New York City Retirement Systems Independent Actuary Statement for Office of the Comptroller

Prepared by:

Glenn D. Bowen, FSA, EA, MAAA
Principal & Consulting Actuary

Scott F. Porter, FSA, EA, MAAA
Principal & Consulting Actuary

Milliman, Inc.
801 Cassatt Road
Suite 111
Berwyn, PA 19312
Tel +1 610-687-5644
milliman.com

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801 Cassatt Road
Suite 111
Berwyn, PA 19312

Tel +1 610 687 5644
www.milliman.com

November 29, 2023

Ms. Krista Olson
Deputy Comptroller for Budget
New York City Comptroller's Office
1 Center Street, 8th Floor
New York, NY 10007

Re: Independent Actuary Statement

Dear Ms. Olson:

We are pleased to present the enclosed report summarizing our Independent Actuary Statement for the five New York City Retirement Systems ("NYCRS"):

- New York City Employees' Retirement System ("NYCERS")
- Teachers' Retirement System of the City of New York ("TRS")
- Board of Education Retirement System of the City of New York ("BERS")
- New York City Police Pension Fund ("POLICE")
- New York City Fire Pension Fund ("FIRE")

The intended purpose of this report is to provide a thorough and independent third party review of the economic actuarial assumptions and actuarial methods used in the NYCRS, which reflects economic forecasts and capital market assumptions through December 31, 2022. All comments and recommendations are intended to be constructive. Our purpose was to identify areas of possible improvement in the system, its operation and/or the actuarial procedures. This report presents an executive summary followed by separate sections discussing in detail our findings, analyses, and recommendations.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by staffs of Office of the Comptroller and the OA. This information includes, but is not limited to, statutory provisions, employee data, administrative policies and financial information. Since the results are dependent on the integrity of the data

supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised.

Milliman's work product was prepared exclusively for the New York City Office of the Comptroller for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning NYCRS' operations, and uses NYCRS' data, which Milliman has not audited. It is not for the use or benefit of any third party for any purpose. Any third party recipient of Milliman's work product who desires professional guidance should not rely upon Milliman's work product, but should engage qualified professionals for advice appropriate to its own specific needs.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Actuarial Standards of Practice promulgated by the Actuarial Standards Board and the applicable Code of Professional Conduct, amplifying Opinions, and supporting Recommendations of the American Academy of Actuaries.

We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

The consultants who worked on this assignment are actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel. The signing actuaries are independent of NYCRS. We are not aware of any relationship that would impair the objectivity of our work.

We would like to thank the staffs of the Office of the Comptroller and the Office of the Actuary (OA) for their cooperation. Their prompt and courteous responses to our questions and requests for information were of valuable assistance to us and greatly appreciated.

We look forward to having the opportunity to present this report to the Oversight Committee and respond to questions regarding our progress.

Respectfully submitted,

Glenn D. Bowen, FSA, EA, MAAA

Scott Porter, FSA, EA, MAAA

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Executive Summary

This report summarizes the Independent Actuary Statement performed by Milliman of the five New York City Retirement Systems ("NYCRS"):

- New York City Employees' Retirement System (NYCERS)
- Teachers' Retirement System of the City of New York (TRS)
- Board of Education Retirement System of the City of New York (BERS)
- New York City Police Pension Fund (POLICE)
- New York City Fire Pension Fund (FIRE)

The primary purposes of the Independent Actuary Statement are to:

- Perform an independent review of the economic assumptions, specifically the investment return assumption
- Perform a broad-based review of the funding policy parameters
- Review the actuarial reports for compliance with Actuarial Standards of Practice (ASOPs)

We reviewed the June 30, 2019 lag actuarial valuation report for Fiscal Year 2021, as supplemented by the June 30, 2020 report, for each system and referenced earlier reports for comparative purposes as needed. The following sections detail our overall findings in the areas of economic assumptions, actuarial methods, and the valuation reports. We are currently conducting data processing that will be the basis for the recommended demographic assumptions that will be included in the experience study report to be issued later.

Overall Assessment

Regarding economic assumptions discussed in Section I, we believe the current assumptions are reasonable. The assumptions reviewed include the inflation assumption, investment return assumption, cost-of-living assumption and general wage inflation assumption component of the amortization method for the initial unfunded liability. Due to recent increases in capital market assumptions since January 1, 2022, we do not recommend any changes at this time to these economic assumptions.

Regarding the various funding policy elements used to develop the actuarially determined contribution discussed in Section II, we believe the current methods are reasonable for their purposes and are in compliance with actuarial standards of practice and guidance within the actuarial community, specifically a white paper titled *Actuarial Funding Policies and Practices for Public Pension Plans* issued by the Conference of Consulting Actuaries. The specific items we reviewed consist of the asset valuation method, actuarial cost method, amortization method, one-year lag methodology and the overall parameters of the funding policy.

In Section III, we discuss some possible enhancements to the disclosures contained in the valuation reports, as well as if the disclosures are in compliance with actuarial standards of practice.

We have found that the OA has employed generally accepted actuarial practices and principles in selecting the various cost allocation methods, determining employer contribution rates, and presenting the results of their work.

Section I – Economic Assumptions

Selection of Actuarial Assumptions

The purpose of the actuarial valuation is to analyze the resources needed to meet the current and future obligations of the System. To provide the best estimate of the long-term funded status of the System, the actuarial valuation should be predicated on methods and assumptions that will estimate the future obligations of the System in a reasonable manner.

An actuarial valuation uses various methods and two different types of assumptions: economic and demographic. Economic assumptions are related to the general economy and its long-term impact on the System, or to the operation of the System itself. Demographic assumptions are based on the emergence of the specific experience of the System's members.

Choosing actuarial assumptions requires the application of actuarial judgement. It is unlikely that any two actuaries, given the same set of experience statistics, would arrive at exactly the same set of actuarial assumptions for any system as complex as NYCRS. Even allowing for the minor variations that occur because of the variability of the underlying statistics and possible data anomalies, differences among actuarial approaches will occur in analyzing trends. Some actuaries prefer to match the results of recent experience very closely in setting future assumptions, while other actuaries will use recent experience as a guide but tend to change existing assumptions gradually over time. Valid arguments can be made for either approach.

