



City of Los Angeles Fire and Police Pension Plan

Risk Assessment

**Including Review of Funded Status of the
Retirement and Health Plans as of June 30, 2019**

February 14, 2020

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Section 1: Introduction and Executive Summary

Introduction

The purpose of this report is to assist the Board of Commissioners,¹ participating employers and members and other stakeholders to better understand and assess the risk profile of the Plan, as well as the particular risks inherent in using a fixed set of actuarial assumptions in preparing the results in our June 30, 2019 funding valuations for the City of Los Angeles Fire and Police Pension Plan (“LAFPP” or “the Plan”).

The results included in our June 30, 2019 funding valuation reports for the Retirement and Health Plans (“the Plans”) were prepared based on a fixed set of economic and non-economic actuarial assumptions under the premise that future experience of LAFPP would be consistent with those assumptions. While those assumptions are generally reviewed every three years (with the assumptions from the last triennial experience study adopted by the Board of Commissioners for use starting with the June 30, 2017 valuation and the revised mortality assumption based on the mortality experience during July 1, 2010 to June 30, 2019 adopted by the Board for use starting with the June 30, 2019 valuation), there is a risk that emerging results may differ significantly as actual experience is fluid and will not completely track current assumptions.

New Actuarial Standard of Practice on Risk Assessment

The Actuarial Standards Board approved the new Actuarial Standard of Practice No. 51 (ASOP 51) regarding risk assessment when performing a funding valuation and it is effective with LAFPP’s June 30, 2019 actuarial valuation for benefits provided by the Retirement Plan.² ASOP 51 requires actuaries to identify and assess risks that “may reasonably be anticipated to significantly affect the plan’s future financial condition.” Examples of key risks listed that are particularly relevant to LAFPP are asset/liability mismatch risk, investment risk, and longevity and other demographic risks. The Standard also requires an actuary to consider if there is any ongoing contribution risk to the plan; however, it does not require the actuary to evaluate the particular ability or willingness of contributing entities to make contributions when due, nor does it require the actuary to assess the likelihood or consequences of future changes in applicable law.

The actuary’s initial assessment can be strictly a qualitative discussion about potential adverse experience and the possible effect on future results, but it may also include quantitative numerical demonstrations where informative. The actuary is also encouraged to consider a recommendation as to whether a more detailed risk assessment would be

¹ This risk report has been prepared at the request of the Board of Commissioners to assist in administering the Fund. This risk report may not otherwise be copied or reproduced in any form without the consent of the Board of Commissioners and may only be provided to other parties in its entirety, unless expressly authorized by Segal. The measurements shown in this risk report may not be applicable for other purposes.

² ASOP 51 does not actually apply to actuaries performing services related to other post-employment benefits; however, as the same kind of information is useful for the administration of the Health Plan, after discussions with LAFPP the Plan has requested Segal to include information on the Health Plan in this risk report.

significantly beneficial for the intended user in order to examine particular financial risks. When making that recommendation, the actuary will take into account such factors as the plan's design, risk profile, maturity, size, funded status, asset allocation, cash flow, possible insolvency and current market conditions. This report incorporates a more detailed risk assessment as agreed upon with LAFPP.

Plan Risk Assessment

In Section 2, we start by discussing some of the historical factors that have caused changes in LAFPP's funded status and employer contribution rates. It is important to understand how the combination of decisions and experience has led to the current financial status of the plan. We follow this with a discussion of the most significant risk factors going forward. Based on our discussions with LAFPP, we have provided a more detailed risk assessment that illustrates the impact on the funded status and employer contribution rates using relevant economic scenario tests. These tests illustrate the effect of future investment returns on the Plan's portfolio coming in differently from the current 7.25% annual investment return assumption used in the June 30, 2019 valuations. The Standard also requires disclosure of plan maturity measures and other historical information that are significant to understanding the risks associated with the Retirement and Health Plans and this information is included in this report.

Executive Summary

Historical Funded Status and Employer Contribution Rates

The following table provides a summary of financial changes to the Retirement and Health Plans over the last 10 valuations. The unfunded actuarial accrued liability (UAAL)³ and contribution rates⁴ increased primarily as a result of the strengthening of the actuarial assumptions used in preparing the valuations and unfavorable investment experience that were offset to some degree by favorable non-investment experience.

³ For example, the UAAL increased by \$404 million in the June 30 2010 valuations, \$823 million in the June 30, 2011 valuations, \$35 million in the June 30, 2014 valuations, \$978 million in the June 30, 2017 valuations, and \$375 million in the June 30, 2019 valuations (for a total of \$2.6B), as a result of the experience studies over the last ten years.

⁴ For example, the increase in the employer's total rate (normal cost plus UAAL) was 2.8% in the June 30, 2010 valuations, 2.9% in the June 30, 2011 valuations, 5.7% in the June 30, 2017 valuations, and 2.8% in the June 30, 2019 valuations, offset to some degree by a decrease in the employer's total rate of 0.3% in the June 30, 2014 valuations, as a result of the experience studies over the last ten years. Note that the above increases in the June 30, 2010 and June 30, 2011 valuations were for the Retirement Plan only as such detail was not readily available in Segal's health valuation reports.

Valuation Date	Market Value Basis		Valuation Value Basis		Total (Aggregate) Employer Contribution Rate (% of Payroll – Payable on July 15)
	Funded Status	UAAL	Funded Status	UAAL	
June 30, 2010	67.6%	\$5.9B	83.3%	\$3.0B	39.08%
June 30, 2019	89.4%	\$2.8B	88.5%	\$3.0B	46.60%

Future Funded Status and Employer Contribution Rates

In this report, we highlight key factors that may affect the financial profile of the Plans going forward. As investment experience in the past 10 years has had a significant impact on the funded status and employer contribution rates, we have also provided deterministic projections (using select scenarios for illustration) under hypothetical favorable and unfavorable future market experience so that the impact of market performance can be better understood.

The total (aggregate) employer contribution rate for the Retirement and Health Plans is 46.60% of total payroll in the June 30, 2019 valuations. Using a deterministic projection, this report shows the effect of either favorable (14.50%) or unfavorable (0.00%) hypothetical market returns for 2019/2020 on key valuation results. In particular, the changes in the total employer contribution rate (relative to the June 30, 2019 valuation aggregate employer contribution rate of 46.6%) in the June 30, 2020 valuation and in the June 30, 2026 valuation (when all the investment gains or losses are fully recognized at the end of the seven-year asset smoothing period) are as shown in the following table:

Contribution Rate Change	2019/2020 Single Plan-Year Investment Return		
	14.50%	7.25% (Baseline)	0.00%
June 30, 2020	-4.2% of payroll	-3.2% of payroll	-2.2% of payroll
June 30, 2026	-18.1% of payroll	-13.3% of payroll	-4.9% of payroll

The reduction in the employer rates shown in the table above is caused mainly by the full amortization of some of the charge layers in the next several years. Except for the increase in the contribution rate in about 15 years under the unfavorable (0%) scenario, the contribution rates are expected to decrease and the Plans would be expected to reach full funding by about 2043 under all three scenarios.⁵

⁵ Assuming no further assumption changes, method changes or experience that differs significantly from assumptions.

Plan Maturity Measures

During the past 10 valuations, the Plans have become more mature as evidenced by an increase in the ratio of members in pay status (retirees and beneficiaries) to active members (as shown in *Section 2, Charts 8a and 8b on pages 23 and 24*) and by an increase in the ratios of plan assets and liabilities to active member payroll (as shown in *Section 2, Charts 9a and 9b on pages 25 and 26*). We expect these trends to continue going forward. This is significant for understanding the volatility of both historical and future employer contribution rates because any increase in UAAL due to unfavorable investment and non-investment experience for the relatively larger group of non-active members would have to be amortized and funded over the payroll of the relatively smaller group of only active members. Put another way, as a plan grows more mature, its contribution rate becomes more sensitive to investment volatility and liability changes. As the Plans continue to mature with time, its risk profile will continue to evolve in this way and contributions will grow more sensitive to plan experience.

Section 2: Key Plan Risks on Funded Status, Unfunded Actuarial Accrued Liabilities, and Employer Contribution Rates

Evaluation of Historical Trends – Retirement and Health Plans

Funded Status and UAAL

One common measure of LAFPP's financial status is the funded ratio. This ratio compares the valuation⁶ and market value of assets to the actuarial accrued liabilities (AAL)⁷ of LAFPP. After accounting for contributions made at the Actuarially Determined Contribution (ADC) amount, the overall level of funding of LAFPP on a valuation basis has remained about the same for the Retirement Plan but increased for the Health Plan as a result of favorable non-investment experience, offset by the strengthening of the actuarial assumptions, and unfavorable investment experience. The funded ratios and UAAL are provided separately for the Retirement and Health Plans for the past 10 valuations from June 30, 2010 to 2019 measured using both valuation and market value of assets in *Charts 1a* and *1b*, respectively.

The factors that caused the changes in the UAAL for the past 10 valuations from June 30, 2010 to 2019 are specified, separately for the Retirement and Health Plans, in *Charts 2a* and *2b*, respectively. The results in *Charts 2a* and *2b* reflect that the reductions in the investment return assumption in the June 30, 2010, 2014, and 2017⁸ valuations, together with the changes in the mortality tables and other assumptions from the three triennial experience studies recommending assumptions used in the June 30, 2011, 2014, 2017, and 2019⁸ valuations, have had the most impact on the UAAL for LAFPP,⁹ followed by the investment experience, especially during 2009 to 2013.

⁶ The valuation value of assets is the portion of the total actuarial value of assets allocated for the Retirement and Health Plans. The actuarial value of assets is equal to the market value of assets less unrecognized returns in each of the last seven years. Unrecognized return is equal to the difference between the actual market return and the expected return on the market value, and is recognized over a seven-year period.

⁷ For the actives, the actuarial accrued liability is the value of the accumulated normal costs allocated to the years before the valuation date. For the pensioners, beneficiaries and inactive vested members, the actuarial accrued liability is the single-sum present value of the lifetime benefit expected to be paid to those members.

⁸ The Board has a practice of reviewing the investment return and other actuarial assumptions at the same time in the triennial experience study. However, the economic assumptions were reviewed in 2010 and used in the June 30, 2010 valuations prior to the triennial experience study conducted in 2011 with assumptions used in the June 30, 2011 valuations. Also, a study to include only the mortality assumption conducted in 2019 was used in the June 30, 2019 valuations.

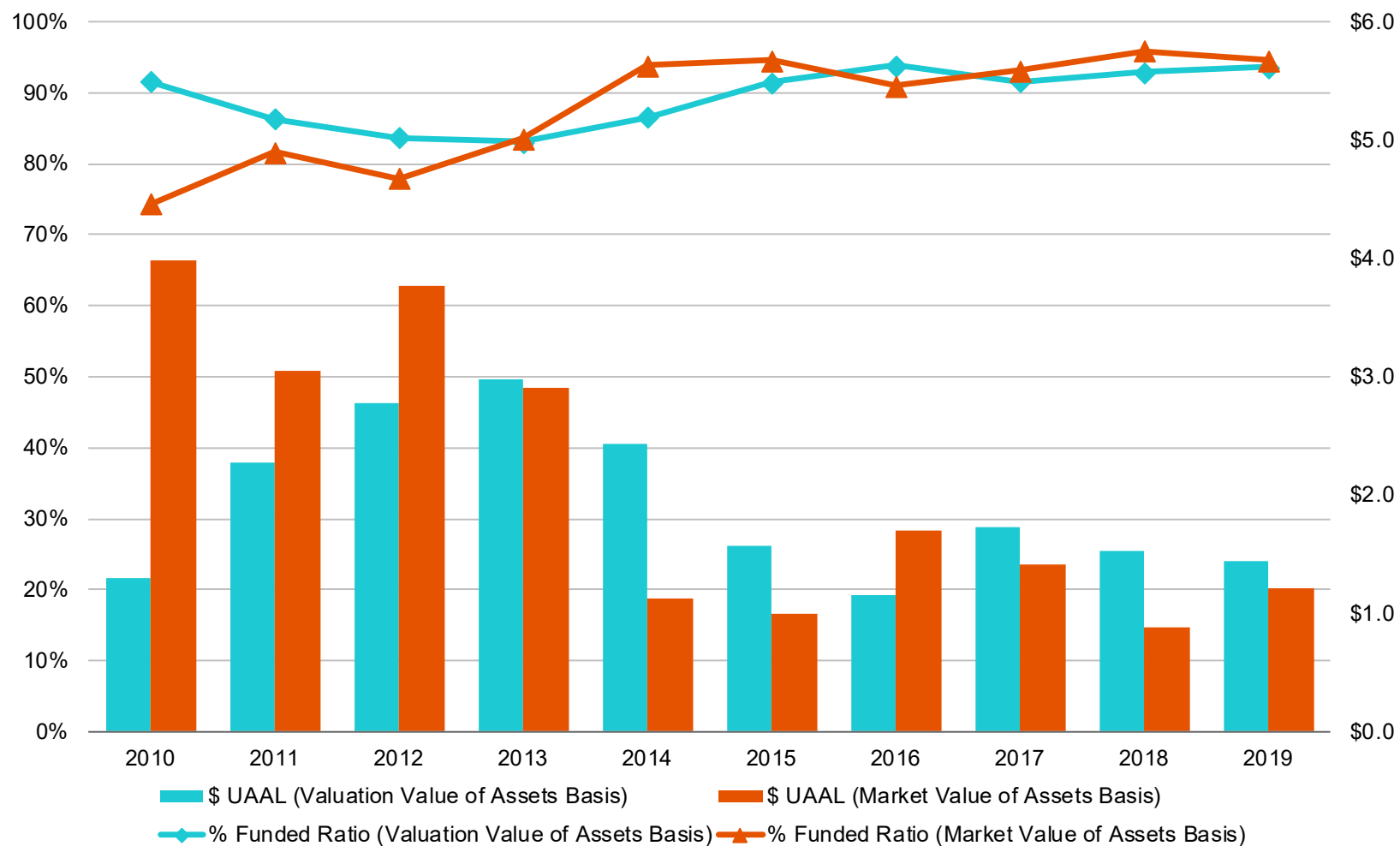
⁹ For example, for the Retirement and Health Plans combined, the UAAL increased by \$404 million in the June 30 2010 valuations, \$823 million in the June 30, 2011 valuations, \$35 million in the June 30, 2014 valuations, \$978 million in the June 30, 2017 valuations, and \$375 million in the June 30, 2019 valuations (for a total of \$2.6B), as a result of the experience studies over the last ten years.

