result in offsetting factors contributing to the System's overall liability experience. As such, these risks are often dwarfed by other risks, particularly those due to investment returns.

The historical section shows that this has been true for this System, with the total magnitude of the liability gains and losses only being about 8% of those from investment deviation. Further, the actual experience of this System shows that the liability deviations of individual years have largely offset each other, resulting in this risk being only a minor driver of the deviations of the actual results from those predicted by prior valuations.

Assumption Change Risk is the potential for the environment to change such that future valuation assumptions are adjusted to be different than the current assumptions. For example, declines in interest rates over time due to economic factors may result in a change in the assumed investment rates of return used in the valuations. In terms of demographic factors, a healthier workforce may result in changes in employee behavior such that retirement rates are adjusted to reflect employees working longer. In addition, mortality rates are adjusted to account for members living longer and receiving more years of their retirement benefits. Assumption change risk is an extension of the risks previously identified, but rather than capturing the risk as it is experienced, it captures the cost of recognizing a change in environment resulting in the current assumption no longer being reasonable.

The historical section shows that assumption change risk has been a relatively significant risk for this System, with increases to the unfunded liability each time a change has been made. In addition to changes in individual assumptions, changes to the methods used in valuing the

SECTION II – IDENTIFICATION AND ASSESSMENT OF RISK

System can have a significant impact on the valuation results as can be seen in the 2014 assumption/method change item where the asset valuation method was changed. The other three relatively large assumption/method change items shown in the history, for 2015, 2018, and 2021, were primarily the result of reductions in the discount rate, along with other assumption changes that had smaller impacts, as a result of the last three experience studies.

The chart below shows the components of changes in the Unfunded Actuarial Liability (UAL) for the System over the last ten years, including investment gains and losses on the Actuarial Value of Assets, liability gains and losses, assumption and method changes, and the paying down of the UAL. Amounts below the horizontal axis are gains, or decreases to the UAL, while amounts above the axis are losses, or increases to the UAL. The net UAL change is shown by the dark blue line. Table II-1 below the chart summarizes the changes in the UAL over the last 10 years.

Historical Changes in UAL 2012-2021
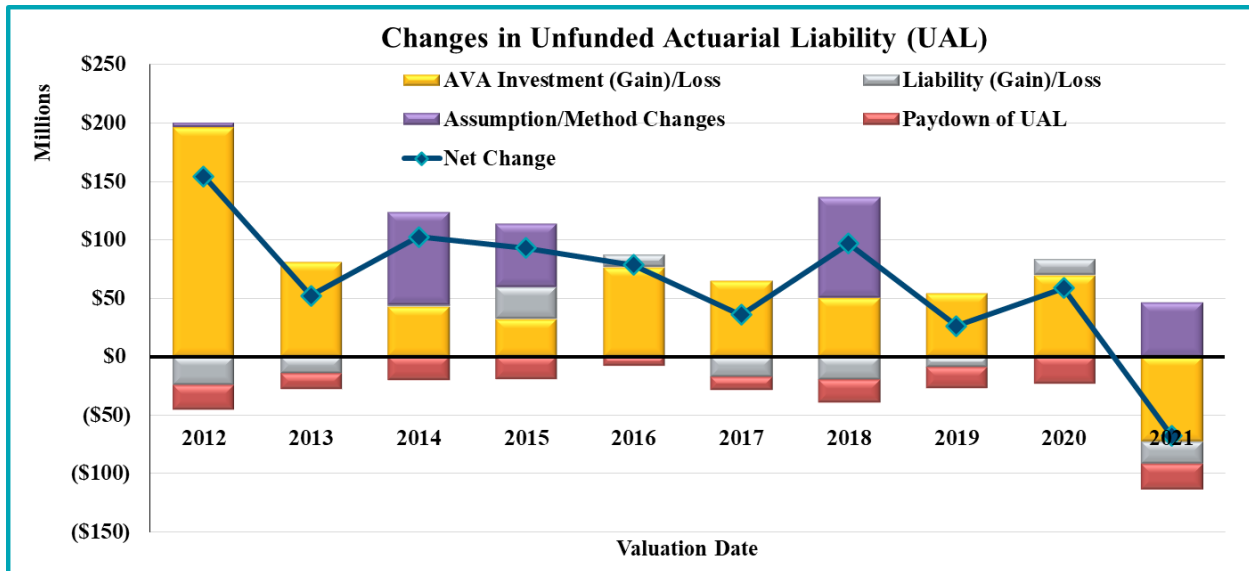
Table II-1 Changes in Unfunded Actuarial Liability (UAL) ($ millions)											
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Discount Rate	**7.75%**	**7.75%**	**7.75%**	**7.50%**	**7.50%**	**7.50%**	**7.25%**	**7.25%**	**7.25%**	**7.00%**	
Source											
AVA Investment (G)/L[1]	$ 195.7	$ 80.5	$ 42.8	$ 31.8	$ 75.7	$ 64.8	$ 49.9	$ 54.1	$ 69.1	$ (72.8)	**$ 591.6**
Liability (G)/L	(24.2)	(14.6)	1.6	27.7	11.4	(17.7)	(20.0)	(9.0)	13.6	(18.5)	**(49.7)**
Assumption/Method Changes	4.2	0.0	78.9	53.9	0.0	0.0	86.4	0.0	0.0	46.0	**269.4**
Paydown of UAL[2]	(21.4)	(13.6)	(20.6)	(20.2)	(8.4)	(11.3)	(19.6)	(18.8)	(23.9)	(22.3)	**(180.1)**
Total UAL Change	**154.3**	**52.3**	**102.7**	**93.2**	**78.7**	**35.8**	**96.7**	**26.3**	**58.8**	**(67.6)**	**$ 631.2**

On a smoothed asset basis, the investment gains and losses (gold bars) from 2012 to 2021 reflect investment losses in nine of the 10 years shown. From 2012 to 2014, the AVA reflects a gradual

SECTION II – IDENTIFICATION AND ASSESSMENT OF RISK

recognition of the former BIF, ERF, and MSF fund balances that are largely responsible for the actuarial losses during that period. After the AVA was set equal to the MVA in 2014, smoothing was used to develop the AVA going forward which spread gains and losses over the five successive years. Over the 10-year period, investment losses and gains, including the recognition of the former BIF, ERF, and MSF fund balances, added approximately $591.6 million to the UAL.

On the liability side (gray bars), the System has experienced offsetting gains and losses, decreasing the UAL by approximately $49.7 million over the 10-year period.

Assumption and method changes (purple bars) have increased the UAL by approximately $269.4 million over the 10-year period. The method changes have included changing actuarial systems in 2012, resetting the AVA to equal the MVA that recognized any remaining prior investment losses in 2014, and changing the funding method from projected unit credit to entry age normal in 2015. The significant assumption changes have included incremental reductions in the discount rate from 8.00% (in 2011) to the current 7.00% and experience studies in 2012, 2015, 2018, and 2021.

It is important to note that investment return changes reflect a downward revision to the estimate of future investment earnings, and ultimately costs will be determined by actual investment earnings. We are continuing to see investment consultants reduce their capital market assumptions with the continued low-interest rate environment. As a result, as previously discussed, future expectations of investment returns may continue to decline necessitating further reductions in the discount rate and corresponding assumption change increases to the liability.

Finally, each year the UAL is expected to decrease as the System contributes towards the UAL, assuming no future investment and liability gains and losses. Net changes due to paying down the UAL (red bars), which reflects benefit accruals and payments, contributions, and timing, have decreased the UAL by approximately $180.1 million over the last 10 years.