Economic Assumptions

Actuarial Standard of Practice No. 27 (ASOP 27), *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries in selecting and recommending investment return assumptions. Each assumption selected by the actuary should be reasonable, which has the following characteristics according to ASOP 27:

- It is appropriate for the purpose of the measurement
- It reflects the actuary's professional judgment
- It takes into account historical and current economic data that is relevant as of the measurement date
- It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data or a combination thereof
- It has no significant bias, i.e. it is not significantly optimistic or pessimistic

ASOP 27 further indicates that there could be a range of reasonable assumptions. The actuary should recognize the uncertain nature of the items for which assumptions are selected and thus, several different assumptions may be reasonable for a given measurement.

In addition, the actuary may consider views of experts, including representatives of the plan sponsor, investment advisors, etc. After considering all of the above as applicable, the final recommendation should reflect the actuary's professional judgment.

In this section, we provide commentary on the investment return assumption, cost-of-living (COLA) assumption, wage inflation and payroll growth assumptions. One of the building blocks of the expected investment return assumption and the COLA assumption is based on the assumed rate of inflation. This analysis reflects economic forecasts and capital market assumptions through December 31, 2022

Inflation

Inflation, as referred to here, means price inflation. The inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return and wage growth. It has a direct impact on the valuation results to the extent it affects the COLA increase assumption. The current assumed rate of inflation is 2.5%.

There is expected to be a long-term relationship between inflation and the investment return assumption. The basic principle is that the investors demand a "real return" – the excess of actual investment returns over inflation. If inflation rates are expected to be high, investors will demand expected investment returns that are also expected to be high enough to exceed inflation, while lower inflation rates will result in lower demanded expected investment returns, at least in the long run.

Since the U.S. Treasury started issuing inflation-indexed bonds (TIPS), it is possible to determine the approximate rate of inflation anticipated by the financial markets by comparing the yields on inflation-indexed bonds with traditional fixed government bonds. The following table displays these yields along with the implied rate inflation at different maturity dates for the bonds.

Implied Rates of Inflation Based on U.S. Treasury Yields			
	5 Years	10 Years	30 Years
	June 30, 2021		
Nominal Yield	0.87%	1.45%	2.06%
Inflation-Indexed Bond Yield	-1.6%	-0.87%	-0.20%
Implied Inflation Rate	2.47%	2.32%	2.26%

Implied Rates of Inflation Based on U.S. Treasury Yields			
	5 Years	10 Years	30 Years
	June 30, 2022		
Nominal Yield	3.01%	2.98%	3.14%
Inflation-Indexed Bond Yield	0.43%	0.65%	0.91%
Implied Inflation Rate	2.58%	2.33%	2.23%

While the implied rate of inflation has slightly increased over the past year, the implied rate of inflation over a 30-year period has essentially remained the same. As of December 31, 2022, the implied rate of inflation from 30-year Treasury bonds equals 2.30%.

Another source for a long-term inflation forecast is the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2022 Trustees Report, the projected ultimate average annual increase in the CPI under the intermediate cost assumptions is 2.40%.

Although assumptions should not be set based on what other systems are doing, it is informative to see how NYCRS compares. According to the National Association of State Retirement Administrators (NASRA) Public Fund Survey (a survey of approximately 200 large municipal and statewide systems), the median inflation assumption for statewide systems was 2.50% as of 2022.

Other sources of inflation forecasts include:

- Survey of Professional Forecasters published by the Philadelphia Reserve Bank
- Blue Chip Financial Forecasts
- Cleveland Federal Reserve Bank Inflation Forecast Model

Milliman uses these sources in establishing its long-term inflation assumption which is 2.30% as of June 30, 2021 and 2.35% as of June 30, 2022, which are both slightly less than the current assumption of 2.50%. In setting the long-term inflation assumption, Milliman anticipates that inflation over the short-term (2.70% over next 5 years) is expected to be higher than over the long-term.

Recommendation: While long-range forecasts are projecting slightly lower inflation than the current 2.50% assumption, we believe the current assumption continues to be

reasonable. With short-term inflation currently at higher levels, we would not recommend any reduction at this time, but believe the assumption should be monitored to determine if any change should be made.

Investment Return

The investment return assumption is one of the primary determinants in the calculation of the expected cost of NYCRS' benefits, providing a discount of the estimated future benefit payments to reflect the time value of money. This assumption has a direct impact on the calculations of actuarial accrued liabilities and actuarially determined contributions. The discount rate is the rate used to discount future benefit payments into an actuarial present value. The traditional actuarial approach used for public sector funding sets the discount rate equal to, or approximately equal to, the expected investment return. The current investment return assumption is 7%.

To develop an analytical basis for assessing the investment return assumption, we utilized information on the allocation of assets for each of the systems from the NYC Comptroller's website (Assets Under Management : Office of the New York City Comptroller Brad Lander (nyc.gov)) detailing assets under management as well as from the 2021 Annual Comprehensive Financial Reports for each of the systems. The website provided detailed information on the allocation of assets. We mapped these asset categories to Milliman's capital market assumptions to compare the current assumption with that expected using Milliman's models. As capital market assumptions have changed significantly over the past year, we used asset values and assumption models as of June 30, 2021 and June 30, 2022 in our analysis.

The following analysis using Milliman's capital market assumptions is intended to provide an independent check of the reasonableness of the investment return assumption. It is intended as a supplement to the analysis done by OA and NYCRS' investment consultants. Note that as part of our analysis, we have mapped NYCRS' target asset allocation into Milliman's expected return model. We acknowledge that NYCRS' investment consultants have a more detailed understanding of the asset classes, but we believe our analysis provides a reasonable proxy.