Charts 2a and *2b* also show that the unfavorable investment experience was offset to a large extent by favorable non-investment experience. The non-investment experience included lower than expected COLAs granted to retirees and beneficiaries, and lower than expected salary increase for continuing actives. The non-investment experience also includes the scheduled 12-month delay in implementing the contribution rates determined in the annual valuation. Finally, *Chart 2b* shows some “negative amortization” for the Health Plan due to the 30-year reamortization of the bases in the June 30, 2006 valuation of the Health Plan. Current assumptions and amortization policy generally will not entail negative amortization in the future.

It is important to note that LAFPP has taken strides in risk management and resulting long-term plan sustainability. This includes strengthening of assumptions, particularly the expected investment rate of return and mortality assumption (generational), and adopting a funding policy that eliminates negative amortization and promotes intergenerational equity. Assumptions will continue to be reviewed in future experience studies to reflect the Plans’ experience as well as future expectations. Those changes may result in higher contributions in the short term, but in the medium to longer term avoid both deferring contributions and allowing unmanaged growth in the UAAL. We believe these actions are essential for LAFPP’s fiscal health going forward.

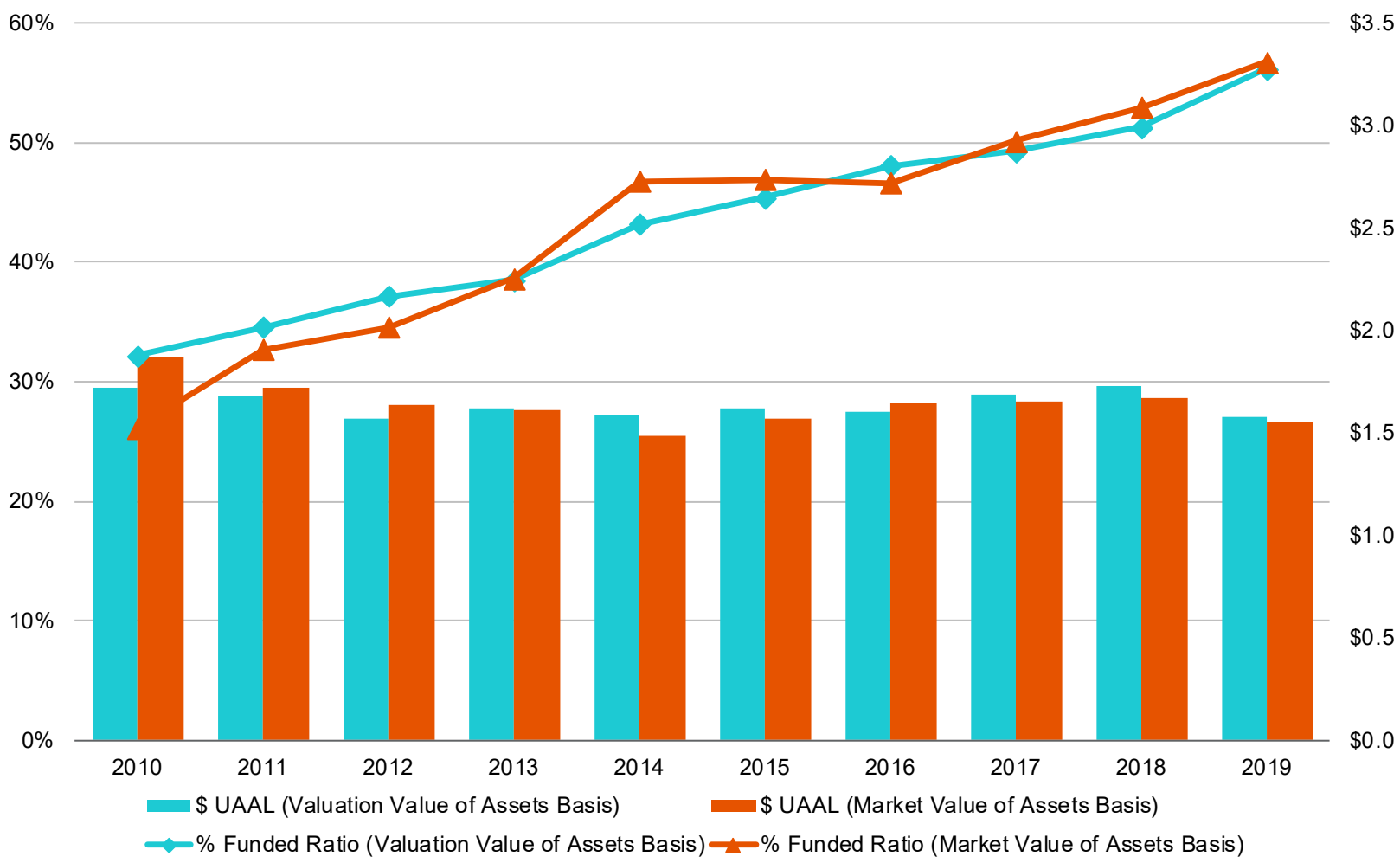
RETIREMENT PLAN

Funded Ratio (Percentages) and Dollar UAAL (\$ Billions)
In June 30, 2010 to 2019 Valuations



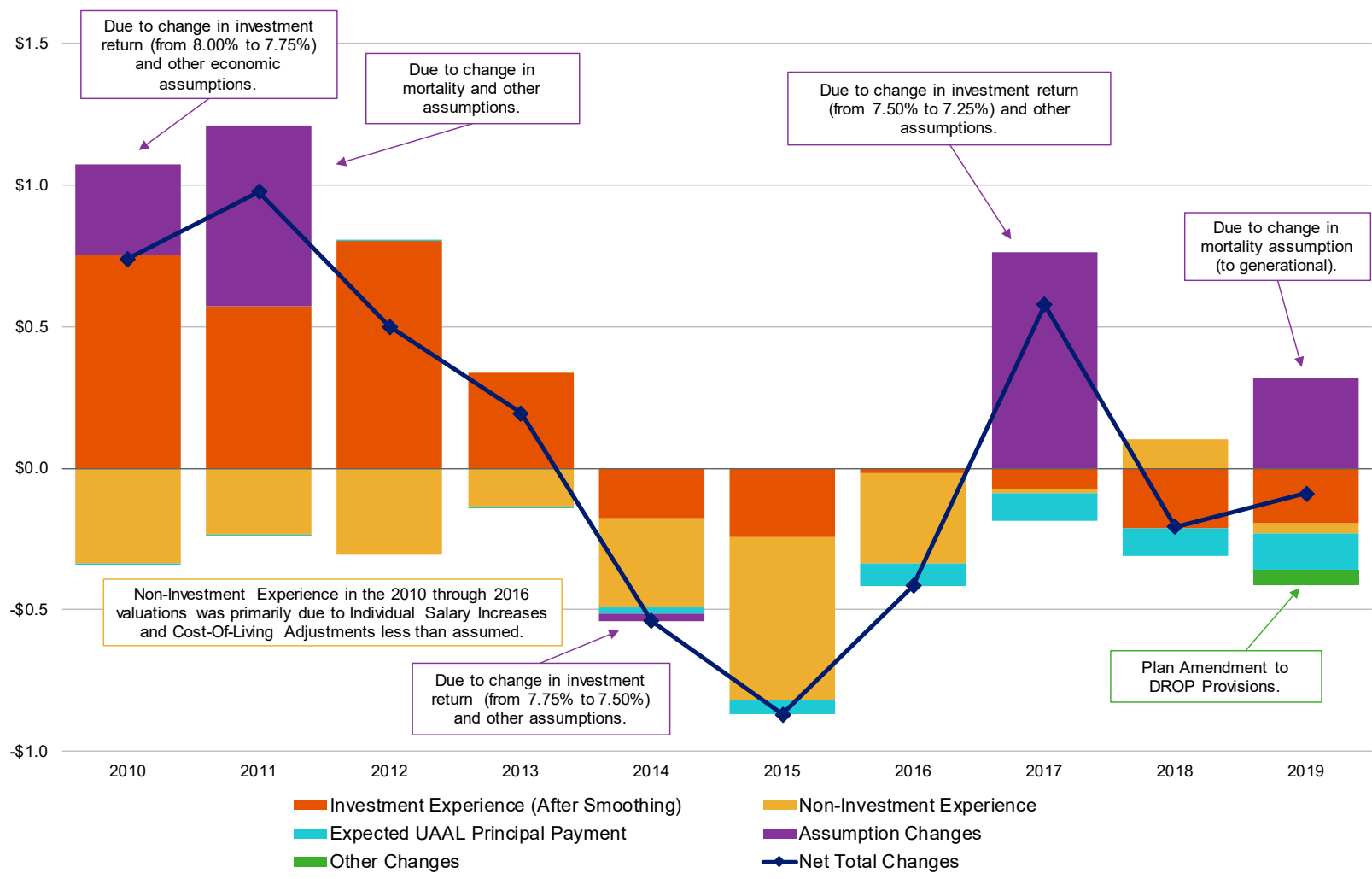
HEALTH PLAN

Funded Ratio (Percentages) and Dollar UAAL (\$ Billions)
In June 30, 2010 to 2019 Valuations



RETIREMENT PLAN

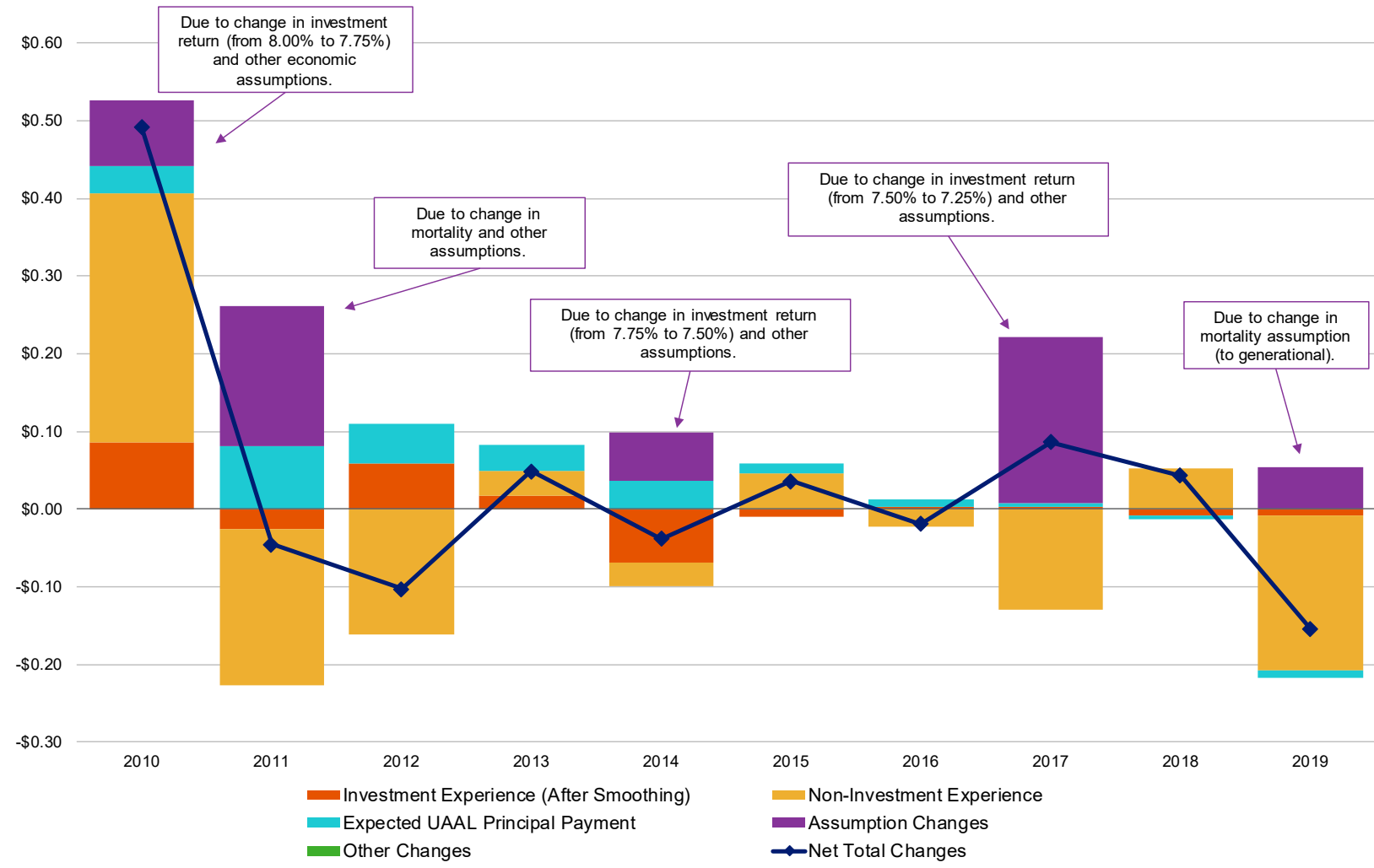
Factors that Changed UAAL in June 30, 2010 to 2019 Valuations (\$ Billions)