SECTION II – IDENTIFICATION AND ASSESSMENT OF RISK

Plan Maturity Measures

The future financial condition of a mature pension plan is more sensitive to each of the risks identified above than a less mature plan. Before assessing each of these risks, it is important to understand the maturity of this System compared to other plans and how the maturity has changed over time.

Plan maturity can be measured in a variety of ways, but they all get at one basic dynamic - the larger the plan is compared to the contribution or revenue base that supports it, the more sensitive the plan will be to risk. The measures below have been selected as the most important in understanding the primary risks identified for this System.

Inactives per Active (Support Ratio)

One simple measure of plan maturity is the ratio of the number of inactive members (those receiving benefits or entitled to a deferred benefit) to the number of active members. The revenue base supporting the plan is usually proportional to the number of active members, so a relatively high number of inactives compared to actives indicate a larger plan relative to its revenue base as well.

The Boston College's Center for Retirement Research, NASRA and the Center for State and Local Government Excellence maintain the Public Plan Database that contains the majority of state plans as well as many large municipal plans, covering over 95% of the membership in public plans as well as over 95% of the assets held by public pension plans.

The chart that follows shows the support ratio for all plans in this database since 2001. The colored bars represent the central 90% of the support ratios for the plans in the database. The Fire and Police Employees' Retirement System of the City of Baltimore is represented by the gold diamonds, which are the same values that were shown in the historical membership counts trend in the previous section. Note that this System was added to the Public Plan Database since the 2019 valuation, so is also reflected within the total database.

The charts showing the System versus this universe of plans in this section show one more year for the System than the universe as the 2021 numbers are not yet available for the database.

SECTION II – IDENTIFICATION AND ASSESSMENT OF RISK

Support Ratio chart with legend: 5th to 25th Percentile, 25th to 50th Percentile, 50th to 75th Percentile, 75th to 95th Percentile, Baltimore Fire and Police. Years 2001–2021.

Survey Data from Public Plans Database as of 6/28/2021
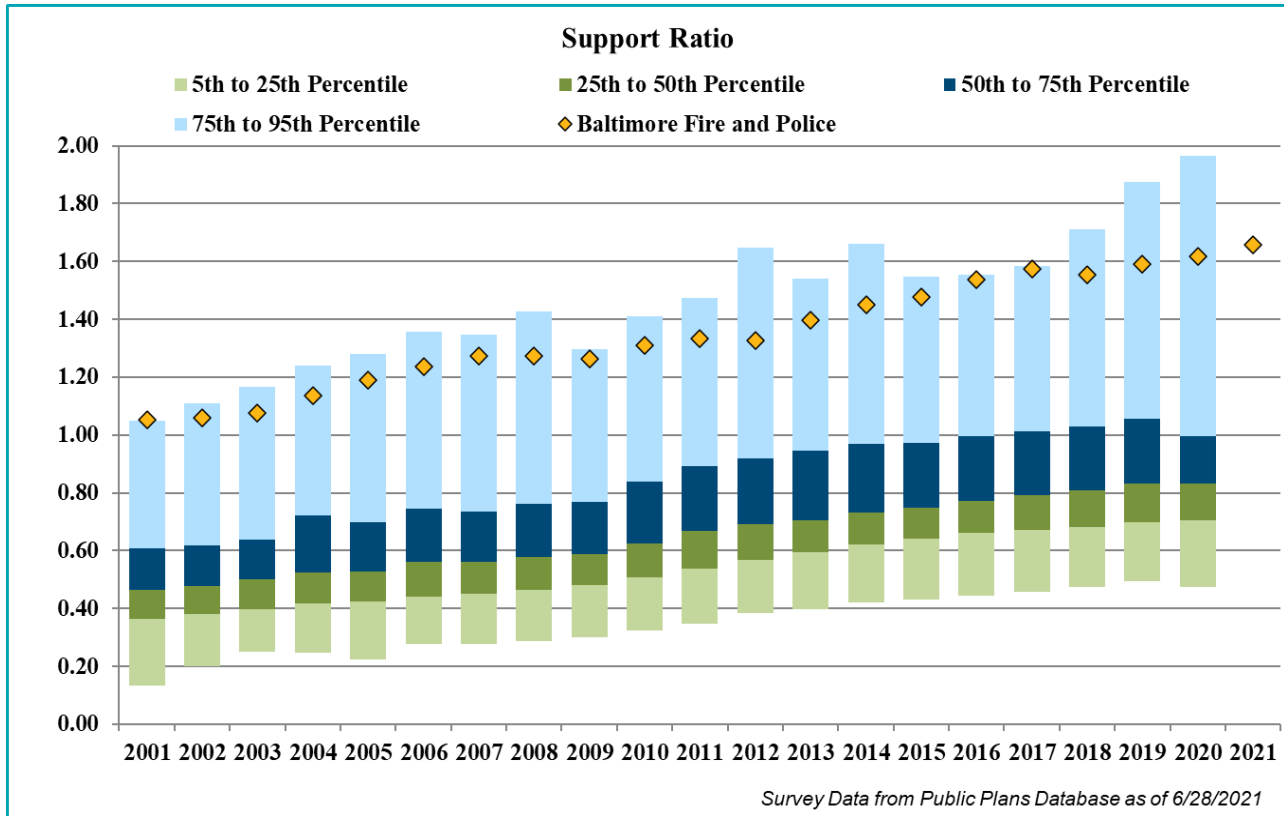
This chart shows that the System was already in a relatively mature status in 2001 being at the tail end of the 75th to 95th percentile. The support ratios for the plans entirely, have increased over the period as they mature, with the System's support ratio generally increasing at a similar pace. The System has remained at the tail end of the 75th to 95th percentile for the entire period.

Net Cash Flow

The net cash flow of the plan as a percentage of the beginning of year assets indicates the sensitivity of the plan to short-term investment returns. Net cash flow is equal to contributions less benefit payments and administrative expenses. Mature plans can have large amounts of benefit payments compared to contributions, particularly if they are well funded. Investment losses in the short-term are compounded by the net withdrawal from the plan leaving a smaller asset base to try to recover from the investment losses. Large negative cash flows can also create liquidity issues.