The following table provides the expected returns on a nominal basis (gross of inflation) and a real basis (net of inflation), for both the arithmetic and the geometric means using Milliman's capital market assumptions as of June 30, 2021 over a 30-year time period for all system assets combined. Geometric means take into account the standard deviation of each asset class's annual return over the period. While the arithmetic mean is the best estimate of the expected return for a given year, the geometric mean accounts for the volatility in asset returns that will be experienced over time and is the more appropriate measure for determining the long-term investment return assumption used for funding pension plans.

Milliman Capital Market Assumptions as of June 30, 2021 Over Next 30 Years

Policy Alloc:	Asset Class	Expected Nominal: Annual Return: Arithmetic Mean	Expected Nominal: Annualized Return: Geometric Mean	Expected Nominal: Standard Deviation or Annual Return	Expected Real: Annual Return: Arithmetic Mean	Expected Real: Annualized Return: Geometric Mean
	US Inflation	2.30%	2.30%	1.16%		
0.76%	US Cash	1.98%	1.97%	1.13%	-0.32%	-0.32%
0.49%	US Core Fixed Income (Aggregate)	3.67%	3.59%	3.96%	1.37%	1.26%
2.13%	US Short (1-3 Yr) Treasury Bonds	2.46%	2.43%	2.19%	0.16%	0.13%
5.40%	US Interm (1-10 Yr) Treasury Bonds	2.75%	2.68%	3.81%	0.45%	0.37%
2.91%	US Long (11-30 Yr) Treasury Bonds	3.56%	2.86%	11.99%	1.26%	0.55%
5.92%	US Credit Bonds	4.21%	4.07%	5.44%	1.91%	1.73%
0.97%	US Corporate Bonds	4.29%	4.13%	5.72%	1.99%	1.79%
5.71%	US Securitized Securities (Mortgages)	4.28%	4.23%	3.14%	1.98%	1.89%
3.55%	US TIPS (Inflation-Indexed Bonds)	2.91%	2.81%	4.54%	0.61%	0.50%
5.29%	US High Yield Bonds	6.25%	5.74%	10.35%	3.95%	3.37%
0.01%	US Bank/Leveraged Loans	5.84%	5.55%	7.84%	3.54%	3.18%
3.10%	Private Credit	9.46%	8.80%	12.00%	7.16%	6.35%
29.83%	US Broad Equity Market	7.63%	6.09%	18.15%	5.33%	3.70%
0.52%	Global Equity	8.11%	6.63%	17.81%	5.81%	4.23%
11.84%	Non-US Equity	9.04%	7.31%	19.35%	6.74%	4.90%
7.54%	Emerging Markets Equity	10.94%	7.36%	27.94%	8.64%	4.95%
0.00%	US REITs	8.05%	5.95%	21.17%	5.75%	3.57%
4.47%	Private Real Estate Property - Core	6.92%	5.96%	14.24%	4.62%	3.58%
6.95%	Private Equity	12.60%	8.53%	30.00%	10.30%	6.09%
1.22%	Infrastructure - Public	7.52%	6.13%	17.24%	5.22%	3.75%
1.41%	Hedge Funds - MultiStrategy	6.05%	5.62%	9.25%	3.75%	3.24%
100.00%	Policy Allocation	7.17%	6.51%	11.90%	4.87%	4.12%

Based on this analysis, the geometric mean equals 6.51% meaning that it is anticipated that market returns would exceed this return 50% of the time. Using the same allocation, the following table provides the analysis as of June 30, 2022, which results in an increase in the geometric mean by 62 basis points to 7.13%.

Milliman Capital Market Assumptions as of June 30, 2022 Over Next 30 Years

		Expected Nominal			Expected Real	
Policy Alloc:	**Asset Class**	Annual Return: Arithmetic Mean	Annualized Return: Geometric Mean	Standard Deviation or Annual Return	Annual Return: Arithmetic Mean	Annualized Return: Geometric Mean
	US Inflation	2.35%	2.35%	1.25%		
0.76%	US Cash	2.57%	2.56%	1.10%	0.21%	0.20%
0.49%	US Core Fixed Income (Aggregate)	4.30%	4.23%	3.91%	1.95%	1.84%
2.13%	US Short (1-3 Yr) Treasury Bonds	3.13%	3.11%	2.09%	0.78%	0.74%
5.40%	US Interm (1-10 Yr) Treasury Bonds	3.34%	3.28%	3.72%	0.99%	0.90%
2.91%	US Long (11-30 Yr) Treasury Bonds	4.31%	3.59%	12.25%	1.96%	1.21%
5.93%	US Credit Bonds	5.03%	4.89%	5.44%	2.67%	2.48%
0.97%	US Corporate Bonds	5.13%	4.97%	5.73%	2.77%	2.56%
5.70%	US Securitized Securities (Mortgages)	4.89%	4.85%	3.01%	2.54%	2.44%
3.55%	US TIPS (Inflation-Indexed Bonds)	3.67%	3.57%	4.58%	1.32%	1.19%
5.29%	US High Yield Bonds	6.59%	6.14%	9.80%	4.24%	3.70%
0.01%	US Bank/Leveraged Loans	6.22%	5.94%	7.70%	3.87%	3.51%
3.10%	Private Credit	9.46%	8.80%	12.00%	7.11%	6.30%
29.83%	US Broad Equity Market	8.05%	6.54%	17.96%	5.70%	4.10%
0.52%	Global Equity	8.75%	7.29%	17.75%	6.40%	4.83%
11.84%	Non-US Equity	10.03%	8.33%	19.25%	7.67%	5.84%
7.54%	Emerging Markets Equity	11.79%	8.46%	27.06%	9.44%	5.97%
0.00%	US REITs	8.62%	6.56%	21.07%	6.27%	4.11%
4.47%	Private Real Estate Property - Core	7.24%	6.00%	16.23%	4.88%	3.57%
6.95%	Private Equity	13.08%	9.03%	30.00%	10.73%	6.52%
1.22%	Infrastructure - Public	7.48%	6.12%	17.07%	5.13%	3.68%
1.41%	Hedge Funds - MultiStrategy	6.60%	6.17%	8.99%	4.25%	3.73%
100.00%	Policy Allocation	7.75%	7.13%	11.78%	5.40%	4.64%

Recommendation: Prior to recent changes in capital market assumptions, we would have suggested consideration for reducing the investment return assumption about 50 basis points, although we believe each of the systems should receive input from their investment advisors prior to a final decision being made. However, since capital market assumptions have increased significantly from June 30, 2021 to June 30, 2022, we would not necessarily recommend any reduction at this time. However, if interest rates decline resulting in a reduction in capital market assumptions in the near future, we suggest a reduction in the investment return assumption be considered.