Note: The primary source of investment losses starting in the June 30, 2009 valuation is the Great Recession, which was recognized in the valuation value of assets over several years.

HEALTH PLAN

Factors that Changed UAAL in June 30, 2010 to 2019 Valuations (\$ Billions)



Note: The primary source of investment losses starting in the June 30, 2009 valuation is the Great Recession, which was recognized in the valuation value of assets over several years.

Employer Contribution Rates

The total (normal cost¹⁰ plus UAAL payment) employer contribution rates determined in the June 30, 2010 to 2019 valuations for the Retirement and Health Plans are provided in *Charts 3a* and *3b*, respectively, and the factors that caused the changes in the total aggregate employer rates¹¹ for the Retirement and Health Plans are provided in *Charts 4a* and *4b*, respectively.

The aggregate employer normal cost rates for the Retirement and Health Plans as shown in *Charts 3a* and *3b* have increased since the June 30, 2010 valuation. For the Retirement Plan, the UAAL rate generally increased between the June 30, 2010 and the June 30, 2019 valuations primarily due to changes in actuarial assumptions and unfavorable investment experience. While there have also been increases in the normal cost rates due to the changes in the actuarial assumptions, those increases were offset to some degree by the plan changes, with the introduction of Tier 6, as new members have been enrolled in the lower cost benefit tier since July 1, 2011. For the Health Plan, the UAAL rate between the June 30, 2010 and the June 30, 2019 valuations remained stable in the 7-8% of payroll range.

For the Retirement Plan, *Chart 4a* shows that the changes in the investment return, mortality tables and other assumptions have had the most impact on increasing the UAAL contribution rates¹² for the Plan. The next greatest impact was from the investment experience during 2010 to 2019. Favorable non-investment experience and full amortization of charge layers have partially offset the increases in contribution rates.

For the Health Plan, *Chart 4b* shows that the non-investment experience¹³ (primarily medical premiums and subsidies lower than projected) has had the most impact on changing the UAAL contribution rates¹² for the Plan, followed by changes in the investment return, mortality tables and other assumptions.

¹⁰The normal cost is the amount of contributions required to fund the portion of the level cost of the member's projected retirement benefit that is allocated to the current year of service.

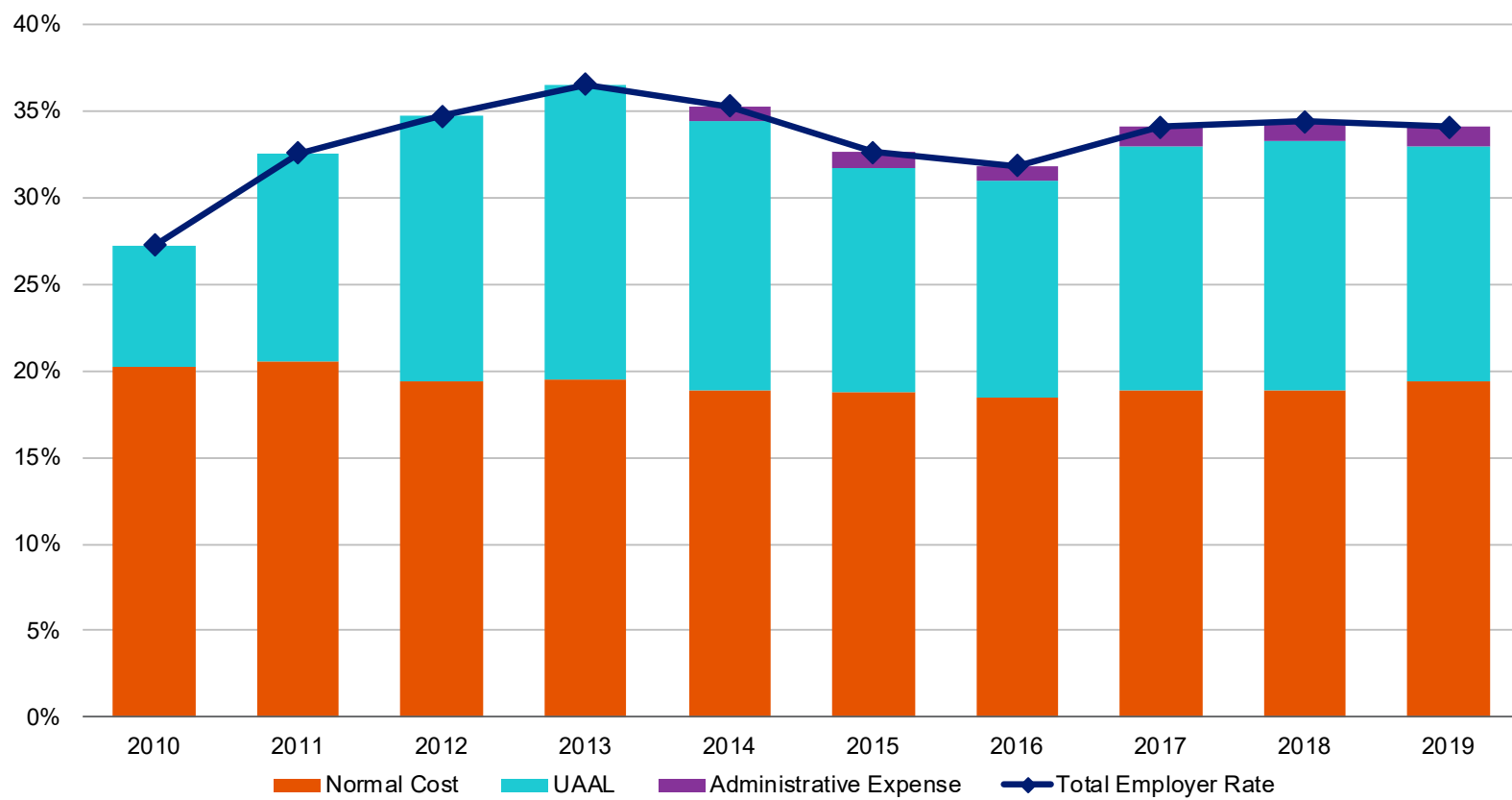
¹¹There are separate contribution rates determined in the valuation for each tier. The aggregate contribution rates have been calculated based on an average of those rates weighted by the payrolls of the active members reported in those valuations.

¹²For example, for the Retirement and Health Plans combined, the increase in the employer's total rate (normal cost plus UAAL) was 2.8% in the June 30, 2010 valuations, 2.9% in the June 30, 2011 valuations, 5.7% in the June 30, 2017 valuations, and 2.8% in the June 30, 2019 valuations, offset to some degree by a decrease in the employer's total rate of 0.3% in the June 30, 2014 valuations (for a total of 13.9%), as a result of the experience studies over the last ten years. Note that the above rate increases in the June 30, 2010 and June 30, 2011 valuations were for the Retirement Plan only as such detail was not readily available in Segal's health valuation reports.

¹³Includes the impact of the annual review and adjustment of the medical trend assumptions.

RETIREMENT PLAN

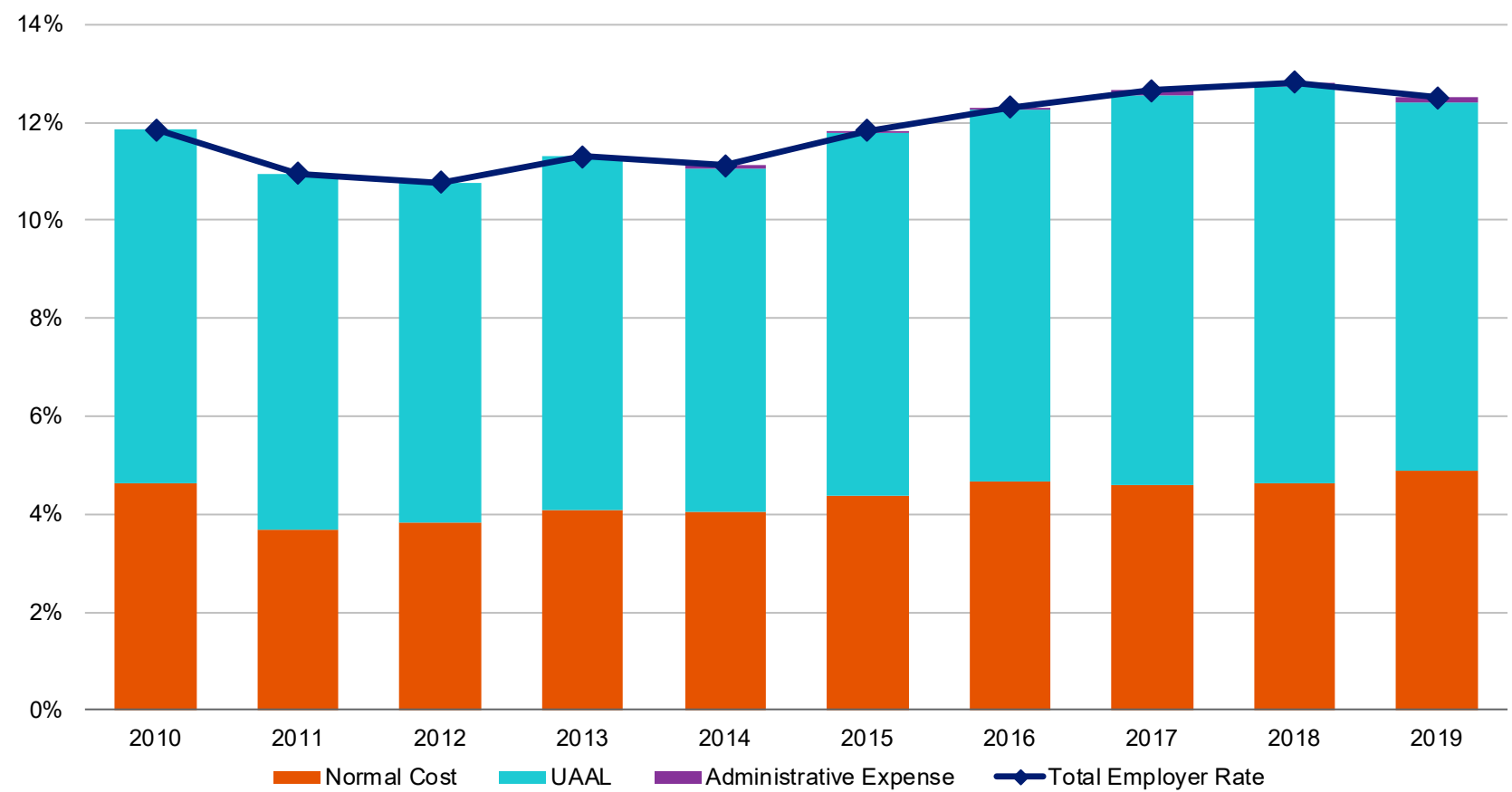
Employer Contribution Rates in June 30, 2010 to 2019 Valuations
(% of Payroll – Payable July 15)



Note: Consistent with the format of the annual valuations and the supplemental schedules included in the annual summaries, the above rates were determined without adjustment for the three-year phase-in of the increase in the employer contribution rates due to assumption changes from the 2011 experience study. For rates after the phase-in adjustments, please refer to our letters dated: January 11, 2012 and February 27, 2013.

