



Pennsylvania Public School Employees' Retirement System

Actuarial Valuation Report
June 30, 2020



September 24, 2021

Board of Trustees
Pennsylvania Public School Employees'
Retirement System
5 North 5th Street
Harrisburg, PA 17101

Ladies and Gentlemen:

This report presents the results of the annual actuarial valuation of the Pennsylvania Public School Employees' Retirement System (Retirement System or PSERS) as of June 30, 2020.

The results of the June 30, 2020 valuation were previously presented to the Budget/Finance Committee of the Board of Trustees at its December 3, 2020 meeting. The Board accepted and certified the results of the valuation via the Public School Employees' Retirement Board (PSERB) Resolution 2020-52. This valuation reports the results of the Retirement System's June 30, 2020 actuarial valuation and recognizes the System's investment consultant's revised Act 5-2017 nine-year geometric average return on the System's assets. The change resulted in the application of Act 5-2017 member shared-risk contributions beginning July 1, 2021, which was duly re-certified by the Board under PSERB Resolution 2021-16.

The valuation takes into account all of the promised benefits to which members are entitled as of June 30, 2020, including pension and survivor benefits, and as required by the Public School Employees' Retirement Code, 24 Pa. C.S. §8101 et. seq. (Retirement Code) is the basis for the contribution rate for fiscal year 2021/2022. In addition, the contribution rate indicated in the report includes a rate for anticipated employer contributions to the Pennsylvania Employees' Defined Contribution plan (DC Plan) for anticipated Class T-G, Class T-H and Class DC participants on or after July 1, 2021 and prior to July 1, 2022.

As required under Section 8502(j) of the Retirement Code, experience studies are performed once in every five-year period. This valuation was prepared on the basis of the demographic and economic assumptions that were recommended on the basis of an Experience Review covering the period from July 1, 2010 to June 30, 2015 and adopted by the Board of Trustees at their June 10, 2016 meeting. As mandated by the Retirement Code, these assumptions will remain in effect for valuation purposes until such time as the Board of Trustees adopts revised assumptions. However, as of the publication of this report, the Board has adopted the recommended demographic and economic assumptions based on the experience study for the period July 1, 2015 to June 30, 2020 effective for the June 30, 2021 valuation of the System.

Reporting requirements of GASB Statements No. 67 and No. 68 took effect for PSERS at the June 30, 2014 and June 30, 2015 reporting dates, respectively. Also, reporting requirements of GASB Statements No. 74 and No. 75 took effect for PSERS at the June 30, 2017 and June 30, 2018 reporting dates, respectively. These requirements are addressed in separate reports.

Assets and Membership Data

The Retirement System provided the individual data for members used in the valuation. While we did not verify the data at their source, we did perform tests for internal consistency and reasonableness. The amount of assets in the trust fund taken into account in the valuation was based on statements prepared by the Retirement System. The accuracy of the results presented in this report is dependent on the accuracy of the data.

Funding Adequacy

The valuation results indicate that the employer contribution rate for fiscal year 2021/2022 is 34.94%. This rate includes a rate of 0.15% for employer contributions to the DC Plan. The 0.15% Act 5 DC contribution rate is an estimated average DC contribution rate. The actual employer DC contribution rate will be based on each employer's Class T-G, Class T-H, and Class DC only membership.

As of June 30, 2020, the total funded ratio of the plan (for Pensions and Health Insurance Premium Assistance combined) is 59.2%, based on the accrued liability and actuarial value of assets calculated under the funding requirements of Section 8328 of the Retirement Code.

For the sixth consecutive year, the PSERS Board has certified the full employer contribution rate calculated by the actuary. This follows 15 years in which contributions to the System were constrained to be less than the actuarially determined amounts. This is an essential step to bring PSERS back to a fully funded status. Full actuarial funding from employers along with member contributions and investment income are necessary sources of funds that will pay down the unfunded liability of the System.

Unless stated otherwise, references to “funded ratio” and “unfunded accrued liability” are measured using the actuarial value of assets. It should be noted that if the same measurements were made using the market value of assets, different funded ratios and unfunded accrued liabilities would result. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the Retirement System if the Retirement System were to settle (i.e., purchase annuities to cover) a portion or all of its liabilities. Assuming contributions are made at the level indicated in the actuarial valuation and no future Retirement System experience gains or losses, future expected plan contributions are expected to remain relatively level as a percent of payroll and the funded status is expected to increase.