This analysis reflected the asset values and target allocations for all the systems combined. We also reviewed each system separately and found little difference in the expected return among the systems. As such, we recommend the assumption be used for all systems.

COLA Assumption

Upon retirement, members receive an annual cost-of-living adjustment (COLA) in the pension benefit once the retiree has met the eligibility conditions. A member must be

retired for at least 5 years and has attained age 62 or if earlier, has been retired for 10 years and attained age 55. The COLA applies to the first $18,000 of a member's maximum retirement allowance.

This annual adjustment occurs each September 1 and is equal to 50% of the change in the CPI-U for March rounded up to the nearest one-tenth of one percent. The resulting percentage cannot be less than 1% or more than 3%. The current assumed COLA rate is 1.5%.

To review the assumption, we performed two independent analyses, a historical and a forward-looking analysis. The following chart displays the historical COLA granted from 2003 to 2022. Using periods ending March 31, the average inflation rate during this period was 2.4% and the average COLA granted was 1.35%. Due to the COLA floor of 1%, the average COLA granted was approximately 56% of the average inflation rate.

COLA History

Period Ending March 31	CPI-U	COLA
2003	3.02%	1.60%
2004	1.74%	1.00%
2005	3.15%	1.60%
2006	3.36%	1.70%
2007	2.78%	1.40%
2008	3.98%	2.00%
2009	-0.38%	1.00%
2010	2.31%	1.20%
2011	2.68%	1.40%
2012	2.65%	1.40%
2013	1.47%	1.00%
2014	1.51%	1.00%
2015	-0.07%	1.00%
2016	0.85%	1.00%
2017	2.38%	1.20%
2018	2.36%	1.20%
2019	1.86%	1.00%
2020	1.54%	1.00%
2021	2.62%	1.40%
2022	8.54%	3.00%
20-Year Average	2.40%	1.35%

In the forward-looking analysis, we produced 10,000 scenarios of projected rates of inflation based on the current inflation assumption of 2.5% and a standard deviation of 1.75%. The standard deviation on the CPI over the past 20 years is 1.69%. Based on

this analysis, we estimated the COLA would average approximately 60% of the inflation assumption or 1.5%. Please note that a lower standard deviation would result in lower COLAs as a percent of the inflation assumption. For instance, using a standard deviation of 1.25% produces a COLA rate that averages approximately 57% of the inflation assumption.

If the inflation assumption is reduced, the COLA rate would be expected to be higher as a percent of inflation. For instance, if the inflation rate is reduced to 2.4%, the percentage would be expected to vary between 58% at a standard deviation of 1.25% to 62% at a standard deviation of 1.75%.

Recommendation: Based on the current assumed rate of inflation, we recommend that the COLA rate be set to 60% of the assumed inflation assumption. At 2.5%, this results in an assumption of 1.5%. If changes are made to the inflation assumption, there may be a corresponding change to the COLA assumption.

Wage Inflation

Wage inflation consists of two components, 1) a portion due to pure price inflation (i.e., increases due to changes in the CPI), and 2) increases in average salary levels in excess of pure price inflation (i.e., increases due to changes in productivity levels, supply and demand in the labor market and other macroeconomic factors) referred to as real wage growth. The current assumption for wage inflation is 3%, consisting of 2.5% for price inflation and 0.50% for real wage inflation.

From a national perspective, the 2022 Social Security Trustees Report has a real wage inflation assumption ranging from 0.53% to 1.77%. However, we find that real wage inflation is much more regional based and is typically smaller for government employers than private sector employers. In addition, recent changes in the job market may also impact real wage inflation. The combination of the pandemic and recent increases in inflation may result in short-term increases in real inflation. However, we would not expect these issues to have a long-term impact.

Recommendation: As part of the demographic analysis, we will review the actual salary increases received over the experience study period. At that time, we will revisit the wage inflation assumption. At this time, we do not recommend any change to the real wage inflation assumption of 0.50%.

Amortization Payment Growth

The initial unfunded accrued liability (UAL) established June 30, 2010 is amortized using a method where the dollar amount of the payment increases each year by 3% (which is the general wage inflation assumption). All other amortization bases use a level dollar method where the payment amount remains level each year. An amortization method

where the increase in the dollar amount of the payment is set equal to the general wage inflation assumption is common amongst public pension systems.

The usual purpose of an amortization method with increasing payment amounts is to establish a contribution rate that is anticipated to be level as a percent of payroll, all else being equal. If actual payroll growth is less (more) than anticipated, then the contribution rate would be expected to increase (decrease) in future years. Since subsequent changes in the unfunded liability are amortized using a level dollar approach, the contribution rate as a percentage of payroll would be expected to decline in the future as payroll increases.

Recommendation: We believe that the amortization method with payments increasing by the general wage inflation assumption of 3% for the purpose of amortizing the initial unfunded liability is reasonable.

Section II – Actuarial Methods

In this section, we discuss the various actuarial methods used in the actuarial valuation to measure the plan's liabilities and funded status and calculate the contribution rates.

Asset Valuation Method

Actuarial Standard of Practice 44 - *Selection and Use of Asset Valuation Methods for Pension Valuations* provides guidance to actuaries in selecting an asset valuation method. The asset valuation method determines the actuarial value of assets (AVA) used in the determination of the employer contribution. The purpose of the asset valuation method is to reduce the impact that market volatility has on the valuation results (in particular, the calculated employer contributions) while still maintaining a reasonable relationship with the market value of assets (MVA).