SECTION II – IDENTIFICATION AND ASSESSMENT OF RISK
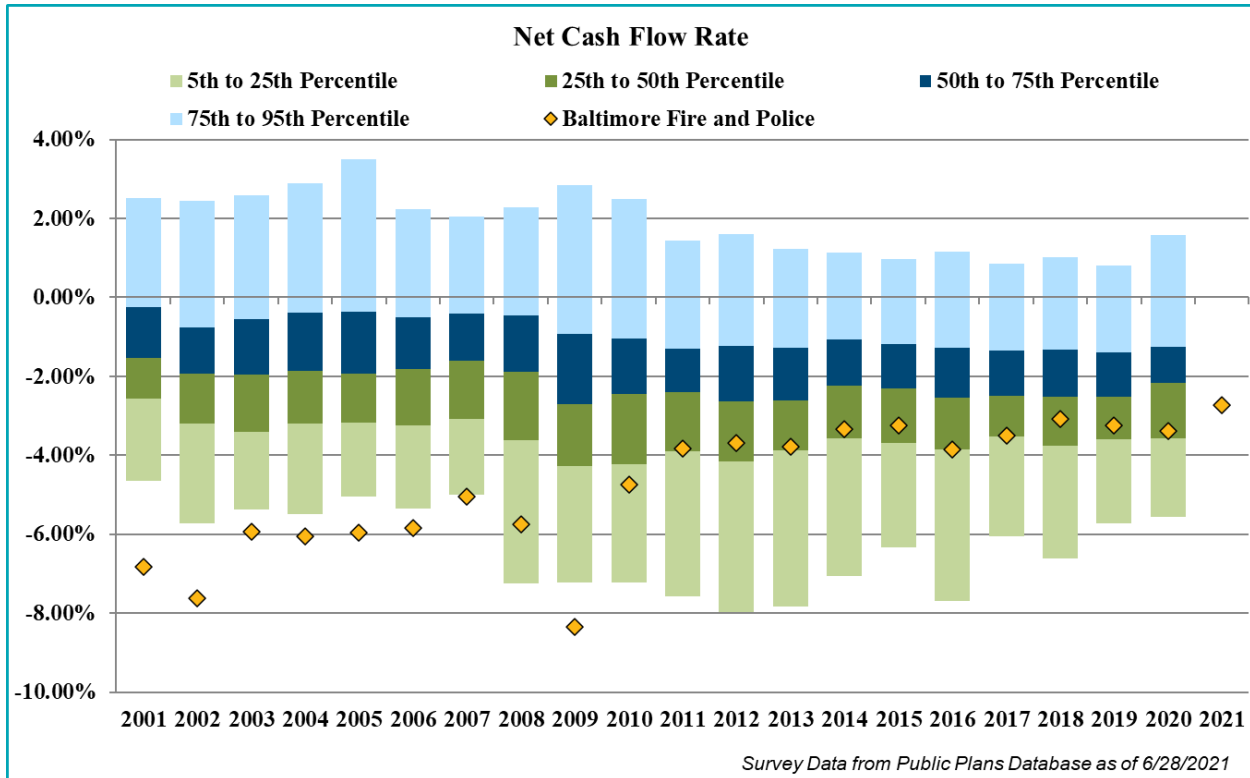
The graph above shows the distribution of net cash flow as a percent of assets, again with the bars showing the 5th to 95th percentile for the plans in the Public Plans Database. The gold diamonds show the System's experience for this metric as well, allowing comparison to the other plans. Up until 2010, the System was generally consistently below the 5th percentile. However, since 2010, the System's cash flow as a percent of assets has improved and consistently been amongst the 25th to 50th percentile. The increase in this percent is primarily due to increases in the employee and employer contributions, which have helped to improve the funding outlook of the System. The employer contributions have increased as a result of the change in the funding policy to close the amortization period and the adoption of more conservative assumptions and methods. Smaller negative cash flows mean that less investment returns are needed in a given year to cover this shortfall.

SECTION II – IDENTIFICATION AND ASSESSMENT OF RISK

Deterministic Scenarios/Stress Testing

We developed several hypothetical scenarios to illustrate the impact deviations from assumed investment returns may have on future funded status and contribution rates. The scenarios are balanced between positive and negative scenarios and are intended to illustrate the importance of both the return itself as well as the timing of such returns.

The graphs on the following pages show the projections under each of these theoretical scenarios: optimistic returns of 9.00% per year and pessimistic returns of 5.00% per year.

The projection charts shown have the same format as those included for the baseline scenario in the prior section. The top projection chart 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.

The bottom chart 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). 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.

Under the baseline results, we assumed a 7.00% investment return assumption per year. The baseline projections are shown in the Summary section.

SECTION II – IDENTIFICATION AND ASSESSMENT OF RISK

Optimistic Returns of 9.00% per year

If the System earns 2.00% greater than the assumed rate of return in each year of the projection, the AVA funded ratio is projected to increase to 100% by the 2029 valuation, 10 years earlier than in the baseline projection. In addition, the employer contribution rate will begin to rapidly decrease and eventually reach 0% in FY 2039. In FY 2039 and all future years, the investment gains would cover all the employer normal costs (including administrative expenses) and in fact more than this amount, resulting in the funded ratios being expected to climb beyond 100% as the employee contributions continue and employer contributions cannot drop below 0%.
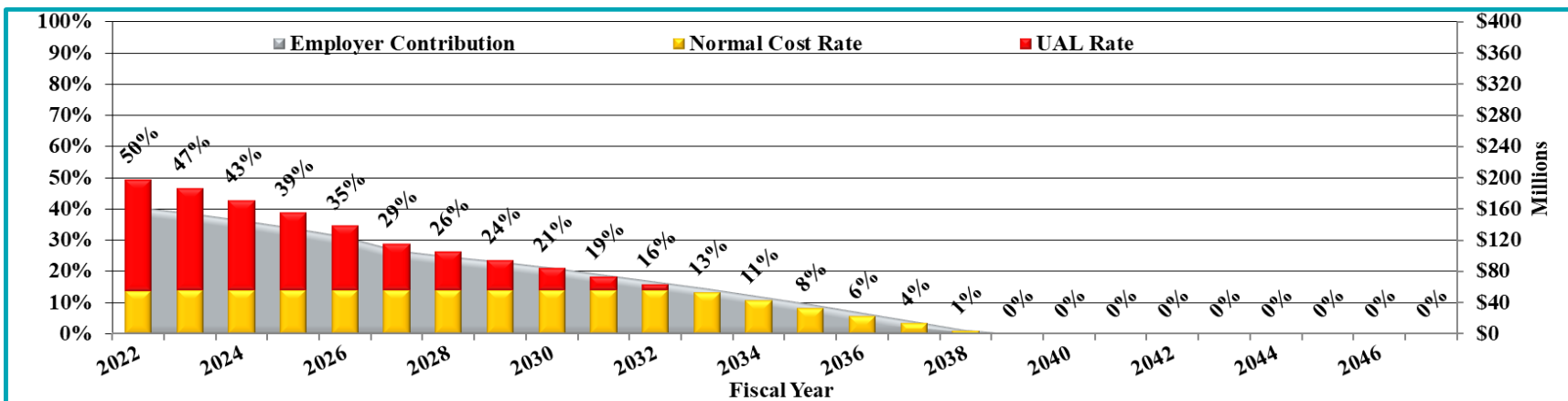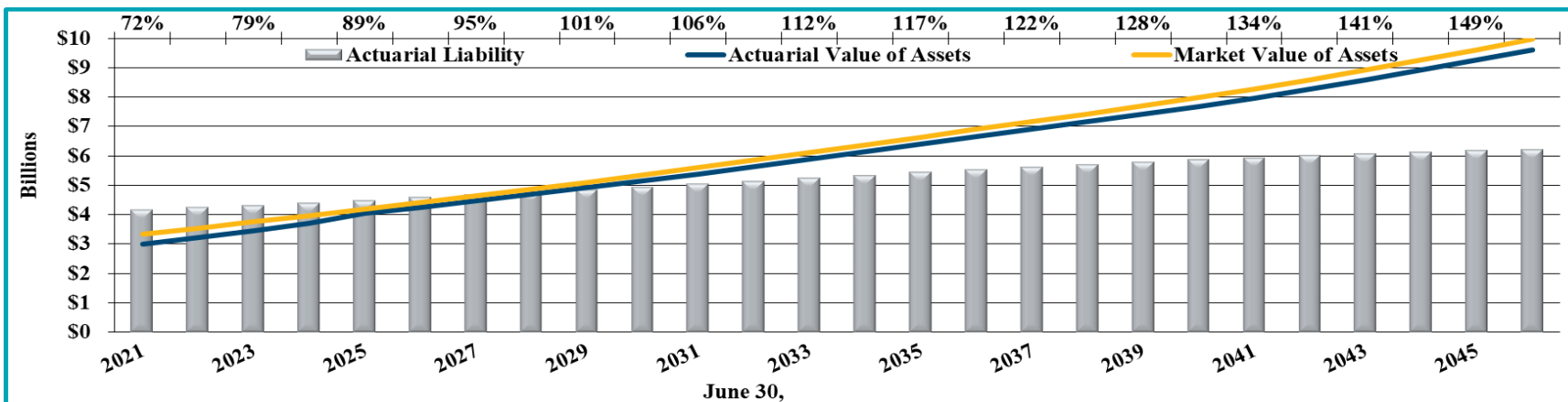
SECTION II – IDENTIFICATION AND ASSESSMENT OF RISK