HEALTH PLAN

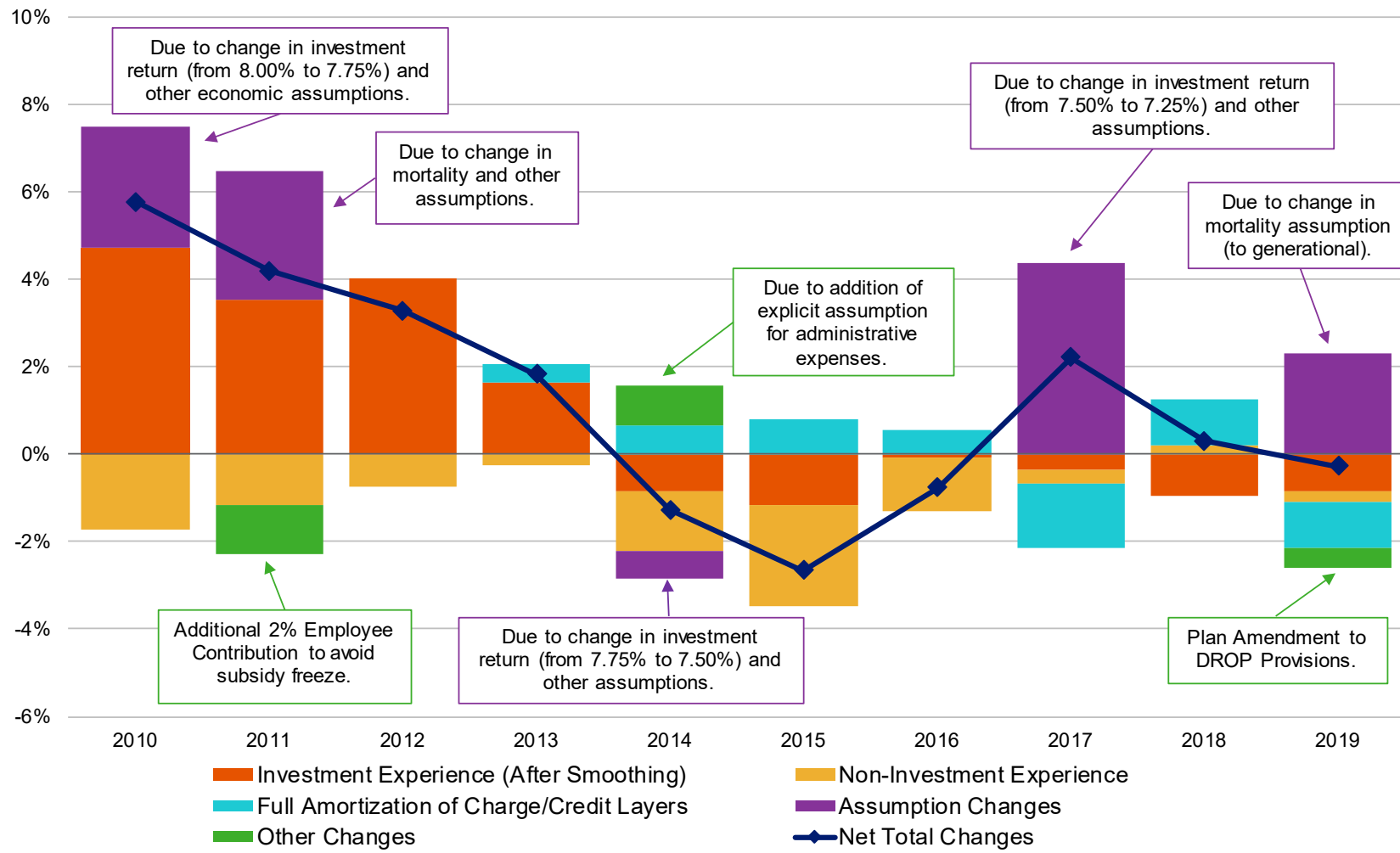
Employer Contribution Rates in June 30, 2010 to 2019 Valuations
(% of Payroll – Payable July 15)



Note: Consistent with the format of the annual valuations and the supplemental schedules included in the annual summaries, the above rates were determined without adjustment for the three-year phase-in of the increase in the employer contribution rates due to assumption changes from the 2011 experience study. For rates after the phase-in adjustments, please refer to our letters dated: January 11, 2012 and February 27, 2013.

RETIREMENT PLAN

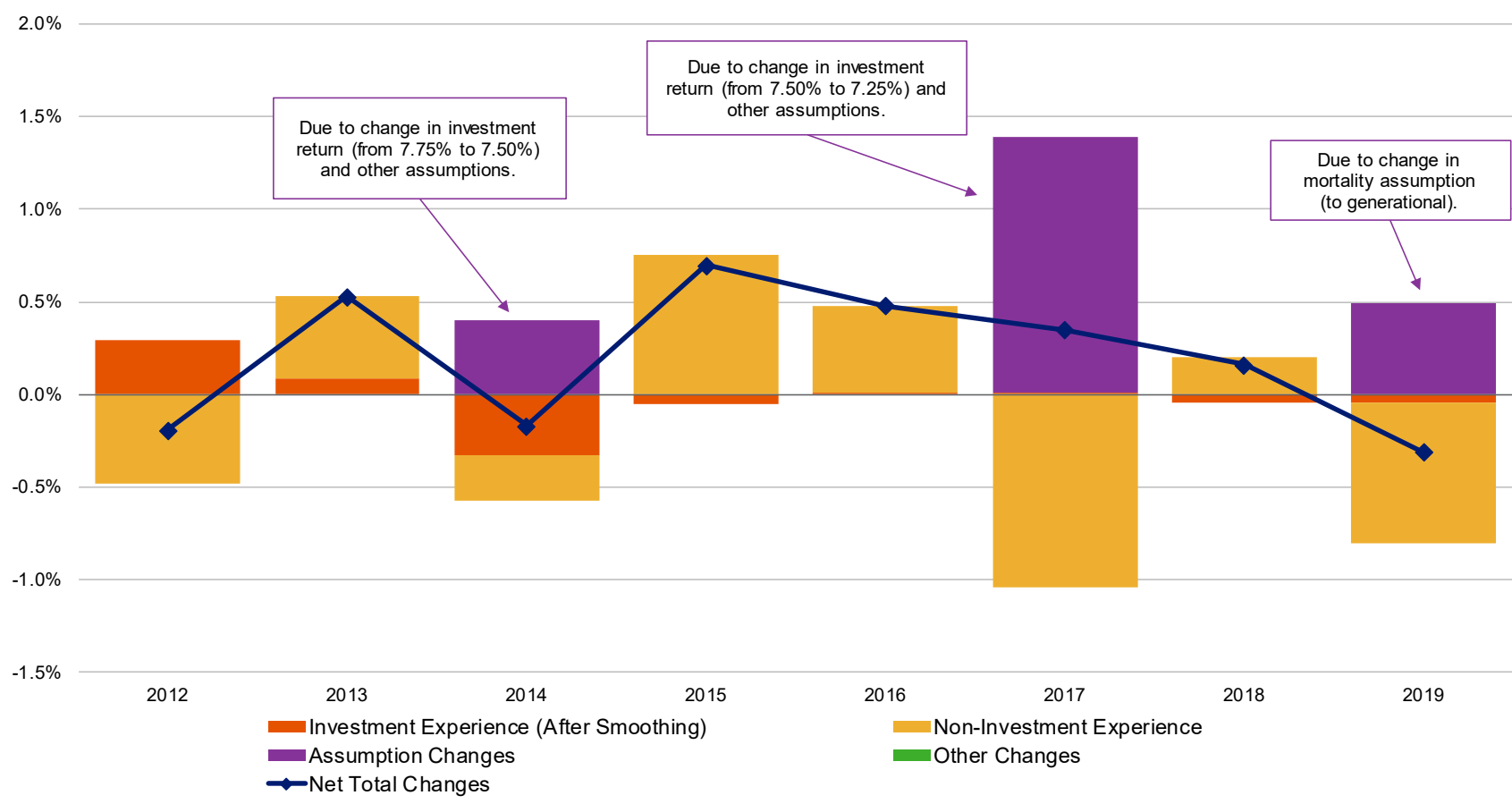
Factors that Affected Employer Contribution Rates in June 30, 2010 to 2019 Valuations (% of Payroll – Payable July 15)



Note: The primary source of investment losses starting in the June 30, 2009 valuation is the Great Recession, which was recognized in the valuation value of assets over several years.

HEALTH PLAN

Factors that Affected Employer Contribution Rates
in June 30, 2010 to 2019 Valuations (% of Payroll – Payable July 15)



Note: The primary source of investment losses starting in the June 30, 2009 valuation is the Great Recession, which was recognized in the valuation value of assets over several years.

Assessment of Primary Risk Factors Going Forward

As discussed in the Evaluation of Historical Trends section, in the 2010 to 2019 valuations the funded ratios and the employer contribution rates have changed mainly as a result of changes in actuarial assumptions, investment experience, and non-investment experience.

In general, we anticipate the following risk factors to have an ongoing influence on those financial metrics in our future valuations:

- Asset/liability mismatch risk – the potential that future plan experience does not affect asset and liability values in the same way, causing them to diverge.

The most significant asset/liability mismatch risk to LAFPP is investment risk, as defined below. In fact, investment risk has the potential to impact asset/liability mismatch in two ways. The first mismatch is evident in annual valuations: when asset values deviate from assumptions, those changes are essentially independent from liability changes. The second mismatch can be caused when systemic asset deviations from assumptions may signal the need for an assumption change, which causes liability values and contribution rates to move in the opposite direction from the experience of the asset values.

Asset/liability mismatch can also be caused by longevity and other demographic assumption risks, which affect liabilities but have no impact on asset levels. These risks are also discussed below.

It may be informative to use the asset volatility and liability volatility ratios and associated contribution rate impacts provided in the following Plan Maturity Measures section when discussing with the City the effect of unfavorable or favorable actuarial experience on the assets and the liabilities of LAFPP.

- Investment risk – the potential that future market returns will be different from the current expected 7.25% annual return assumption.

The investment return assumption is a long-term, deterministic assumption for valuation purposes even though in reality market experience can be quite volatile in any given year. We have included deterministic scenario tests later in this section so that LAFPP can better understand the risk associated with earning either more or less than the assumed rate.

Also, the Board has a policy of reviewing the investment return and the other actuarial assumptions generally every three years, with the next triennial experience study (recommending assumptions for the June 30, 2020 actuarial valuations) scheduled to be performed in 2020.

- Longevity and other demographic risks – the potential that mortality or other demographic experience will be different than expected.

The change to using generational,¹⁴ amount-weighted mortality tables that reflects data from public sector retirement plans was the change in the mortality experience study conducted in late 2019 for use in the June 30, 2019 valuations. As can be observed from *Charts 2a, 2b, 4a, and 4b*, there had been relatively small unfavorable impact on the UAAL and employer contribution rates due to non-investment related experience relative to the assumptions used in the last 10 valuations.

- Contribution risk – the potential that actual future contributions will be different from expected future contributions.

ASOP 51 does not require the actuary to evaluate the particular ability or willingness of the plan sponsor or other contributing entity to make contributions to the plan when due. However, it does require the actuary to consider the potential for and impact of actual contributions deviating from expected in the future. The City has a well-established practice of making the ADC determined in the annual actuarial valuations, based on the Board of Commissioners' Actuarial Funding Policy. As a result, in practice LAFPP has essentially no contribution risk.

Furthermore, when ADCs determined in accordance with the LAFPP Actuarial Funding Policy are made in the future by the City (and contributions required by the Administrative Code are made by the employees), it is anticipated that the Plan would have enough assets to provide all future benefits promised to the current members enrolled in the Plan, if all of the actuarial assumptions used in the valuation are met.

The ASOP also lists interest rate risk as an example of a potential risk to consider. However, the valuations of your Plans' liabilities are not linked directly to market interest rates so the resulting interest rate risk exposure is minimal.

Scenario Tests: Deterministic Projections

Since the funded ratio, UAAL and the employer contribution rates have fluctuated as a result of deviation in investment experience in the last 10 valuations, we have examined the risk for LAFPP associated with earning either higher or lower than the assumed rate of 7.25% in future valuations using projections under a deterministic approach.

To measure such risk, we have included scenario tests to study the change in the UAAL and contribution rates if LAFPP were to earn a market return higher or lower than 7.25% in the next year following the June 30, 2019 valuations. In *Charts 5, 6 and 7*, we show the aggregate employer contribution rates, funded ratios, and UAAL respectively assuming that the Plan's portfolio market return in 2019/2020 will be as follows: Scenario 1: 14.50%, Scenario 2: 7.25% (baseline) or

¹⁴ A generational mortality table provides dynamic projections of mortality experience for each cohort of current and future retirees. For example, the mortality rate for someone who is 65 next year will be slightly less than for someone who is 65 this year. In general, using generational mortality anticipates increases in the cost of the Plan over time as participants' life expectancies are projected to increase. This is in contrast to updating a static mortality assumption with each experience study as we had proposed in prior experience studies.