In the actuarial valuations, the asset valuation method recognizes the difference between the actual and expected investment income on the MVA based on the valuation return assumption. Effective June 30, 2019, the preliminary AVA was reset to the MVA, and the recognition period and percentages were modified from 15% for the first four years and 20% for the last two years to 20% per year for a 5-year period. Additionally, the preliminary AVA is limited to a 20% corridor, i.e., no less than 80% nor more than 120% of market value, and variable plan fund assets are added for TRS and BERS.

As part of the One-Year Lag Methodology (OYLM), the preliminary AVA is then increased by a receivable amount based on employer contribution and administrative expense amounts to determine the final AVA. Please see the discussion on the OYLM that follows the amortization method discussion regarding the adjustment for the receivable contribution. Note that an AVA without the receivable contribution is reported in the Schedule of Funding Progress.

The Conference of Consulting Actuaries' Public Plans Community issued a white paper ("CCA White Paper") on model actuarial funding policies to provide guidance to policymakers and other interested parties on the development of actuarially based funding policies for public pension plans. Under the guidelines for asset smoothing methods, the 5-year recognition with the 20% corridor used by each of the system valuations is classified as a model practice (i.e., a method most consistent with the level cost allocation model described in the white paper).

The CCA White Paper notes that frequent restart of smoothing should be avoided. The Chief Actuary provided reasons for resetting the June 30, 2019 AVA equal to the MVA in the Revised 2021 A&M letters for each system sent in July 2021 from her to the Board of Trustees. ASOP 44 does not address the restart of smoothing but does note that justification should be provided for changes in the actuarial asset method. We agree the reasons for the change are appropriately disclosed.

We agree with the use of a five-year period and the 20% corridor. Additionally, we find that this method is reasonable and consistent with the guidance provided in Actuarial Standard of Practice 44 - *Selection and Use of Asset Valuation Methods for Pension Valuations*.

We also reviewed the numerical calculations of the actuarial valuation of assets and found them to be accurate.

Actuarial Cost Method

Actuarial Standard of Practice 4 - *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions* provides guidance to actuaries in selecting an actuarial cost method. Each of the valuations use the Entry Age Normal actuarial cost method to determine the cost of benefits accrued during the upcoming year (known as the normal cost) plus the value of benefits accrued for all years of past service (known as the accrued liability) as of the valuation date. For the Variable Supplemental Fund (VSF) liabilities included in the Fire and Police valuations, a portion of the present value of future VSF transfers is reflected in the present value of future normal costs and a portion is reflected in the UAL. These liability measurements are then used in the determination of the employer contribution.

The purpose of any cost method is to allocate the cost of future benefits to specific time periods. Most public plans follow one of a group of generally accepted funding methods, which allocate the cost over the members' working years. In this way, benefits are financed during the time in which services are provided. The Entry Age Normal actuarial cost method is the most common cost method used by public plans. The 2022 Public Fund Survey from the National Association of State Retirement Administrators shows that about 90% of the retirement systems surveyed are using the Entry Age Normal cost method.

The focus of the Entry Age Normal actuarial cost method is the level allocation of costs over the member's working lifetime. For a public plan, this means current taxpayers pay their fair share of the pensions of the public employees who are currently providing services. Current taxpayers are not expected to pay for services received by a past generation, nor are they expected to pay for the services that will be received by a future generation.

We find that the actuarial cost method used is reasonable and consistent with the guidance provided in Actuarial Standard of Practice 4 - *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions.* The actuarial cost method used is also consistent with model practice described in the CCA white paper.

For GASB Statements Nos. 67 and 68, the Entry Age Normal actuarial cost method is the only permissible cost method for financial reporting purposes.

Amortization Method

Actuarial Standard of Practice 4 - *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions* provides guidance to actuaries in selecting an actuarial cost or contribution allocation procedure. Additional guidance on amortization policy is provided in the CCA white paper. For background, the following are the key methods used in each of the actuarial valuations for the systems in determining the UAL amortization payments that are included in the actuarially determined contribution.

- A layered amortization approach is used to calculate the contribution to pay off the UAL. The Initial Unfunded Accrued Liability as of the June 30, 2010 is amortized over a closed period (11 years as of the June 30, 2020 lag valuation). Future changes in the UAL after June 30, 2010 are amortized over new closed periods. The amortization period for each new layer (referred to as bases) varies by the cause of the change in the UAL.
    - Actuarial Gains and Losses – Over closed 15-year periods
    - Assumption and Method Changes – Over closed 20-year periods
    - Benefit Changes – Over the remaining working lifetimes of those impacted, unless the amortization period is determined by statute
- The Initial UAL is being amortized using Increasing Dollar Payments (IDP). Under IDP, amortization payments increase by 3.0% per year, consistent with the assumed rate of general wage increases.
- Increments to the UAL established after June 30, 2010 are amortized using Level Dollar Payments (LDP).
- Due to the lag methodology, the amortization payment is determined using the indicated number of years less one year and increased with interest until mid-year of the applicable fiscal year.

The above information is provided in Table III-2 of the valuation reports. The table does not specifically address how amortization payments are calculated if a negative UAL (AVA greater than AL) develops. We do note that the OA indicated that for one employer in NYCERS the contribution was not reduced below the sum of the normal cost and administrative expenses. We suggest that the OA define its methods when this could occur for a specific employer and for the system in total.

We find that the amortization method used is reasonable and consistent with the guidance provided in Actuarial Standard of Practice 4 - *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*.

For the most part, the amortization method used is consistent with the model practice described in the CCA white paper. One exception is that under model practice in the CCA white paper, UAL bases are amortized as a percentage of payroll; whereas, all bases except for the Initial UAL are amortized on a level dollar basis in the NYCRS valuations. The reason level dollar amortization is classified as an acceptable practice in the white paper instead of a model practice is that one of the stated objectives of the white paper is to have costs that are level as a percent of payroll. Under the level dollar method, payments to amortize the UAL are in theory just that, level in dollar terms. If the payroll increases by 3% as assumed, that means the UAL contributions for the bases being amortized on a level dollar basis will decrease each year as a percent of payroll.

We believe the use of level dollar amortization is reasonable. Compared to level percent of payroll amortization, the level dollar approach generally provides more rapid payment of the UAL.