Pessimistic Returns of 5.00% per year

If the System earns 2.00% less than the assumed rate of return in each year of the projection, the AVA funded ratio is projected to increase to only 81% by 2039 when 100% is reached in the baseline projection. In addition, the employer contribution rate will steadily increase to about 52% by FY 2040 (final year of the initial 20-year closed period). In FY 2040, the initial 20-year UAL is fully paid off, and the UAL rate shown is due to funding asset losses from the assumed 20-year layered approach during the projection period that was discussed in the Summary section.
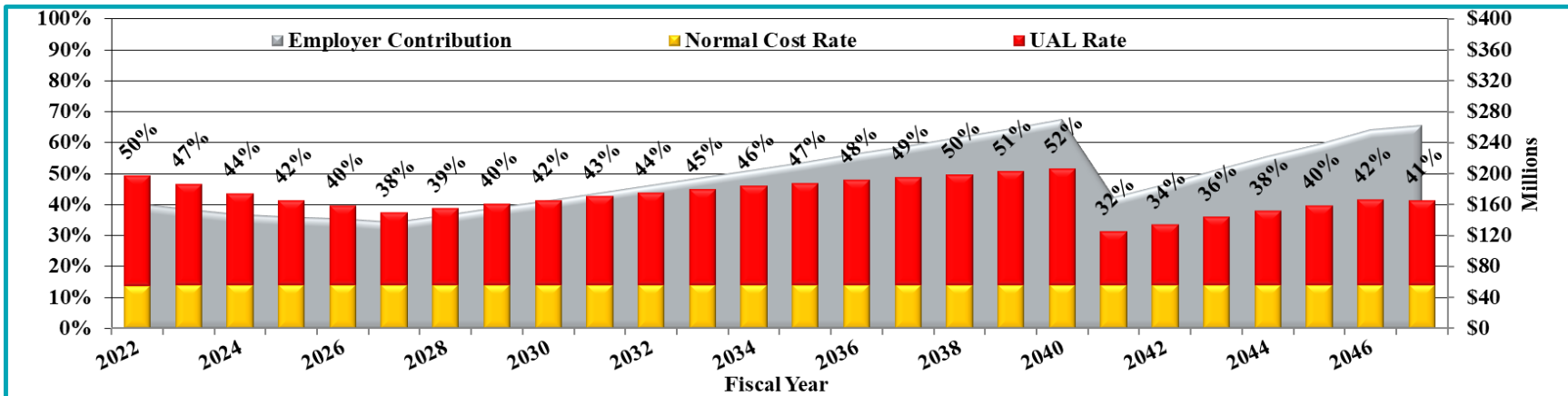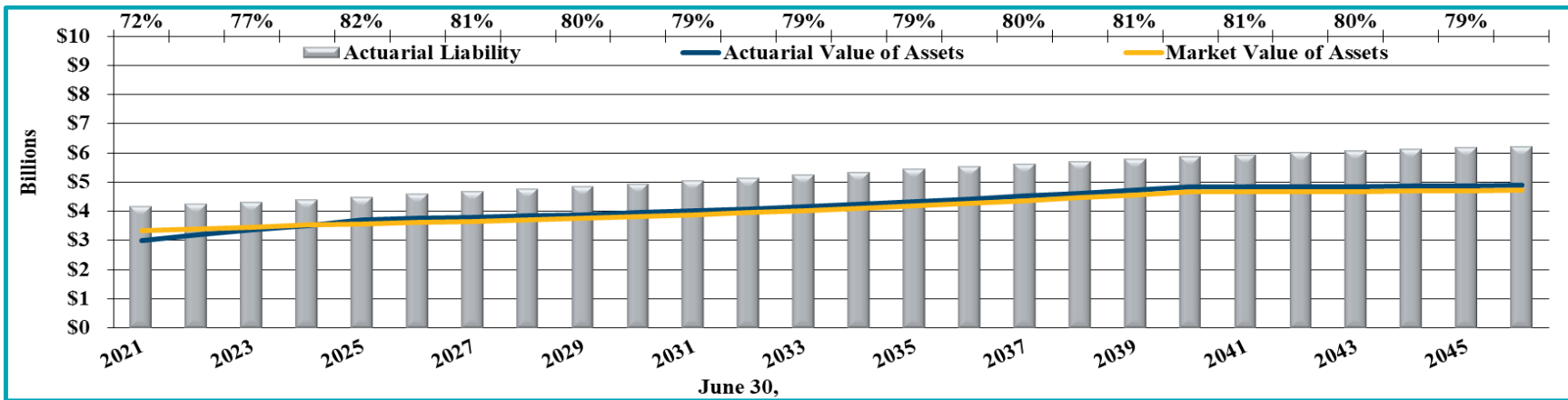
SECTION III – ASSETS

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 the System's assets including:

- Disclosure of the System's assets as of June 30, 2021
- Statement of the changes in market values during the year
- Development of the actuarial value of assets
- 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 investment 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 III – 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, 2021 is summarized below.

	Annuity Savings Fund	Annuity Reserve Fund	Pension Accumulation Fund	Pension Reserve Fund	Paid Up Benefit Fund	Contingency Reserve Fund	Total
Table III-1							
System Market Value of Assets as of June 30, 2021							
Fund Balance on 6/30/2020	$ 363,557,369	$ 404,662,893	$ (145,553,531)	$ 2,047,377,157	$ (24,585,535)	$ 0	$ 2,645,458,353
Ordinance Transfers	$ 0	$ 0	$ 0	$ (24,585,535)	$ 24,585,535	$ 0	$ 0
Actuarial Transfers	$ 0	$ 26,418,735	$ (290,677,616)	$ 264,258,881	$ 0	$ 0	$ 0
Adjusted Fund Balance on 6/30/2020	$ 363,557,369	$ 431,081,628	$ (436,231,147)	$ 2,287,050,503	$ 0	$ 0	$ 2,645,458,353
Contributions							
Member	$ 31,656,700	$ 0	$ 0	$ 0	$ 0	$ 0	$ 31,656,700
Employer (City/State)	$ 0	$ 0	$ 151,088,173	$ 0	$ 0	$ 0	$ 151,088,173
Net Investment Income							
Interest, Dividends, and							
Realized Capital Gains	$ 11,247,653	$ 0	$ 287,781,656	$ 0	$ 0	$ 0	$ 299,029,309
Unrealized Gains (Losses)	$ 0	$ 0	$ 510,522,169	$ 0	$ 0	$ 0	$ 510,522,169
Expenses	$ 0	$ 0	$ (35,391,614)	$ 0	$ 0	$ 0	$ (35,391,614)
Total Investment Income	$ 11,247,653	$ 0	$ 762,912,211	$ 0	$ 0	$ 0	$ 774,159,864
Net Fund Transfers	$ (53,104,166)	$ 53,209,630	$ (105,464)	$ 0	$ 0	$ 0	$ 0
Payments of Benefit & Refunds	$ (5,920,251)	$ (37,623,253)	$ (14,399,794)	$ (187,439,603)	$ (23,220,684)	$ 0	$ (268,603,585)
Administrative Expenses	$ 0	$ 0	$ (4,927,776)	$ 0	$ 0	$ 0	$ (4,927,776)
Fund Balance on 6/30/2021	$ 347,437,305	$ 446,668,005	$ 458,336,203	$ 2,099,610,900	$ (23,220,684)	$ 0	$ 3,328,831,729
Ordinance Transfers	$ 0	$ 0	$ 0	$ (23,220,684)	$ 23,220,684	$ 0	$ 0
Actuarial Transfers	$ 0	$ 1,305,156	$ (258,036,143)	$ 256,730,987	$ 0	$ 0	$ 0
Adjusted Fund Balance on 6/30/2021	$ 347,437,305	$ 447,973,161	$ 200,300,060	$ 2,333,121,203	$ 0	$ 0	$ 3,328,831,729