Scenario 3: 0.00%. Detailed employer contribution rates, funded ratios and UAAL developed for the City only (excluding Harbor Port Police and Airport Police) for each of the Retirement and Health Plans and in total under each of the three Scenarios over a 6-year illustration period are provided in *Appendix C* of this report. This information is similar to what we understand had been provided to the City in the past to assist the City in their budgeting process.

The following table summarizes for the Retirement and Health Plans the resulting contribution changes (relative to the June 30, 2019 valuation aggregate employer contribution rate of 46.6%) in the immediately next valuation as well as in June 30, 2026 valuations when all of the investment gains and losses are fully recognized in the (smoothed) actuarial value of assets.

Contribution Rate Change	2019/2020 Single Plan-Year Investment Return		
	14.50%	7.25% (Baseline) ¹⁵	0.00%
June 30, 2020	-4.2% of payroll	-3.2% of payroll	-2.2% of payroll
June 30, 2026	-18.1% of payroll	-13.3% of payroll	-4.9% of payroll

The reduction in the employer rates shown in the table above is caused mainly by the full amortization of some of the charge layers in the next several years. As of June 30, 2019, the longest-duration amortization base is 22 years and will be fully amortized on June 30, 2041. Except for the increase in the contribution rates in about 15 years under the unfavorable (0%) scenario, the contribution rates are expected to decrease and the Plans would be expected to reach full funding by about 2043 under all three scenarios.¹⁶

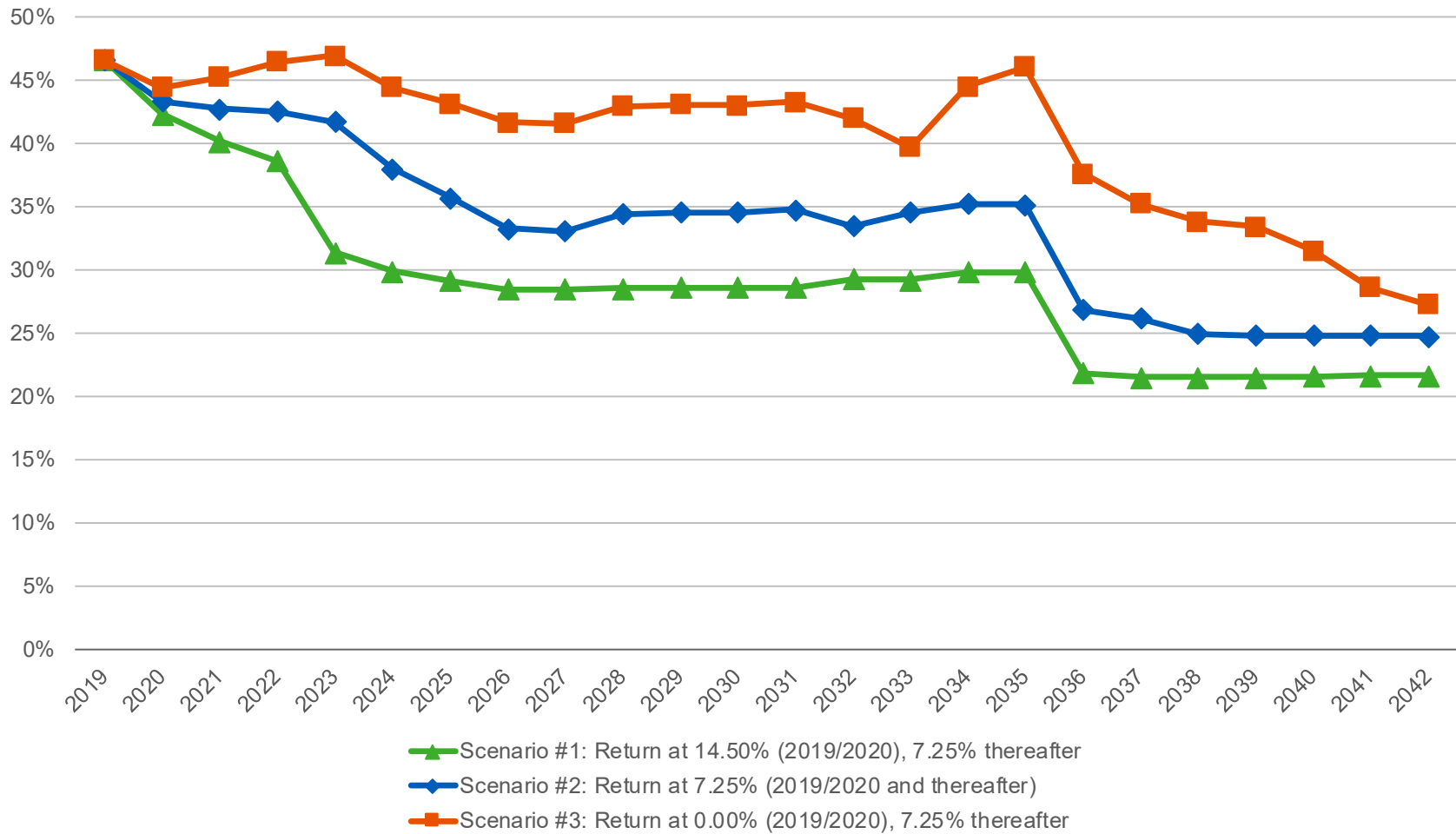
While we have not assigned a probability on the 2019/2020 market return coming in at these rates, the Board and other stakeholders monitoring LAFPP should still be able to prorate and estimate the funded status and employer contribution rates for the June 30, 2020 and next several valuations as the actual investment experience for the 2019/2020 year becomes available throughout the year. Additionally, comparable experience in upcoming future years are likely to have a similar impact on the Plan absent any significant plan or assumption changes.

¹⁵In the baseline projection for the Retirement Plan, we observed that the net amortization payment is expected to be negative (a credit to the contribution rate) even though the Retirement Plan still has a UAAL as of June 30, 2033. We have combined the UAAL layers and restarted the amortization of UAAL over 6 years (which is the effective amortization period).

¹⁶Assuming no further assumption changes, method changes or experience that differs significantly from assumptions.

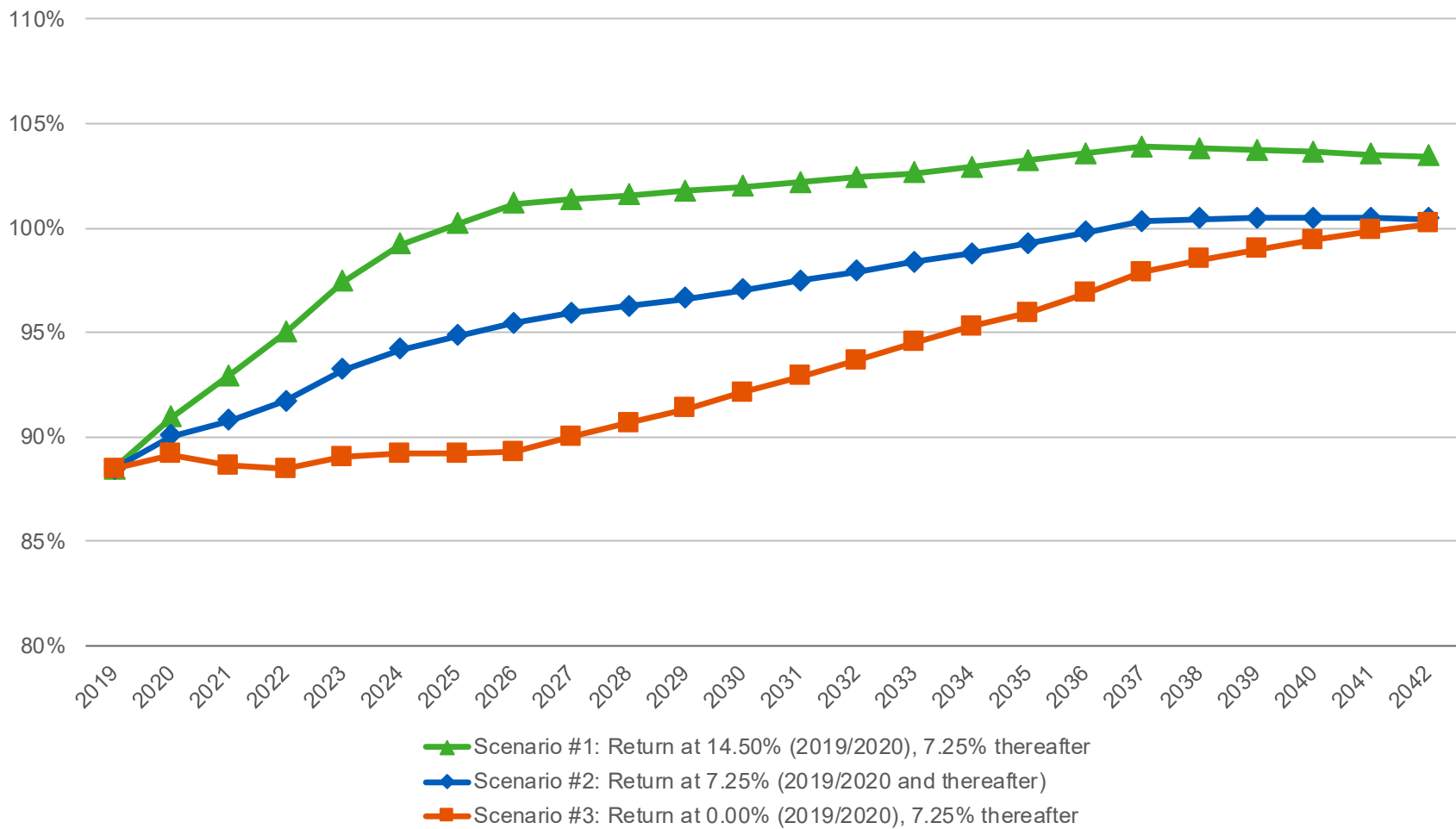
RETIREMENT AND HEALTH PLANS

Projected Employer Contribution Rates Under Three Hypothetical Market Return Scenarios for 2019/2020 for the June 30, 2019 to 2042 Valuations (% of Payroll – Payable July 15)



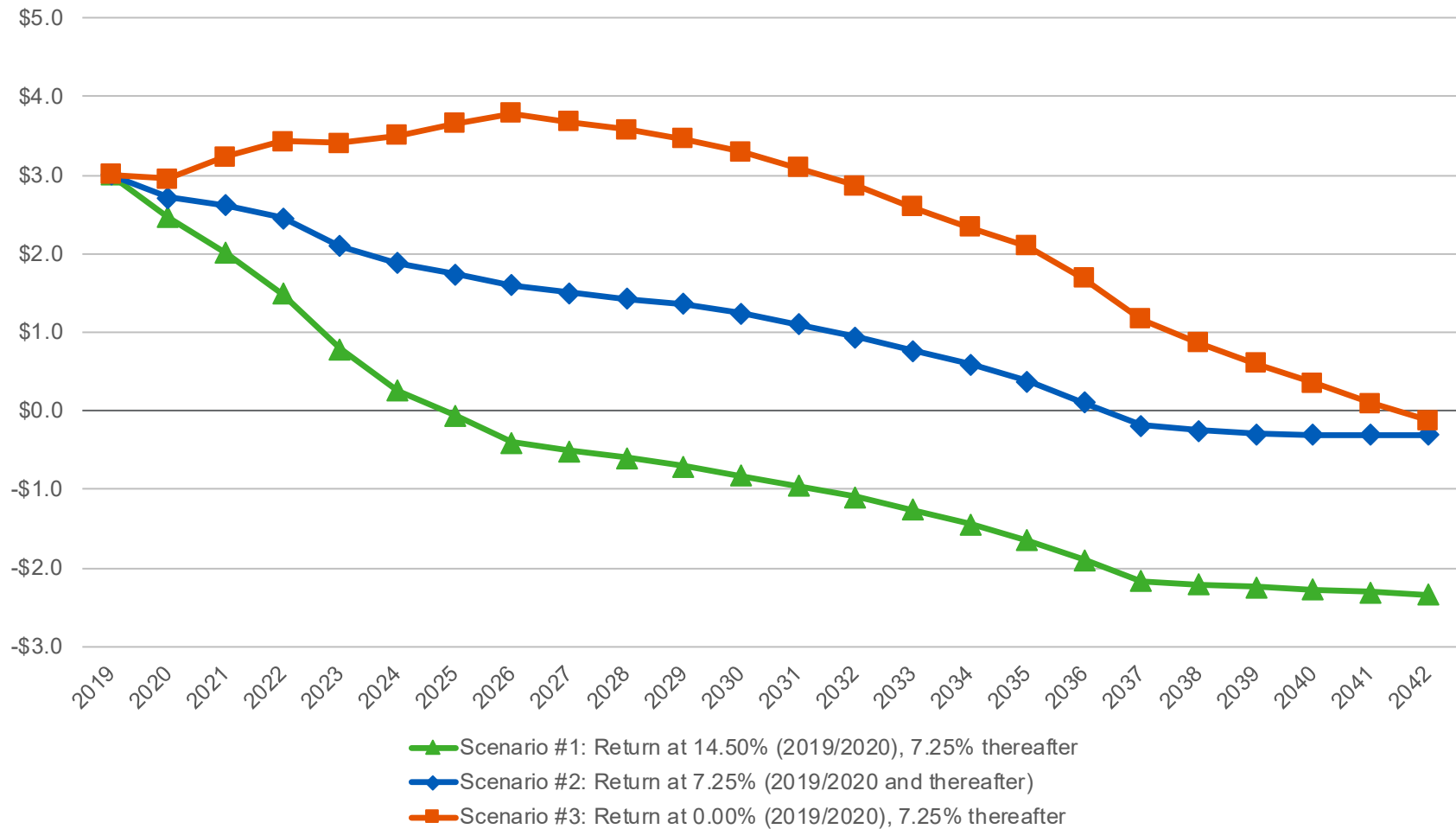
RETIREMENT AND HEALTH PLANS

Projected Funded Ratios (on Valuation Value of Assets) Under Three Hypothetical Market Return Scenarios for 2019/2020 for the June 30, 2019 to 2042 Valuations