We reviewed the amortization calculations for each of the valuations. We were able to match all calculated values in the June 30, 2020 lag valuations except for the amortization amount related to the 2019 method change in the NYCERS valuation. After discussion with OA, the 2019 method change base comprised of two amortization bases: one amortized over 20 years and one amortized over 15 years. We recommend that these amounts be shown separately.

We also note that many of the level dollar amortization amounts contained in the June 30, 2020 lag valuation did not match those contained in the June 30, 2019 lag valuation. OA indicated that the differences were due to the elimination of bases in the 2019 lag valuation for one employer since the sum was negative, meaning that it indicated there was a surplus. In the 2020 lag valuation, there was no longer a surplus and the amortization bases were re-instituted. We recommend that OA add disclosures of these types of changes to the report.

Recommendation: We note that it is unusual to have an initial base amortized using a level percent of pay approach with subsequent bases amortized using a level dollar approach. With that being said, we believe the methodology is reasonable and recommend no changes.

We recommend the amortization calculation for the 2019 method change in the June 30, 2020 NYCERS Lag valuation be reviewed.

From a disclosure perspective, we recommend the following items be added:

- The interest adjustments reflected in the calculation
- Comments be incorporated regarding any changes to the development of the amortization amounts to assist stakeholders in understanding them from one year to the next

One-Year Lag Methodology

As the valuation date lags the contribution year (June 30, 2020 valuation date determines calculated employer contributions for the 2022 fiscal year), an adjustment is made in the calculation of the employer contributions to account for the difference. This one-year lag methodology (OYLM) is described in the valuation reports as follows:

> *One-Year Lag Methodology uses a June 30, XX-2 valuation date to determine Fiscal Year XX employer contributions.*
>
> *This methodology requires adjustments to certain components used to determine the Fiscal Year XX employer contributions as follows:*
>
> *a. Normal Cost:*
>
> *The normal cost as of June 30, XX-2 is rolled forward with the assumed actuarial interest rate of 7.0% to derive the mid-year normal cost for Fiscal Year XX.*
>
> *b. UAL Payments*
>
> *For determining the UAL payments for Fiscal Year XX, and to be consistent with the OYLM, the UAL as of June 30, XX-2 is adjusted by the discounted value of employer normal cost and UAL payments paid during Fiscal Year XX-1 and the discounted value of Administrative Expenses reimbursed during Fiscal Years XX-1 and XX.*

We have the following observations about the OYLM:

- Under the OYLM, our analysis shows that a system would not be projected to reach a 100% Funded Ratio (Market Value of Assets equal to Actuarial Liability) if all assumptions are met, although it would come very close (our analysis projects a 99% Funded Ratio). This is because the Actuarial Value of Assets used in the UAL contribution calculation includes the receivable contribution, but the Market Value of Assets does not include it. We still believe the overall funding of NYCRS is appropriate.
- The OYLM description in the valuation report states that the UAL is adjusted by the contribution receivable and expenses. The actual approach used in the valuation is that AVA is adjusted by that amount as opposed to the UAL, which mathematically is the same. We suggest that descriptions of the OYLM and the Actuarial Asset Valuation Method in the valuation report be reviewed to see if they sufficiently describe this adjustment.

Funding Policy

In addition to the parameters discussed above, we reviewed other parts of NYCRS funding, such as:

- Actual Contributions Received – Are the contributions received equal to the amount anticipated? Over the last 10 years, the statutory contribution received has equaled the actuarially determined contributions for each of the Systems, with the exception of some minor differences for two years for NYCERS.

- Results by employer – There are many different participating employers in the Systems. How are the contributions allocated between employers? The valuation report shows a breakdown of contributions by employer for NYCERS, TRS and BRS but does not describe the method of allocation.

  It is our understanding that any actuarially determined contribution is determined based on the liabilities and normal costs for that employer's membership. The actuarial valuation provides the following items by employer:

  - Components of contribution requirement: employer normal cost, allocated administrative expenses and the total of amortization payments.
  - Liability information: Present value of benefits and actuarial accrued liability.
  - Census Data: Information on active data by employer including age service count and salary charts plus information by tier and changes since the prior years.

  We believe this information provided is beneficial to the stakeholders of those employers. However, we suggest additional information be included:

  - Normal Cost: We suggest the gross normal cost and the amount covered by members, in addition to the employer normal cost be added to the report. We discuss this further below in the normal cost rates by group section.
  - Amortization Bases: We suggest the individual amortization bases by employer be added to the report.

Recommendation: We recommend the valuation reports describe how the contributions are allocated by employer plus incorporate more detailed information on normal cost and individual amortization bases.

Contribution Adequacy

There will always be a competition between providing strong funding to the system and having reasonable contribution rates. We believe that the NYCRS funding policies strike a reasonable balance between the two.

Normal Cost Rates by Group

Normal Cost amounts provided in the valuation reports represent the employer portion and are aggregated by tier. Normal Costs rates as a percentage of pay are not shown.

Recommendation: We recommend the following disclosures be added:

- Displaying the development of the employer normal cost by showing the gross normal cost and the portion anticipated to be reduced by member contributions.
- Consideration be given to showing gross normal cost and net normal cost rates as a percentage of pay.
- Provide additional breakdowns showing the normal cost rates for each tier to better understand the relative cost difference in the Plan provisions.

Section III – Actuarial Valuation Reports

Actuarial Standards of Practice

We have reviewed the June 30, 2021 actuarial valuation reports from the perspective of serving as an actuarial communication and Statement of Actuarial Opinion (SAO). There are a number of Actuarial Standards of Practice (ASOPs) that apply to the development of the valuation results and the preparation of the actuarial valuation report. We have found that the valuation report is in compliance with the applicable ASOPs (see below), but we have identified several suggestions for consideration for future valuation reports.