SECTION III – ASSETS

The chart below shows the calculation of the investment gain/loss. On a market value basis, the System earned a 29.77% return, a total investment gain of $774.2 million during FY 2021, resulting in a net system asset gain on a market value of assets basis of $585.7 million. On an actuarial value of assets basis, the System had a lower return for the year, 10.09%, producing a gain of $72.8 million to the System on that basis.

	Table III-2 Development of Investment Gain/(Loss)	
1.	Market Value of Assets as of 6/30/2020	$ 2,645,458,353
2.	Market Value of Assets as of 6/30/2021	$ 3,328,831,729
3.	Earnings During 7/1/2020 to 6/30/2021 (Net of Investment Expenses)	$ 774,159,864
4.	Mean Assets [(1. + 2. - 3.) ÷ 2]	$ 2,600,065,109
5.	Investment Return for FY 2021 [3. ÷ 4.]	29.77%
6.	Investment Gain/(Loss) for FY 2021 [5. - 7.25%] x 4.	$ 585,654,266

SECTION III – 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 methodology are included in Appendix C of the report.

Table III-3 Development of Actuarial Value of Assets			
1. Market Value of Assets at of 6/30/2021			$ 3,328,831,729
Plan Year End	**Gain/(Loss)**	**Percent Not Recognized**	**Amount Not Recognized**
6/30/2018	$ 22,586,529	20%	$ 4,517,306
6/30/2019	(43,830,180)	40%	(17,532,072)
6/30/2020	(211,215,623)	60%	(126,729,374)
6/30/2021	585,654,266	80%	468,523,413
2. Total Delayed Recognition			$ 328,779,273
3. Preliminary Actuarial Value of Assets [2. - 1.]			$ 3,000,052,456
4. Corridor for Actuarial Assets			
80% of Market Value			$ 2,663,065,383
120% of Market Value			$ 3,994,598,075
5. Actuarial Value of Assets as of 6/30/2021			$ 3,000,052,456

SECTION IV – LIABILITIES AND EXPERIENCE GAINS/(LOSSES)

In this section, we provide detailed information related to the System's liability measurements, including:

- Disclosure of the System's liabilities in total and by employer;
- Development of the experience gains and losses by assets, liabilities, and unfunded liabilities during the year; and
- Detailed development of the sources of the liability gains and losses during the year.

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 in accordance with the amortization method, 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 2023 as determined by this June 30, 2021 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 IV – LIABILITIES AND EXPERIENCE GAINS/(LOSSES)

Table IV-1 Liability by Employer			
	As of June 30, 2021		
	State	**City**	**Total**
Number of Members			
Actives	1	3,838	3,839
Service Retirees	49	3,878	3,927
Disabled	6	912	918
Beneficiaries	19	1,496	1,515
Total Members	75	10,124	10,199
Total Projected Current Payroll of Active Member	$ 90,401	$ 330,509,390	$ 330,599,791
Projected Total Payroll for Plan Year 2022	$ 92,887	$ 339,598,398	$ 339,691,285
Average Active Age	63.40	41.38	41.38
Average Active Service	36.06	14.30	14.31
Development of Unfunded Actuarial Liability (UAL)			
Actuarial Liability (AL)			
Actives	$ 1,127,851	$ 1,405,676,104	$ 1,406,803,955
Service Retirees	23,535,054	2,077,383,970	2,100,919,024
Disabled	1,781,584	401,972,853	403,754,437
Beneficiaries	3,795,697	272,625,206	276,420,903
Terminated Vested	0	1,859,453	1,859,453
Total Liabilities	$ 30,240,186	$ 4,159,517,586	$ 4,189,757,772
Actuarial Value of Assets (AVA)*	$ 21,653,315	$ 2,978,399,141	$ 3,000,052,456
AVA Unfunded Actuarial Liability (UAL)	$ 8,586,871	$ 1,181,118,445	$ 1,189,705,316
Funded Ratio using AVA	71.6%	71.6%	71.6%
Market Value of Assets (MVA)	$ 24,026,327	$ 3,304,805,402	$ 3,328,831,729
Funded Ratio using MVA	79.5%	79.5%	79.5%

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

SECTION IV – 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.

		Actuarial Liabilty	Actuarial Value of Assets	Unfunded Actuarial Liability
Table IV-2 **Development of 2021 Experience Gain/(Loss)**				
1.	Value as of 6/30/2020	$ 4,069,216,869	$ 2,811,813,190	$ 1,257,403,679
2.	Additions			
	a. Total Normal Cost	$ 71,089,400		$ 71,089,400
	b. Expected Employer Contributions		$ 151,088,173	$ (151,088,173)
	c. Expected Member Contributions		$ 31,656,700	$ (31,656,700)
3.	Decreases			
	a. Actual Benefit Payments	$ (268,603,585)	$ (268,603,585)	$ 0
	b. Actual Administrative Expenses		$ (4,927,776)	$ 4,927,776
4.	Expected Interest			
	a. On 1 for one year	$ 295,018,223	$ 203,856,456	$ 91,161,767
	b. On 2a for one year	$ 5,153,982		$ 5,153,982
	c. On 2b for one year*		$ 10,953,893	$ (10,953,893)
	d. On 2c for 1/2 year		$ 1,127,477	$ (1,127,477)
	e. On 3a for 1/2 year	$ (9,566,521)	$ (9,566,521)	$ 0
	f. On 3b for 1/2 year		$ (175,506)	$ 175,506
5.	Expected Value 6/30/2021 [sum 1. - 4.]	$ 4,162,308,368	$ 2,927,222,501	$ 1,235,085,867
6.	Excess Contributions	$ 0	$ 0	$ 0
7.	Due to Change in Actuarial Assumptions and Methodologies	$ 45,988,331	$ 0	$ 45,988,331
8.	Benefit Changes	$ 0	$ 0	$ 0
9.	Expected Value After Changes	$ 4,208,296,699	$ 2,927,222,501	$ 1,281,074,198
10.	Actual Value as of 6/30/2021	$ 4,189,757,772	$ 3,000,052,456	$ 1,189,705,316
11.	Actuarial Gain/(Loss)	$ 18,538,927	$ 72,829,955	$ 91,368,882
12.	Total Gain/(Loss)	$ (27,449,404)	$ 72,829,955	$ 45,380,551

* Assumes employer contributions made at beginning of year.