RETIREMENT AND HEALTH PLANS

Projected UAAL (on Valuation Value of Assets) Under Three Hypothetical Market Return Scenarios for 2019/2020 for the June 30, 2019 to 2042 Valuations (\$ Billions)



Plan Maturity Measures that Affect Primary Risks

The annual actuarial valuations consider the number and demographic characteristics of covered members, including active members and non-active members (inactive vested, retirees and beneficiaries). In the past 10 valuations from June 30, 2010 to 2019, LAFPP has become more mature, indicated by the continued increase in the ratio of non-active to active members covered by the Retirement and Health Plans as shown in *Charts 8a* and *8b*, respectively. The Charts also show the ratio of members in pay status (retirees and beneficiaries) to active members. This ratio excludes the inactive vested members who have relatively smaller liabilities. The increase in the ratios is significant because any increase in UAAL due to unfavorable future investment and non-investment experience for a plan with a relatively larger group of non-active members would have to be amortized and funded using the payroll of a relatively smaller group of active members.

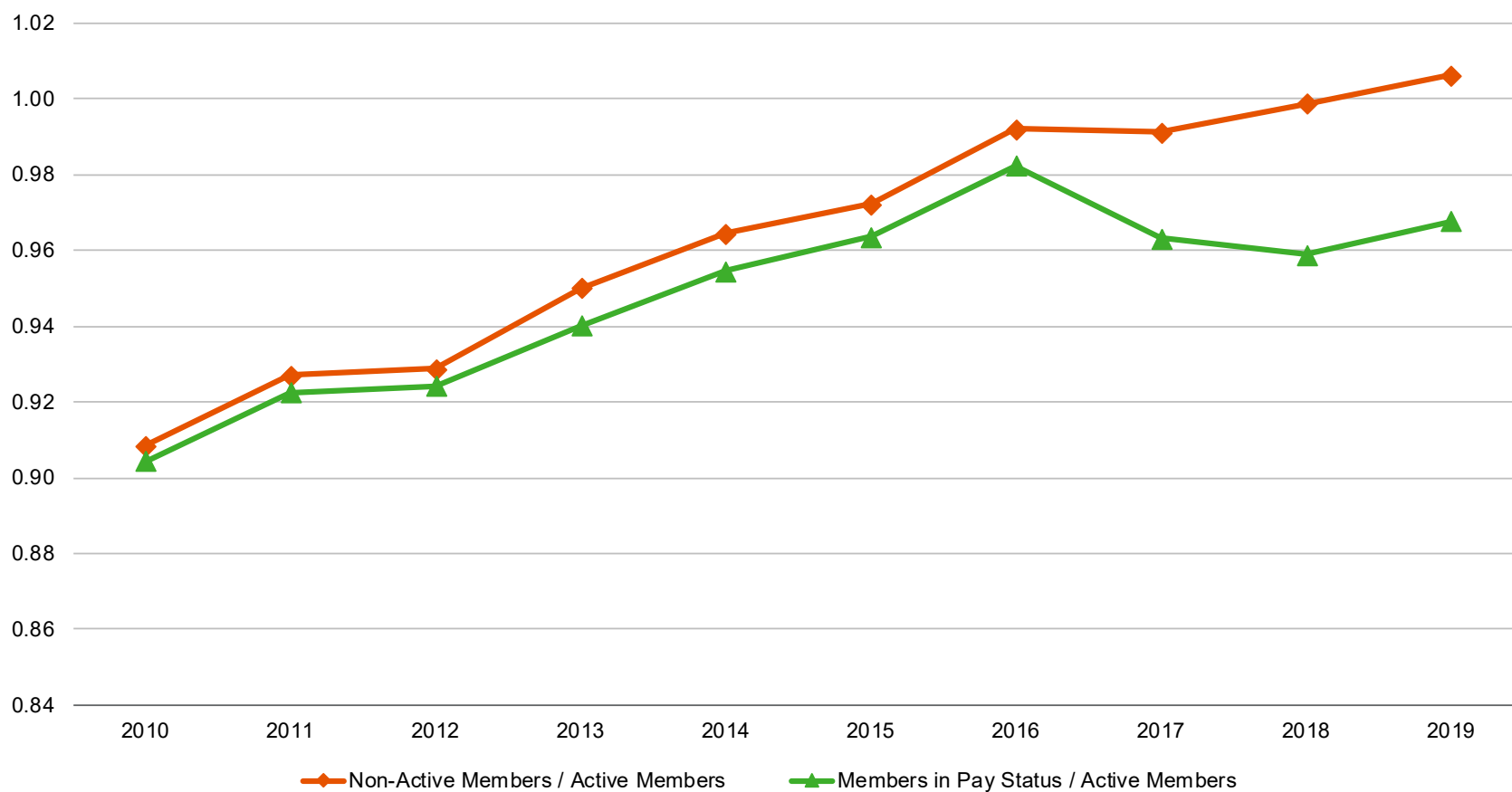
Besides the ratio of members in pay status to active members, another indicator of a more mature plan is relatively large amounts of assets and/or liabilities compared to active member payroll, which leads to increasing volatility in the level of required contributions. The **Asset Volatility Ratio (AVR)**, which is equal to the market value of assets divided by total payroll, provides an indication of contribution sensitivity to changes in the current level of assets and is detailed for the Retirement and Health Plans in *Charts 9a* and *9b*, respectively. The **Liability Volatility Ratio (LVR)**, which is equal to the actuarial accrued liability divided by payroll, provides an indication of the contribution sensitivity to changes in the current level of liability and is detailed for the Retirement and Health Plans in *Charts 9a* and *9b*, respectively. Over time, the AVR should approach the LVR because when a plan is fully funded the assets will equal the liabilities. As such, the LVR also indicates the long-term contribution sensitivity to the asset volatility, as the plan approaches full funding.

In particular, the Retirement Plan's AVR was 13.4 as of June 30, 2019. This means that a 1% asset gain or loss in 2019/2020 (relative to the assumed investment return) would amount to 13.4% of one year's payroll. Similarly, the Retirement Plan's LVR was 14.2 as of June 30, 2019, so a 1% liability gain or loss in 2019/2020 would amount to 14.2% of one year's payroll.¹⁷ Based on LAFPP's policy to amortize actuarial experience over a period of 20 years, there would be a 0.9% of payroll decrease or increase in the required contribution rate for each 1% asset gain or loss, respectively, and a 1.0% of payroll decrease or increase in the required contribution rate for each 1% liability gain or loss, respectively, for the Retirement Plan.

¹⁷The AVR and the LVR for the Health Plan as of June 30, 2019 are 1.3 and 2.3, respectively, which are considerably different than those ratios noted above for the Retirement Plan.

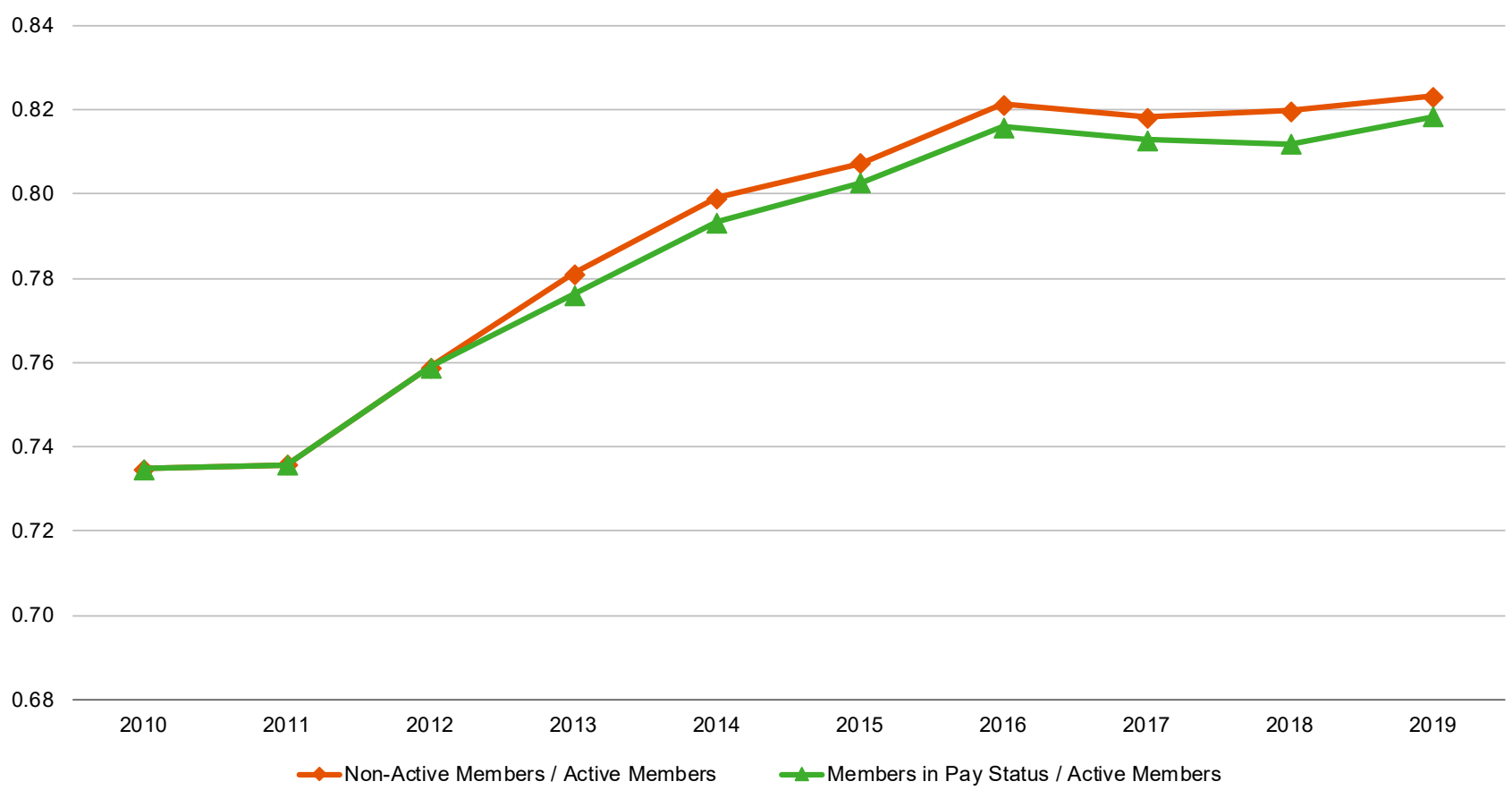
RETIREMENT PLAN

Ratios of Members in Pay-Status (Retirees and Beneficiaries) to Active Members & Non-Active Members (Inactive Vested, Retirees and Beneficiaries) to Active Members
In June 30, 2010 to 2019 Valuations