The following ASOPs are applicable to pension actuarial reports:

- ASOP 4: Measuring Pension Obligations and Determining Pension Plan Costs or Contributions
- ASOP 23: Data Quality
- ASOP 27: Selection of Economic Assumptions for Measuring Pension Obligations
- ASOP 35: Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations
- ASOP 41: Actuarial Communications
- ASOP 44: Selection and Use of Asset Valuation Methods for Pension Valuations
- ASOP 51: Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions
- ASOP 56: Modeling

Review of Compliance with the ASOPs and Suggestions for Future Reports

ASOP 4: This ASOP provides guidance to actuaries when preparing pension valuations, as well as certain other SAOs. The ASOP requires the actuary to include a number of items in the actuarial report, including the purpose of the measurement, summary of plan provisions, data and actuarial methods and assumptions, as well as certain additional information.

The certification letter in the front of each valuation clearly states the purpose of the actuarial measurements along with a statement that calculations may differ significantly for other purposes. The valuation reports identify the actuarial methods, assumptions, the substantive plan provisions, and other principal information. We recommend including disclosures of sources of the key actuarial assumptions including specific references to and actuarial experience studies on which the assumption are based. Section II of this report contains specific comments and recommendations regarding the actuarial methods specific to the Systems' valuation reports.

ASOP 23: This ASOP provides guidance to actuaries when selecting, reviewing, using, or relying on data supplied by others, when performing actuarial services. The ASOP requires the actuary to disclose the source of the data, whether the actuary reviewed the

data, and to indicate any concerns about the data and if there are any limitations on the actuarial work product as a result of those concerns.

The certification letter in the front of each valuation describes the source of data used for the valuation. The letter further discloses that the data was used without audit but was reviewed for consistency and reasonableness. We believe that the valuation reports are in compliance with ASOP 23.

ASOP 27: This ASOP provides guidance to actuaries when selecting economic assumptions for measuring pension obligations in a defined benefit plan. The ASOP also requires actuaries to disclose the assumptions used as well as the rationale for the selection of the assumptions.

The economic assumptions used in the valuations are stated in the valuation reports. Section 4.1.2 of ASOP 27 begins by stating:

> For each economic assumption that has a significant effect on the measurement and that the actuary has selected, the actuary should disclose the information and analysis used to support the actuary's determination that the assumption is reasonable.

We did not find any discussion of the support for the economic assumptions in the actuarial valuation reports. We recommend stating how long each material assumption has been in place, and further recommend stating the rationale for the assumption, or referring to any outside reports that discuss the development of the assumption.

Please refer to Section I above for our detailed comments on the economic assumptions.

ASOP 35: This ASOP provides guidance to actuaries when selecting demographic assumptions for measuring pension obligations in a defined benefit plan. The ASOP also requires actuaries to disclose the assumptions used as well as the rationale for the selection of the assumptions.

The valuation reports disclose the key demographic assumptions used for the calculation of the liabilities. We recommend that the valuation reports include detail on the rationale for the use of each material demographic assumption and the most recent experience study be specifically referenced in each valuation report. The assumptions section of this report that follows contains additional comments and recommendations specific to each Systems' valuation reports.

We are currently conducting data processing that will be used for an analysis of the demographic assumptions that will be included in the experience study report to be issued later.

For information purposes only, we note that the Pension Committee of the American Academy of Actuaries finalized a public policy practice note *Selecting and Documenting Mortality Assumptions for Measuring Pension Obligations* in January 2023, that provides background and ideas as to how a pension actuary might comply with ASOP 35.

ASOP 41: This ASOP provides guidance to actuaries when issuing actuarial communications. The ASOP requires actuaries to include various disclosure items in the actuarial report including the intended user, scope, purpose, actuarial qualifications.

Overall, we find the communication to be robust and clear, with disclosure of data, assumptions, methods and plan provisions such that an independent actuary can assess the reasonableness of the actuary's work. There were no mentions of any assumptions being set by law or prescribed by another party. There were no mentions of any deviations from Actuarial Standards of Practice. Subsequent events are disclosed.

We believe that the valuation reports are in compliance with ASOP 41, however we do have minor recommendations. Section 3.4.4 of ASOP 41 discusses responsibility for assumptions and methods and begins by stating:

> "An actuarial communication should identify the party responsible for each material assumption and method. Where the communication is silent about such responsibility, the actuary who issued the communication will be assumed to have taken responsibility for that assumption or method."

We recommend that the date of the experience study that is the basis for assumptions be explicitly stated in the report. For any assumptions used that are not taken directly from the experience study (for instance, annual updating of the mortality improvement projection scale) we recommend explicitly stating the source of the assumption.

Finally, Section 3.4.2 of ASOP 56 discusses conflicts of interest and begins by stating:

> "An actuary who is not financially, organizationally, or otherwise independent concerning any matter related to the subject of an actuarial communication should disclose any pertinent information that is not apparent."

In the cover letter of the NYCERS valuation report the signing actuaries take care to disclose that they are members of NYCERS, and state that they do not believe that this impairs their objectivity. This is an appropriate disclosure.

ASOP 44: This ASOP provides guidance to actuaries when selecting an asset valuation method for an actuarial valuation. High level considerations for choosing a smoothing method to develop an actuarial value of assets (AVA), if a smoothing method is selected, include:

- AVA falls within a reasonable range around the market value of assets (MVA)
- Gains and losses are recognized within a reasonable period of time
- The smoothing method is not biased (is not expected to produce results that skew toward either understatement or overstatement relative to the MVA)

All five systems have the following components in common in the determination of the preliminary AVA:

- Gains and losses are amortized over a 5 year period
- The AVA is constrained to be no less than 80% and no more than 120% of the MVA.

These approaches are very common and we believe that they are in compliance with ASOP 44. We note that the AVA was reset to the MVA on June 30, 2019, and prior to that was reset on June 30, 2011. While too frequent resets can introduce bias over time, we do not believe that has occurred here.

For TRS and BERS, the assets are divided into fixed assets and variable assets. The gain/loss determination is performed on fixed assets, as is the 80%/120% collar around MVA, and then the variable assets are added in to determine the preliminary AVA. As of June 30, 2020 the variable assets were roughly 10% of the MVA for TRS and 1% for BERS. It is not clear from the report what the variable assets are comprised of or why they are excluded from the smoothing/collar calculations. However, due to the small percent of MVA represented by the variable assets, and if the percentage remains relatively consistent over time, we do not believe this methodology would introduce systemic bias into the AVA calculation.