SECTION IV – LIABILITIES AND EXPERIENCE GAINS/(LOSSES)

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

Table IV-3 Elements of Actuarial Liability -- Gain/(Loss)		
1. Age and Service Retirements - Gain/(Loss)	$	900,000
2. Disability Retirements - Gain/(Loss)		5,370,000
3. Deaths in Service - Gain/(Loss)		710,000
4. Withdrawals from Employment - Gain/(Loss)		4,150,000
5. Pay Increases - Gain/(Loss)		890,000
6. Deaths After Retirement - Gain/(Loss)		2,530,000
7. New Entrants - Gain/(Loss)		(1,600,000)
8. Continuing Inactives - Gain/(Loss)		30,000
9. Continuing Actives - Gain/(Loss)		2,230,000
10. Other - Gain/(Loss)*		3,330,000
11. Total Actuarial Liability - Gain/(Loss) [sum of (1. to 9.)]	$	18,540,000

 * Includes the addition of terminated vested liabilty and data corrections.

SECTION V – 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 employer contribution: the net normal cost, a provision for anticipated administrative expenses, and an amortization of the unfunded actuarial liability (UAL).

The funding methodology employed is the entry age normal actuarial funding method for this System. 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 as of the valuation date is developed in Section IV of this report. In this section, we develop the contribution amounts by amortizing the initial UAL base over the remaining portion of the 20-year closed period beginning July 1, 2020, using a level dollar amortization approach. After that date, each year's bases are amortized over its own 20-year period. Additional information about this methodology is provided in Appendix C.

					July 1, 2022 Remaining Balance	July 1, 2022 Annual Payment	July 1, 2021 Remaining Balance	July 1, 2021 Annual Payment
Type of Base	Date Established	Original Amount	Original Period	Remaining Period				
1. Initial UAL	7/1/2020	$ 1,257,403,679	20	18	$ 1,198,632,667	$ 111,363,731	$ 1,233,598,667	$ 113,381,221
2. Assumption Change	7/1/2021	45,988,331	20	19	49,207,515	4,449,509	45,988,331	0
3. (Gain)/Loss	7/1/2021	(89,881,682)	20	19	(96,173,399)	(8,696,323)	(89,881,682)	0
Total		$ 1,213,510,328			$ 1,151,666,783	$ 107,116,917	$ 1,189,705,316	$ 113,381,221

Table V-1a
Total - Schedule of Amortization Bases as of July 1, 2021 and July 1, 2022

Since contributions are payable a year after they are developed, the initial UAL base is amortized over 18 years on July 1, 2022 and subsequent bases established in 2021 are amortized over 19 years on July 1, 2022.

SECTION V – CONTRIBUTIONS

The following charts show the schedule of amortization bases for the State and City separately.

					July 1, 2022	July 1, 2022	July 1, 2021	July 1, 2021
	Date	Original	Original	Remaining	Remaining	Annual	Remaining	Annual
Type of Base	Established	Amount	Period	Period	Balance	Payment	Balance	Payment
Table V-1b								
State - Schedule of Amortization Bases as of July 1, 2021 and July 1, 2022								
1. Initial UAL	7/1/2020	$ 9,650,626	20	18	$ 9,137,498	$ 848,956	$ 9,404,054	$ 864,336
2. Assumption Change	7/1/2021	(452,106)	20	19	(483,753)	(43,743)	(452,106)	0
3. (Gain)/Loss	7/1/2021	(365,077)	20	19	(390,632)	(35,322)	(365,077)	0
Total		$ 8,833,443			$ 8,263,113	$ 769,891	$ 8,586,871	$ 864,336

					July 1, 2022	July 1, 2022	July 1, 2021	July 1, 2021
	Date	Original	Original	Remaining	Remaining	Annual	Remaining	Annual
Type of Base	Established	Amount	Period	Period	Balance	Payment	Balance	Payment
Table V-1c								
City - Schedule of Amortization Bases as of July 1, 2021 and July 1, 2022								
1. Initial UAL	7/1/2020	$ 1,247,753,053	20	18	$ 1,189,495,169	$ 110,514,775	$ 1,224,194,613	$ 112,516,885
2. Assumption Change	7/1/2021	46,440,437	20	19	49,691,268	4,493,252	46,440,437	0
3. (Gain)/Loss	7/1/2021	(89,516,605)	20	19	(95,782,767)	(8,661,001)	(89,516,605)	0
Total		$ 1,204,676,885			$ 1,143,403,670	$ 106,347,026	$ 1,181,118,445	$ 112,516,885

SECTION V – CONTRIBUTIONS

The table below develops the State and City contributions to be paid in Fiscal Year 2023 based on this June 30, 2021 valuation.

Table V-2 FY 2023 Contribution Summary				
	State	**City**	**Total**	**% of Payroll**
Total Normal Cost	$ 24,303	$ 74,032,986	$ 74,057,289	22.40%
Expense Load	1,356	4,957,641	4,958,997	1.50%
Expected Member Cont. for FY 2022	(9,040)	(33,050,939)	(33,059,979)	(10.00%)
Net Normal Cost at 7/1/2021	$ 16,619	$ 45,939,688	$ 45,956,307	13.90%
Interest to 7/1/2022[1]	$ 457	$ 1,263,341	$ 1,263,798	0.38%
7/1/2022 Amortization of Unfunded Actuarial Liability[2]	769,891	106,347,026	107,116,917	32.40%
Net Plan Cost at 7/1/2022	$ 786,967	$ 153,550,055	$ 154,337,022	46.68%
Adjustment to Payment Date[3]	0	434,097	434,097	0.14%
Net Plan Cost at 7/1/2022 (w/ adjustment)	$ 786,967	$ 153,984,152	$ 154,771,119	46.82%

[1] Interest increases the Net Normal Cost by the assumed 2.75% payroll growth.
[2] See Table V-1a-c for development.
[3] City contribution assumed to be 49.86% at July 1 and 50.14% at August 1. Adjustment increases half of the Net Plan Cost (City) to August 1 by the assumed 7.00% interest rate.

APPENDIX A – SYSTEM MEMBERSHIP

The data for this valuation was provided electronically in Excel formats by the System's 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, 2021.

The following pages contain a summary of the data provided:

➢ Reconciliation of active and DROP/DROP2 members as of June 30, 2021
➢ Reconciliation of retirees, disabled members, and beneficiaries as of June 30, 2021
➢ Age/service and age/salary/service distribution for active members as of June 30, 2021
➢ Counts and average benefit amount by age for retirees, beneficiaries, and disabled members as of June 30, 2021