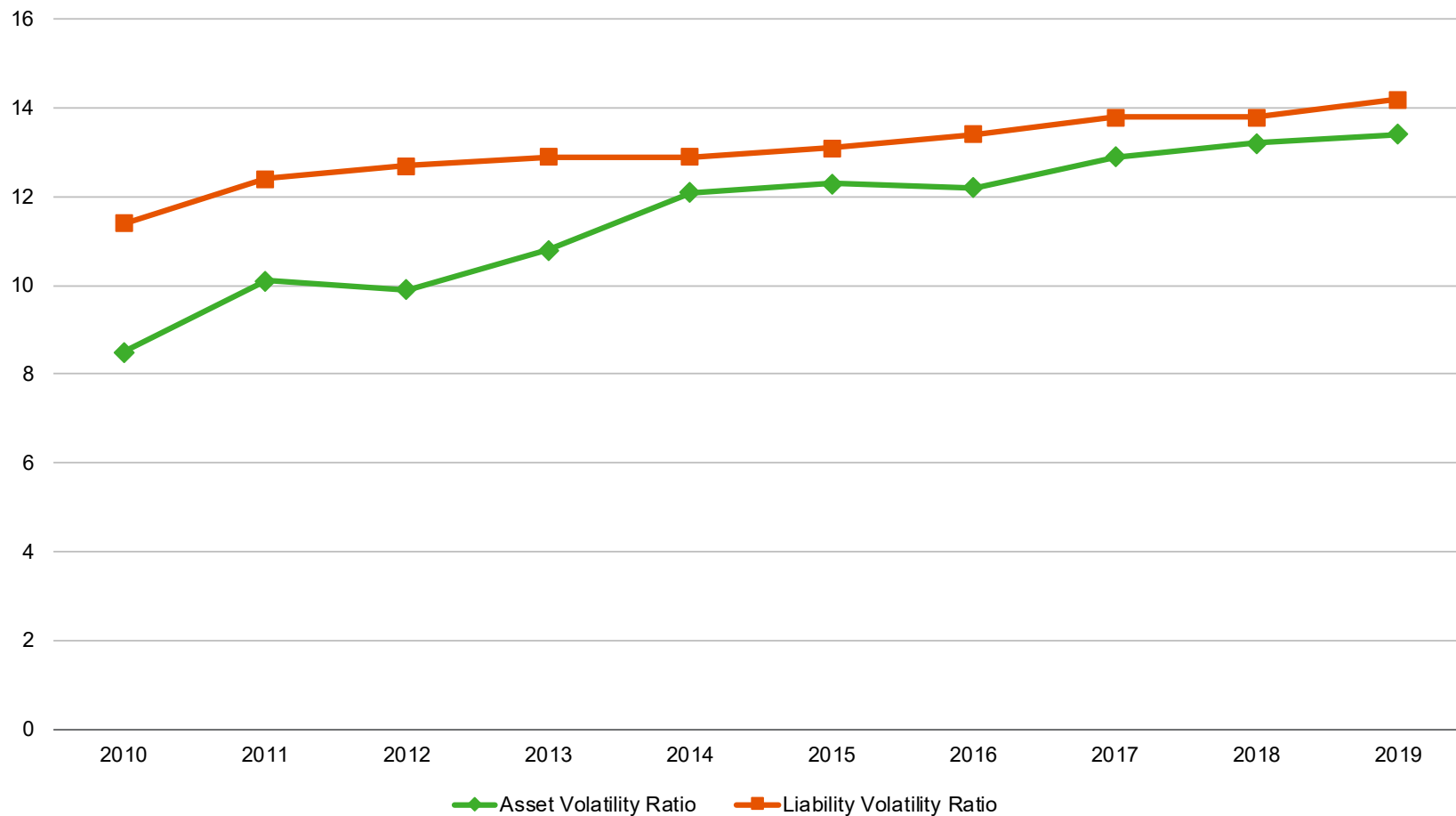
HEALTH PLAN

Ratios of Members in Pay-Status (Retirees and Beneficiaries) to Active Members & Non-Active Members (Inactive Vested, Retirees and Beneficiaries) to Active Members In June 30, 2010 to 2019 Valuations



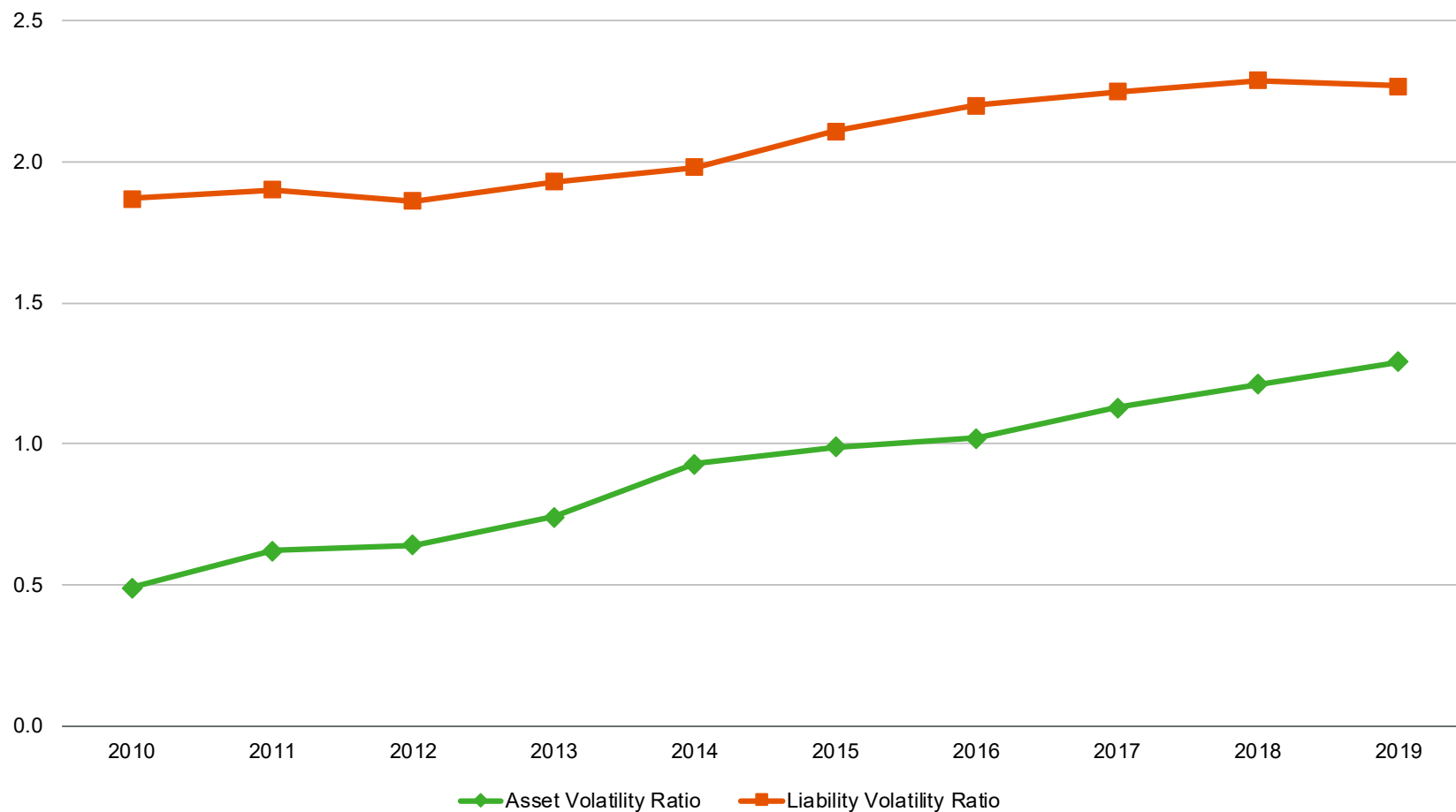
RETIREMENT PLAN

Volatility Ratios in June 30, 2010 to 2019 Valuations



HEALTH PLAN

Volatility Ratios in June 30, 2010 to 2019 Valuations



Appendix: Actuarial Assumptions & Methods, Actuarial Certification, and Detailed Scenario Test Results

Actuarial Assumptions & Methods

Unless otherwise noted, the results included in this report have been prepared based on the assumptions and methods used in preparing the June 30, 2019 valuations.

Deterministic Projection

In addition, we have prepared the deterministic projection using the following assumptions and methods applied in the June 30, 2019 actuarial valuation:

- Non-economic assumptions will remain unchanged.
- Retirement benefit formulas will remain unchanged.
- Los Angeles Charter and Administrative Code will remain unchanged.
- UAAL amortization method will remain unchanged (i.e., 20-year layers for actuarial gains/losses, 20-year layers for assumption changes, 15-year layers for plan amendments, 30-year layers for actuarial surplus, and level percent of pay).
- Economic assumptions will remain unchanged, including the annual 7.25% investment earnings and 3.50% active payroll growth assumptions.
- Deferred investment gains and losses will be recognized over a seven-year period.
- In estimating the benefit payments for the open group, we have assumed that the annual payments will increase by 4% and 7% for the Retirement and Health Plans, respectively.
- All other actuarial assumptions used in the June 30, 2019 actuarial valuation will be realized.

Other Considerations

The results presented in this report are intended to provide insight into key plan risks that can inform financial preparation and future decision making. However, we emphasize that deterministic projections, by their nature, are not a guarantee of future results. The modeling projections are intended to serve as illustrations of future financial outcomes that are based on the information available to us at the time the modeling is undertaken and completed, and the agreed-upon assumptions and methodologies described herein. Emerging results may differ significantly if the actual experience proves to be different from these assumptions or if alternative methodologies are used. Actual experience may differ due to such variables as demographic experience, the economy, stock market performance and the regulatory environment.

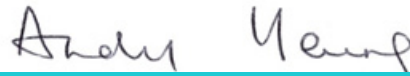
Actuarial Certification

The actuarial calculations in this report were completed under the supervision of Andy Yeung, ASA, MAAA, FCA, Enrolled Actuary and Thomas Bergman, ASA, MAAA, Enrolled Actuary.

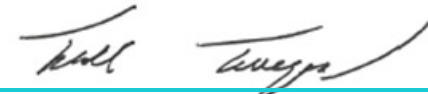
The actuarial opinions expressed in this report were prepared by Paul Angelo, FSA, MAAA, FCA, Enrolled Actuary, Andy Yeung, ASA, MAAA, FCA, Enrolled Actuary, and Todd Tauzer, FSA, MAAA, FCA, CERA. We are members of the American Academy of Actuaries and we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein.



Paul Angelo, FSA, MAAA, FCA, EA
Senior Vice President and Actuary



Andy Yeung, ASA, MAAA, FCA, EA
Vice President and Actuary



Todd Tauzer, FSA, MAAA, FCA, CERA
Vice President and Consulting Actuary

Detailed Scenario Test Results – City Only

Scenario 1: Assumed Market Return 14.50% for 2019/2020 and 7.25% Return Thereafter on Market Value of Assets

6-Year Illustration of UAAL, Funding Ratio and City Contributions (\$ in thousands) - Excludes Port Police and Airport Police

Contributions Made on July 15

Valuation Year	June 30 of Valuation Year		Fiscal Year End	Fiscal Year Pay	Retirement Plan Only					
	UAAL	Funded Ratio			UAAL Normal Cost	UAAL Amortization	Administrative Expense	City Contributions (July 15) Total Rate	Contribution Amount	Incremental Increase
2018	\$ 1,519,449	92.9%	2020	\$ 1,562,124	18.84%	14.53%	1.12%	34.49%	\$ 538,776	\$ -
2019	\$ 1,430,767	93.6%	2021	\$ 1,616,798	19.37%	13.73%	1.12%	34.22%	\$ 553,268	\$ 14,492
2020	\$ 936,494	96.0%	2022	\$ 1,673,386	19.33%	9.61%	1.12%	30.06%	\$ 503,020	\$ (50,248)
2021	\$ 518,976	97.9%	2023	\$ 1,731,954	19.22%	7.51%	1.12%	27.85%	\$ 482,349	\$ (20,671)
2022	\$ 62,628	99.8%	2024	\$ 1,792,573	19.11%	6.06%	1.12%	26.29%	\$ 471,267	\$ (11,082)
2023	\$ (538,635)	102.0%	2025	\$ 1,855,313	19.58%	-1.60%	1.12%	19.10%	\$ 354,365	\$ (116,902)
2024	\$ (995,957)	103.6%	2026	\$ 1,920,249	19.34%	-2.87%	1.12%	17.59%	\$ 337,772	\$ (16,593)
2025	\$ (1,249,078)	104.3%	2027	\$ 1,987,458	19.13%	-3.48%	1.12%	16.77%	\$ 333,297	\$ (4,475)