We note that for all five systems there are additional adjustments to the preliminary AVA that are made in the determination of the final AVA.

- All five systems add two items to the preliminary AVA to determine the final AVA:
  - Present value of employer contribution for the year following valuation date (and preceding the year the calculated contributions are to be made)
  - Present value of expected administrative expense reimbursements.

- For TRS and BERS, an adjustment is also made for monies due to/from the Tax-Deferred Annuity Program

These receivables/payables are not included in the gain/loss determination and thus changes are recognized immediately as opposed to being amortized over time, and they are also not subject to the 80%/120% corridor around the market value of assets. We believe that the exclusion of these receivables/payables from the MVA and thus the asset

smoothing calculation is part of the actuarial cost method/funding policy, as opposed to the asset smoothing method, and thus is not subject to ASOP 44 considerations.

ASOP 51: This ASOP provides guidance to actuaries on the assessment and disclosure of the risks that future measurements may differ from that which is expected.

The valuation report for each system contains a detailed and robust discussion of potential risks, including:

- Risk of not achieving the expected rate of return on investments
- Risk of volatility of investment returns
- Risk of plan maturity
- Risk of decreases in expected rate of return
- Longevity risk
- Litigation risk
- Plan sponsor insolvency risk
- Inflation risk
- Risk of not receiving the actuarially determined contribution
- Agency/political risk
- Intergenerational equity risk

The information is provided via text, as well as graphically or via table where appropriate. In addition, the risks for each system are placed into categories of high, medium or other based on the actuary's judgment. We believe that the valuation reports are in compliance with ASOP 51.

ASOP 56: This ASOP provides guidance to actuaries when performing actuarial services that require modeling. The standard addresses work related to the designing, developing, selecting, modifying, using, reviewing, or evaluating models. The standard requires that the actuary disclose the intended purpose of the model, any material inconsistencies or unreasonable output, and any other material limitations of the model. If the actuary has a limited understanding of models developed by another party that they are relying on, additional disclosures should be included.

The valuation reports contain ASOP 56 modeling disclosures at the beginning of the *Actuarial Assumptions and Methods* section and we believe that the valuation reports are in compliance with ASOP 56.

For information purposes only, we note that the Pension Committee of the American Academy of Actuaries finalized a public policy practice note *Modeling – for Pension Actuaries* in January 2023, that provides background and ideas as to how a pension actuary might comply with ASOP 56.

Summary of Plan Provisions

The valuation reports for all systems provide a robust summary of all plan provisions. We provide the following suggestions for additional clarity:

- Loan Provisions for all Systems: We suggest more clarity could be provided on how this impacts a member's benefit.

- Salary Limitations for NYCERS, TRS and BERS: We suggest that the overtime limitation and governor's salary limitation in effect at the time of the valuation be noted.

- Retirement Benefit for Tier 3 (TRS, BERS, and POLICE) and Tier 3 Enhanced (FIRE): The reports note that the retirement benefits for these groups are offset by a percent of the benefit payable from Social Security. However, this offset is limited to only being based on public earnings for which credited service was earned within New York State. We suggest this detail be added to the report for clarity.

- Credited Service for POLICE and FIRE: The reports note that there are certain types of service preceding uniformed police or fire service that is included in Allowable Police or Fire Service. However, it is not clear from the report that this service has to be properly transferred into these plans in order for it to count. We suggest some language be added to the report to clarify this point.

- Retirement Benefit and Vested Retirement Benefit for POLICE and FIRE: The benefit formula description in the report under these sections For Tier 1 and Tier 2 do not include the benefit attributable to non-uniformed service or other credited service. We recommend the relevant benefit information associated with this service be added to each of the reports.

- Ordinary Death Benefit for POLICE and FIRE: You may wish to clarify that the Ordinary Death Benefit applies to terminated vested members in addition to active members.

Summary of Actuarial Assumptions

The valuation reports for all systems provide a robust summary of all actuarial assumptions. As noted above, ASOP 35 requires actuaries to disclose the rationale for the selection of the assumptions. The disclosure may reference any actuarial experience study report. We recommend that the actuarial valuation report reference the applicable Experience Study Report. We would also recommend reference to the relevant Proposed Changes in Actuarial Assumptions and Methods Reports which form the basis for the actuarial valuation reports.

We provide the following suggestions for additional clarity for each of the reports:

- Beneficiary Mortality for all Systems: We suggest the application of the beneficiary mortality tables be clarified to whether the tables are applied both while the member is still alive or only for survivors after the member has died.

- Form of Payment for all Systems: The assumed form of payment is a Maximum Retirement Allowance. This assumption is appropriate if there are no significant subsidies for other forms of benefit payments. The report could state that there are no such subsidies or otherwise provide rationale for why this assumption is appropriate. If the amount of the benefit is impacted by potential outstanding loans, refunds of contributions or other items, we suggest they be disclosed here.

- Retirement Assumption for Terminated Vested Members for all Systems. The reports do not appear to include retirement assumptions for vested terminated members. We suggest this assumption be disclosed, including the treatment of vested members who are past first payment age.

- Retroactive Wage Adjustments for applicable Systems: The reports note that salaries have been adjusted for assumed or known retroactive wage adjustments, but it does appear to disclose the assumptions. We suggest these assumptions be disclosed.

- Improved Retirement Programs for NYCERS, TRS and BERS: For various groups, the retirement assumptions are split between members “mandated into their retirement program” and those “elected an improved retirement program”. We believe that it would be helpful to provide information as to which retirement programs are considered to be improved for the purpose of determining which set of assumptions is applied.

- WTC Disability Benefits Law and the WTC Death Benefits Law for POLICE and FIRE: The reports note that the obligation for the special benefits attributable to the WTC Disability Benefits Law and the WTC Death Benefits Law are determined “through estimation techniques for post-retirement reclassifications”. Additional language could be added to the report to explain the estimation technique.