APPENDIX A – SYSTEM MEMBERSHIP

			Active	DROP (Grand)	DROP2 (Grand)	DROP2 (Non-Grand)	Total Total
A.	**Active Members as of June 30, 2020**		**3,374**	**148**	**371**	**34**	**3,927**
B.	**Exits:**						
	1. Terminations:	Non-vested	140	0	0	0	140
	2. Transfers:	Out	2	0	0	0	2
	3. Leaves:	Other	0	0	0	0	0
	4. Prior Incorrect Inclusions		0	0	1	0	1
	5. Deaths:	Line-of-Duty	1	0	1	0	2
		Non-Line-of-Duty w/ Survivor	0	0	0	0	0
		Non-Line-of-Duty w/out Survivor	1	1	0	0	2
	6. DROP2s:	DROP2 (Grandfathered)	3	0	0	0	3
		DROP2 (Non-Grandfathered)	38	0	0	0	38
	7. Retirements:	Service	58	33	48	4	143
	8. Disablements:	Line-of-Duty	7	0	0	0	7
		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):		253	34	50	4	341
	11. Military Leaves:		8	0	0	0	8
	12. Pending Disablement:		3	0	0	0	3
C.	**Remaining Active Members [A. - B.10]**		**3,121**	**114**	**321**	**30**	**3,586**
D.	**Entrances:**						
	1. New Entrants		205	0	0	0	205
	2. New DROP2s		0	0	3	38	41
	3. Prior Omissions		0	1	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	0	0	0	0	0
		Disability - Non-Line-of-Duty	0	0	0	0	0
		Disability - Line-of-Duty	0	0	0	0	0
		Other Termination	6	0	0	0	6
	6. Subtotal (All Entrances):		211	1	3	38	253
E.	**Active Members as of June 30, 2021**		**3,332**	**115**	**324**	**68**	**3,839**

APPENDIX A – SYSTEM MEMBERSHIP

Reconciliation of Inactive System Members					
	Retirees		Disableds		
	Primary	Beneficiary	Primary	Beneficiary	Total
A. Inactive Members as of June 30, 2020	**3,897**	**1,146**	**939**	**369**	**6,351**
B. Exits:					
1. Payments Ceased	0	2	0	0	2
2. Returned to Active Membership	0	0	0	0	0
3. Prior Incorrect Inclusion	0	0	0	0	0
4. Deaths: Primary with no Survivor	53	0	13	0	66
Beneficiary	0	66	0	30	96
Primary with Survivor	62	0	21	0	83
5. Subtotal (All Exits):	115	68	34	30	247
C. Remaining Active [A. - B.5]	**3,782**	**1,078**	**905**	**339**	**6,104**
Adjustments	0	0	0	0	0
Adjusted Remaining Members	**3,782**	**1,078**	**905**	**339**	**6,104**
D. Entrances:					
1. New Retirements: Primary	143	0	10	0	153
2. Active Death: Beneficiary	0	2	0	0	2
3. Beneficiary Assumes Payments	0	62	0	21	83
4. Prior Omissions	2	0	3	0	5
5. Ex-Spouse Receiving Payments (QDRO)	0	13	0	0	13
6. Subtotal (all exits):	145	77	13	21	256
E. Inactive Members as of June 30, 2021	**3,927**	**1,155**	**918**	**360**	**6,360**

APPENDIX A – SYSTEM MEMBERSHIP

	Age/Service Distribution of Active Members									
	Active Members as of June 30, 2021									
	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	113	2	0	0	0	0	0	0	0	115
25-29	274	77	1	0	0	0	0	0	0	352
30-34	235	215	168	9	0	0	0	0	0	627
35-39	94	119	300	136	4	0	0	0	0	653
40-44	51	43	92	244	125	4	0	0	0	559
45-49	28	25	68	143	229	93	1	0	0	587
50-54	15	17	34	83	150	186	78	0	0	563
55-59	7	3	11	31	53	64	71	18	2	260
60-64	0	1	5	8	12	13	21	22	6	88
65-69	0	0	2	3	1	2	6	2	14	30
70 & Up	0	0	0	0	0	0	0	0	5	5
Total	817	502	681	657	574	362	177	42	27	**3,839**
	Average Age = 41.38					Average Service = 14.31				

APPENDIX A – SYSTEM MEMBERSHIP

	Age/Service Distribution of Active Members									
	Active Members as of June 30, 2021									
					Average Payroll					
Age	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & Up	Total
Under 25	$ 55,253	$ 55,668	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 55,260
25-29	58,078	72,718	78,080	0	0	0	0	0	0	61,337
30-34	59,554	76,052	80,358	82,901	0	0	0	0	0	71,121
35-39	59,571	71,830	81,172	85,960	82,624	0	0	0	0	77,366
40-44	63,856	74,016	80,232	87,545	97,381	109,268	0	0	0	85,495
45-49	62,535	72,424	81,573	85,591	97,716	105,647	110,585	0	0	91,416
50-54	85,051	76,439	80,295	84,267	95,110	101,861	104,267	0	0	95,284
55-59	99,506	122,566	79,196	87,081	90,418	96,643	99,320	103,090	133,460	95,332
60-64	0	82,704	78,920	84,933	89,918	89,667	92,508	101,777	106,553	93,438
65-69	0	0	80,971	81,008	80,750	88,076	89,358	117,114	101,152	94,946
70 & Up	0	0	0	0	0	0	0	0	95,119	95,119
Total	$ 59,647	$ 74,408	$ 80,787	$ 86,231	$ 95,991	$ 101,479	$ 100,418	$ 103,070	$ 103,628	$ 81,919

Total Pensionable Payroll = $ 314,488,595   Average Pensionable Payroll = $ 81,919

APPENDIX A – SYSTEM MEMBERSHIP

Schedule of Benefit Recipients by Attained Age and Type of Retirement							
June 30, 2021 - 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	2	5	0	7
35-39	0	0	0	5	22	0	27
40-44	1	6	1	14	51	0	73
45-49	103	38	0	23	92	0	256
50-54	411	23	1	32	126	1	594
55-59	518	7	9	32	113	1	680
60-64	602	2	1	15	57	1	678
65-69	594	2	1	14	55	0	666
70-74	708	0	1	18	54	0	781
75-79	442	0	0	23	47	0	512
80-84	264	0	0	18	40	0	322
85-89	139	0	0	16	22	1	178
90 & Up	53	0	0	5	13	0	71
Total	3,835	78	14	217	697	4	**4,845**
Average Annual Benefit	$ 47,255	$ 39,289	$ 32,885	$ 21,534	$ 40,117	$ 77,250	$ 44,931

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, 2021 - Beneficiaries									
	Type of Retirement									
Age	NR	ER	DS	NLOD Dis	LOD Dis	LOD 100	NLOD DR	NLOD Dth	LOD Dth	Total
Under 20	2	0	0	1	4	0	0	6	0	13
20-24	0	0	0	0	1	0	0	1	1	3
25-29	1	0	0	0	0	0	0	0	0	1
30-34	0	0	0	0	0	0	0	0	1	1
35-39	0	0	0	0	1	0	0	1	0	2
40-44	2	2	0	2	2	0	0	2	1	11
45-49	10	2	0	0	2	0	0	7	3	24
50-54	42	0	0	2	4	0	3	2	4	57
55-59	74	0	0	8	10	0	3	6	3	104
60-64	96	0	0	3	15	0	6	3	2	125
65-69	123	0	0	12	12	0	11	3	4	165
70-74	162	0	0	9	24	0	10	12	10	227
75-79	143	0	0	17	33	0	7	7	7	214
80-84	129	1	0	28	45	1	8	4	4	220
85-89	116	0	0	29	42	0	7	3	3	200
90 & Up	85	0	0	17	36	0	4	1	5	148
Total	985	5	0	128	231	1	59	58	48	**1,515**
Average Annual Benefit	$ 20,986	$ 14,818	$ 0	$ 14,984	$ 19,162	$ 42,852	$ 33,939	$ 21,447	$ 51,828	$ 21,694

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 21-043.

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.

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 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.

APPENDIX B – SUMMARY OF PLAN PROVISIONS

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

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.

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

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.

APPENDIX B – SUMMARY OF PLAN PROVISIONS

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 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

APPENDIX B – SUMMARY OF PLAN PROVISIONS

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

7.00% 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.