Valuation Year	June 30 of Valuation Year		Fiscal Year End	Fiscal Year Pay	Health Plan Only					
	UAAL	Funded Ratio			UAAL Normal Cost	UAAL Amortization	Administrative Expense	City Contributions (July 15) Total Rate	Contribution Amount	Incremental Increase
2018	\$ 1,725,291	51.2%	2020	\$ 1,562,124	4.60%	8.19%	0.09%	12.88%	\$ 201,202	\$ -
2019	\$ 1,570,343	56.1%	2021	\$ 1,616,798	4.85%	7.63%	0.09%	12.57%	\$ 203,232	\$ 2,030
2020	\$ 1,513,862	59.7%	2022	\$ 1,673,386	4.89%	7.45%	0.09%	12.43%	\$ 208,002	\$ 4,770
2021	\$ 1,466,968	62.9%	2023	\$ 1,731,954	4.99%	7.33%	0.09%	12.41%	\$ 214,936	\$ 6,934
2022	\$ 1,409,541	66.1%	2024	\$ 1,792,573	5.09%	7.20%	0.09%	12.38%	\$ 221,921	\$ 6,985
2023	\$ 1,331,677	69.5%	2025	\$ 1,855,313	5.23%	7.03%	0.09%	12.35%	\$ 229,131	\$ 7,210
2024	\$ 1,262,198	72.4%	2026	\$ 1,920,249	5.40%	6.91%	0.09%	12.40%	\$ 238,111	\$ 8,980
2025	\$ 1,196,251	75.1%	2027	\$ 1,987,458	5.54%	6.84%	0.09%	12.47%	\$ 247,836	\$ 9,725

Valuation Year	June 30 of Valuation Year		Fiscal Year End	Fiscal Year Pay	Retirement and Health Plan Combined					
	UAAL	Funded Ratio			UAAL Normal Cost	UAAL Amortization	Administrative Expense	City Contributions (July 15) Total Rate	Contribution Amount	Incremental Increase
2018	\$ 3,244,740	86.9%	2020	\$ 1,562,124	23.44%	22.72%	1.21%	47.37%	\$ 739,978	\$ -
2019	\$ 3,001,110	88.4%	2021	\$ 1,616,798	24.22%	21.36%	1.21%	46.79%	\$ 756,500	\$ 16,522
2020	\$ 2,450,356	91.0%	2022	\$ 1,673,386	24.22%	17.06%	1.21%	42.49%	\$ 711,022	\$ (45,478)
2021	\$ 1,985,944	93.0%	2023	\$ 1,731,954	24.21%	14.84%	1.21%	40.26%	\$ 697,285	\$ (13,737)
2022	\$ 1,472,169	95.0%	2024	\$ 1,792,573	24.20%	13.26%	1.21%	38.67%	\$ 693,188	\$ (4,097)
2023	\$ 793,042	97.4%	2025	\$ 1,855,313	24.81%	5.43%	1.21%	31.45%	\$ 583,496	\$ (109,692)
2024	\$ 266,241	99.2%	2026	\$ 1,920,249	24.74%	4.04%	1.21%	29.99%	\$ 575,883	\$ (7,613)
2025	\$ (52,827)	100.2%	2027	\$ 1,987,458	24.67%	3.36%	1.21%	29.24%	\$ 581,133	\$ 5,250

Detailed Scenario Test Results – City Only

Scenario 2: Assumed Market Return 7.25% for 2019/2020 and 7.25% Return Thereafter on Market Value of Assets

6-Year Illustration of UAAL, Funding Ratio and City Contributions (\$ in thousands) - Excludes Port Police and Airport Police

Contributions Made on July 15

Valuation Year	June 30 of Valuation Year		Fiscal Year End	Fiscal Year Pay	Retirement Plan Only					
	UAAL	Funded Ratio			UAAL Normal Cost	UAAL Amortization	Administrative Expense	City Contributions (July 15) Total Rate	Contribution Amount	Incremental Increase
2018	\$ 1,519,449	92.9%	2020	\$ 1,562,124	18.84%	14.53%	1.12%	34.49%	\$ 538,776	\$ -
2019	\$ 1,430,767	93.6%	2021	\$ 1,616,798	19.37%	13.73%	1.12%	34.22%	\$ 553,268	\$ 14,492
2020	\$ 1,157,038	95.0%	2022	\$ 1,673,386	19.33%	10.55%	1.12%	31.00%	\$ 518,750	\$ (34,518)
2021	\$ 1,071,989	95.6%	2023	\$ 1,731,954	19.22%	9.82%	1.12%	30.16%	\$ 522,357	\$ 3,607
2022	\$ 939,356	96.3%	2024	\$ 1,792,573	19.11%	9.66%	1.12%	29.89%	\$ 535,800	\$ 13,443
2023	\$ 643,434	97.6%	2025	\$ 1,855,313	18.97%	8.95%	1.12%	29.04%	\$ 538,783	\$ 2,983
2024	\$ 471,305	98.3%	2026	\$ 1,920,249	18.78%	5.32%	1.12%	25.22%	\$ 484,287	\$ (54,486)
2025	\$ 367,753	98.7%	2027	\$ 1,987,458	18.62%	2.93%	1.12%	22.67%	\$ 450,557	\$ (33,730)

Valuation Year	June 30 of Valuation Year		Fiscal Year End	Fiscal Year Pay	Health Plan Only					
	UAAL	Funded Ratio			UAAL Normal Cost	UAAL Amortization	Administrative Expense	City Contributions (July 15) Total Rate	Contribution Amount	Incremental Increase
2018	\$ 1,725,291	51.2%	2020	\$ 1,562,124	4.60%	8.19%	0.09%	12.88%	\$ 201,202	\$ -
2019	\$ 1,570,343	56.1%	2021	\$ 1,616,798	4.85%	7.63%	0.09%	12.57%	\$ 203,232	\$ 2,030
2020	\$ 1,536,140	59.2%	2022	\$ 1,673,386	4.89%	7.54%	0.09%	12.52%	\$ 209,508	\$ 6,276
2021	\$ 1,522,832	61.5%	2023	\$ 1,731,954	4.99%	7.57%	0.09%	12.65%	\$ 219,092	\$ 9,584
2022	\$ 1,498,195	64.0%	2024	\$ 1,792,573	5.09%	7.57%	0.09%	12.75%	\$ 228,553	\$ 9,461
2023	\$ 1,451,225	66.8%	2025	\$ 1,855,313	5.23%	7.51%	0.09%	12.83%	\$ 238,037	\$ 9,484
2024	\$ 1,410,617	69.2%	2026	\$ 1,920,249	5.40%	7.50%	0.09%	12.99%	\$ 249,440	\$ 11,403
2025	\$ 1,371,387	71.5%	2027	\$ 1,987,458	5.54%	7.53%	0.09%	13.16%	\$ 261,549	\$ 12,109

Valuation Year	June 30 of Valuation Year		Fiscal Year End	Fiscal Year Pay	Retirement and Health Plan Combined					
	UAAL	Funded Ratio			UAAL Normal Cost	UAAL Amortization	Administrative Expense	City Contributions (July 15) Total Rate	Contribution Amount	Incremental Increase
2018	\$ 3,244,740	86.9%	2020	\$ 1,562,124	23.44%	22.72%	1.21%	47.37%	\$ 739,978	\$ -
2019	\$ 3,001,110	88.4%	2021	\$ 1,616,798	24.22%	21.36%	1.21%	46.79%	\$ 756,500	\$ 16,522
2020	\$ 2,693,178	90.1%	2022	\$ 1,673,386	24.22%	18.09%	1.21%	43.52%	\$ 728,258	\$ (28,242)
2021	\$ 2,594,821	90.8%	2023	\$ 1,731,954	24.21%	17.39%	1.21%	42.81%	\$ 741,450	\$ 13,192
2022	\$ 2,437,551	91.7%	2024	\$ 1,792,573	24.20%	17.23%	1.21%	42.64%	\$ 764,353	\$ 22,903
2023	\$ 2,094,659	93.2%	2025	\$ 1,855,313	24.20%	16.46%	1.21%	41.87%	\$ 776,820	\$ 12,467
2024	\$ 1,881,922	94.1%	2026	\$ 1,920,249	24.18%	12.82%	1.21%	38.21%	\$ 733,727	\$ (43,093)
2025	\$ 1,739,140	94.8%	2027	\$ 1,987,458	24.16%	10.46%	1.21%	35.83%	\$ 712,106	\$ (21,621)

Detailed Scenario Test Results – City Only

Scenario 3: Assumed Market Return 0.00% for 2019/2020 and 7.25% Return Thereafter on Market Value of Assets

6-Year Illustration of UAAL, Funding Ratio and City Contributions (\$ in thousands) - Excludes Port Police and Airport Police

Contributions Made on July 15

Valuation Year	June 30 of Valuation Year		Fiscal Year End	Fiscal Year Pay	Retirement Plan Only					
	UAAL	Funded Ratio			Normal Cost	UAAL Amortization	Administrative Expense	Total Rate	Contribution Amount	Incremental Increase
2018	\$ 1,519,449	92.9%	2020	\$ 1,562,124	18.84%	14.53%	1.12%	34.49%	\$ 538,776	\$ -
2019	\$ 1,430,767	93.6%	2021	\$ 1,616,798	19.37%	13.73%	1.12%	34.22%	\$ 553,268	\$ 14,492
2020	\$ 1,377,582	94.1%	2022	\$ 1,673,386	19.33%	11.49%	1.12%	31.94%	\$ 534,479	\$ (18,789)
2021	\$ 1,625,003	93.3%	2023	\$ 1,731,954	19.22%	12.14%	1.12%	32.48%	\$ 562,539	\$ 28,060
2022	\$ 1,816,263	92.8%	2024	\$ 1,792,573	19.11%	13.26%	1.12%	33.49%	\$ 600,333	\$ 37,794
2023	\$ 1,825,695	93.1%	2025	\$ 1,855,313	18.97%	13.73%	1.12%	33.82%	\$ 627,467	\$ 27,134
2024	\$ 1,938,774	93.0%	2026	\$ 1,920,249	18.78%	11.18%	1.12%	31.08%	\$ 596,813	\$ (30,654)
2025	\$ 2,099,221	92.7%	2027	\$ 1,987,458	18.62%	9.78%	1.12%	29.52%	\$ 586,697	\$ (10,116)

Valuation Year	June 30 of Valuation Year		Fiscal Year End	Fiscal Year Pay	Health Plan Only					
	UAAL	Funded Ratio			Normal Cost	UAAL Amortization	Administrative Expense	Total Rate	Contribution Amount	Incremental Increase
2018	\$ 1,725,291	51.2%	2020	\$ 1,562,124	4.60%	8.19%	0.09%	12.88%	\$ 201,202	\$ -
2019	\$ 1,570,343	56.1%	2021	\$ 1,616,798	4.85%	7.63%	0.09%	12.57%	\$ 203,232	\$ 2,030
2020	\$ 1,558,419	58.6%	2022	\$ 1,673,386	4.89%	7.64%	0.09%	12.62%	\$ 211,181	\$ 7,949
2021	\$ 1,578,696	60.1%	2023	\$ 1,731,954	4.99%	7.80%	0.09%	12.88%	\$ 223,076	\$ 11,895
2022	\$ 1,586,668	61.8%	2024	\$ 1,792,573	5.09%	7.93%	0.09%	13.11%	\$ 235,006	\$ 11,930
2023	\$ 1,570,580	64.0%	2025	\$ 1,855,313	5.23%	7.99%	0.09%	13.31%	\$ 246,942	\$ 11,936
2024	\$ 1,558,828	66.0%	2026	\$ 1,920,249	5.40%	8.09%	0.09%	13.58%	\$ 260,770	\$ 13,828
2025	\$ 1,546,103	67.8%	2027	\$ 1,987,458	5.54%	8.22%	0.09%	13.85%	\$ 275,263	\$ 14,493

Valuation Year	June 30 of Valuation Year		Fiscal Year End	Fiscal Year Pay	Retirement and Health Plan Combined					
	UAAL	Funded Ratio			Normal Cost	UAAL Amortization	Administrative Expense	Total Rate	Contribution Amount	Incremental Increase
2018	\$ 3,244,740	86.9%	2020	\$ 1,562,124	23.44%	22.72%	1.21%	47.37%	\$ 739,978	\$ -
2019	\$ 3,001,110	88.4%	2021	\$ 1,616,798	24.22%	21.36%	1.21%	46.79%	\$ 756,500	\$ 16,522
2020	\$ 2,936,001	89.2%	2022	\$ 1,673,386	24.22%	19.13%	1.21%	44.56%	\$ 745,661	\$ (10,839)
2021	\$ 3,203,699	88.7%	2023	\$ 1,731,954	24.21%	19.94%	1.21%	45.36%	\$ 785,615	\$ 39,954
2022	\$ 3,402,931	88.5%	2024	\$ 1,792,573	24.20%	21.19%	1.21%	46.60%	\$ 835,339	\$ 49,724
2023	\$ 3,396,275	89.0%	2025	\$ 1,855,313	24.20%	21.72%	1.21%	47.13%	\$ 874,409	\$ 39,070
2024	\$ 3,497,602	89.1%	2026	\$ 1,920,249	24.18%	19.27%	1.21%	44.66%	\$ 857,583	\$ (16,826)
2025	\$ 3,645,324	89.1%	2027	\$ 1,987,458	24.16%	18.00%	1.21%	43.37%	\$ 861,960	\$ 4,377