Years of Service	Police	Fire
0	0.25%	0.25%
1	0.25%	10.00%
2	1.50%	15.00%
3	18.25%	15.00%
4	6.25%	1.75%
5	5.50%	1.75%
6	1.25%	0.25%
7	4.25%	0.25%
8	1.25%	0.25%
9	2.25%	1.75%
10	1.25%	1.75%
11 – 13	1.25%	0.25%
14	1.25%	1.75%
15	4.00%	1.75%
16 – 18	1.25%	0.25%
19 – 20	1.25%	2.50%
20+	0.75%	0.75%

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.

4. Disability

Age	Rate[1]
25	0.0035
30	0.0050
35	0.0065
40	0.0075
45	0.0080
50	0.0070
55	0.0040
60	0.0040

[1] Assumes 80% of all disabilities are Line of Duty and 20% are Non-Line of Duty.

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5. **Pre-Retirement Mortality (values shown for 2021)**

Actives and DROPs: 125% and 130% of the Pub-2010 Safety Employee Mortality Table for males and females, respectively, with generationally mortality improvement using the RPEC_2014_v2020 model, with an ultimate rate of 1.00% for ages 20-80, an ultimate rate of 0.05% for ages 80-95, an ultimate rate of 0.00% for ages 95-120, convergence to the ultimate rate in year 2027, and using the committee selected weighing assumption.

Age	Actives and DROPs[1] Male	Female
20	0.000537	0.000229
25	0.000553	0.000322
30	0.000718	0.000485
35	0.000860	0.000640
40	0.000945	0.000741
45	0.001063	0.000848
50	0.001406	0.001114
55	0.002126	0.001647
60	0.003438	0.002309

[1] Assumes 20% of all deaths are Line of Duty and 80% are Non-Line of Duty.

6. **Post-Retirement Mortality (values shown for 2021)**

Retirees and Beneficiaries: 125% and 130% of the Pub-2010 Safety Healthy Retiree Mortality Table for males and females, respectively, with generationally mortality improvement using the RPEC_2014_v2020 model (same as described in pre-retirement morality above).

Disabled members: 120% of the Pub-2010 Safety Disabled Retiree Mortality Table with generationally mortality improvement using the RPEC_2014_v2020 model (same as described in pre-retirement morality above).

Age	Retirees and Beneficiaries Male	Female	Disabled Members Male	Female
55	0.003717	0.003455	0.005598	0.005698
60	0.006615	0.006130	0.009188	0.008868
65	0.011149	0.009599	0.014408	0.012209
70	0.018284	0.015429	0.021347	0.017254
75	0.031957	0.026945	0.035184	0.026476
80	0.058303	0.048206	0.061400	0.044498
85	0.106579	0.085296	0.103189	0.078734
90	0.188062	0.148462	0.180539	0.137042
95	0.282587	0.237137	0.271284	0.218895

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7. Withdrawal

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

Years of Service[1]	Police	Fire
0	7.0%	14.0%
1	10.0%	5.0%
2	12.0%	4.0%
3	9.0%	2.5%
4	7.0%	2.5%
5	5.5%	2.5%
6	4.0%	2.0%
7	3.5%	2.0%
8	3.0%	2.0%
9	2.5%	2.0%
10	2.0%	2.0%
11	1.8%	1.2%
12	1.6%	1.2%
13	1.4%	1.2%
14 – 19	1.2%	1.2%
20+	0.0%	0.0%

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

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

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Age	Service <10	10	11	12	13	14	15	16	17	18	19	20	21-24	25+
Non-grandfathered Early Retirement Rate for Police and Firemen													
<45												4.00%	4.00%	
45												4.00%	4.00%	
46		Members Not Yet Eligible for Early Retirement										4.00%	4.00%	
47												4.00%	4.00%	
48												4.00%	4.00%	
49												4.00%	4.00%	
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: either they 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%

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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	45.0%	25.0%
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	10.0%	5.0%
2	10.0%	5.0%
3	15.0%	10.0%
4	10.0%	5.0%
5	10.0%	5.0%
6	20.0%	5.0%
7	25.0%	5.0%
8	18.0%	20.0%
9 – 14	18.0%	13.0%
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.

9. **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 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

APPENDIX C – ACTUARIAL ASSUMPTIONS AND METHODS

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.

10. Cost-of-Living Adjustment Assumption

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

11. Percent Married

Males 70%, Females 70% for actives and current retirees and disabled members who elect 50% Joint & Survivor Form.

12. Spouse Age

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

13. Remarriage Rates

None.

14. Children Loads

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

15. Benefit Loads

75% 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 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.

APPENDIX C – ACTUARIAL ASSUMPTIONS AND METHODS

16. Disclosures regarding Models Used

In accordance with Actuarial Standard of Practice (ASOP) No. 56 *Modeling*, the following disclosures are made:

a. Valuation Software

Cheiron utilizes ProVal, an actuarial valuation software program leased from Winklevoss Technologies (WinTech), to calculate liabilities and projected benefit payments. We have reviewed the underlying workings of this model to the degree feasible and consistent with ASOP No. 56 and believe them to be appropriate for the purposes of the valuation.

b. Projections

This valuation report includes projections of future contributions and funded status for the purpose of assisting the Board of Trustees and the sponsors of the System with the management of the Fund.

The projections are based on the same census data and financial information as of June 30, 2021 as disclosed in this actuarial valuation. The projections assume continuation of the plan provisions and actuarial assumptions in effect as of June 30, 2021 and do not reflect the impact of any changes in benefits or actuarial assumptions that may be adopted after June 30, 2021.

The projections assume that all future assumptions are met except where specifically indicated. The future outcomes become increasingly uncertain over time, and therefore the general trends and not the absolute values should be considered in the review of these projections. Further, for the purpose of these projections, we have only reflected the impact of new entrants entering the plan in aggregate and have not developed individual liabilities or detailed profiles related to these potential new entrants. We feel this is appropriate for the purpose of these projections, but if they were to be used for other purposes, this may not be appropriate and alternative projections may need to be developed.

c. Mortality Improvement Model

Cheiron utilized the RPEC_2014_v2020 Model Implementation Tool for the purposes of developing the customized version of MP-2020 used in this report. This tool is updated and published annually by the Society of Actuaries and their Retirement Plans Experience Committee and allows actuaries to develop customized versions of mortality improvement scales based on the parameters and data underlying the published MP-2020 scale but allowing practitioners to vary parameters from those used in the published MP-2020 scale.

We have reviewed this model and believe it is appropriate to our intended use in developing a customized mortality improvement scale for the Programs. Further, we are

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aware of no material inconsistencies that would limit our ability to use this model for its intended purpose.

17. 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. A similar amount is developed for the State. However, the aggregate payments must also 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.

18. Changes since Last Valuation

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

19. 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 2014-2020 valuations. The results of this study were presented in May 2021 and went into effect starting with the June 30, 2021 valuation.

APPENDIX C – ACTUARIAL ASSUMPTIONS AND METHODS

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 initial unfunded actuarial liability is amortized as a level dollar figure over a closed 20-year period beginning on July 1, 2020. Subsequent changes in the UAL due to experience gains and losses, assumption changes, or plan changes are amortized over new closed 20-year periods.

4. Changes since Last Valuation
The amortization method changed from a single closed 25-year period beginning on July 1, 2014 to a 20-year layered approach with an initial unfunded liability set as a closed 20-year period beginning on July 1, 2020.