Financial Results and Membership Data

Detailed summaries of the financial results of the valuation and membership data used in preparing the valuation are shown in the valuation report. The actuaries prepared supporting schedules included in the Actuarial and Statistical Section of the PSERS Comprehensive Annual Financial Report (Annual Report) and also provided historical data schedules included in the Financial Section of the Annual Report.

Use of Models

Actuarial Standard of Practice No. 56 (ASOP 56) provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. Buck uses the following:

- third-party software in the performance of annual actuarial valuations and projections to calculate the liabilities associated with the provisions of the plan using data and assumptions as of the measurement date under the funding methods specified in this report.
- an internally developed model that applies applicable funding methods and policies to the liabilities derived from the output of the third-party software and other inputs, such as plan assets and contributions, to generate many of the exhibits found in this report

Buck has an extensive review process whereby the results of the liability calculations are checked using detailed sample output, changes from year to year are summarized by source, and significant deviations from expectations are investigated. Other outputs and the internal model are similarly reviewed in detail and at a high level for accuracy, reasonability and consistency with prior results. Buck also reviews the third-party model when significant changes are made to the software or model. The review is performed by experts within the company who are familiar with applicable funding methods as well as the manner in which the model generates its output. If significant changes are made to the internal model, extra checking and review are completed. Significant changes to the internal model that are applicable to multiple clients are generally developed, checked and reviewed by multiple experts within the company who are familiar with the details of the required changes.

Actuarial Standard of Practice No. 51 (ASOP 51) applies to funding calculations such as those presented in this report and requires certain disclosures of potential risks. Exhibit VIII contains an assessment of the key risks applicable to the Retirement System.

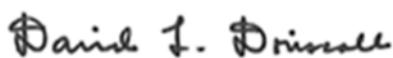
Future actuarial measurements may differ significantly from current measurements due to Retirement System experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in Retirement System provisions or applicable law. Liability models necessarily rely on the use of actuarial assumptions, approximations and estimates and are sensitive to changes in these actuarial assumptions, approximations and estimates. Small variations in these actuarial assumptions, approximations and estimates may lead to significant changes in actuarial measurements. An analysis of the potential range of such future differences is beyond the scope of this valuation.

Use of this report for any other purpose, or by anyone other than the Board of Trustees or the staff of PSERS or employers or its auditors, may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the report for that purpose. Buck should be asked to review any statement to be made on the basis of the results contained in this report. Buck will accept no liability for any such statement made without prior review by Buck.

Buck is not responsible for the calculation of the geometric average time-weighted rate of return, net of fees, for the nine-year period ending June 30, 2020, which is an important factor in determining future contributions to the Retirement System and its liabilities. This calculation was performed by PSERS' investment advisor and Buck has not reviewed or audited this calculation. Buck is not responsible for the accuracy of the census data and asset value data provided to it by the Retirement System. In performing its calculations, Buck relies on the staff of the Retirement System for information about the System, including benefit provisions and administrative provisions, as well as legal determinations regarding interpretation of the System's governing documents. Buck does not obtain independent legal review of legal interpretations of the Retirement System provided by the System.

David L. Driscoll is a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries. Edward Quinn and Salvador Nakar are Members of the American Academy of Actuaries. We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. This report has been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions concerning it.

Buck Global, LLC



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Pennsylvania Public School Employees' Retirement System

Table of Contents

Table/Exhibit

Executive Summary	1
Table 1 - Summary of Results of Actuarial Valuation as of June 30, 2020	12
Table 2 - Summary of Sources of Employer Contribution Rate as of June 30, 2020.....	13
Table 3 - Determination of Health Insurance Premium Assistance Contribution Rate for Fiscal Year 2021/2022	14
Table 4 - Summary of Market Value of Plan Assets as of June 30, 2020	15
Table 5 - Derivation of Actuarial Value of Assets as of June 30, 2020	16
Table 6 - Analysis of Change in Unfunded Accrued Liability as of June 30, 2020	17
Table 7 - Schedules of Funding Progress for Pensions	18
Table 8 - Solvency Test for Pensions- Comparative Summary of Accrued Liability and Actuarial Value of Assets	18
Table 9 - Schedule of Employer Contributions	19
Table 10 - History of Contribution Rates and Funded Ratios	20
Table 11 - History of Annuitants, Beneficiaries, Survivor Annuitants and Active Members	21
Table 12 - Description of Actuarial Assumptions and Methods	22
Table 13 - Summary of Benefit and Contribution Provisions.....	26
Table 14 - Summary of Membership Data as of June 30, 2020	32
Exhibit I - Active Membership Data as of June 30, 2020 - Number and Average Annual Salary	38
Exhibit II - The Number and Average Annual Annuity as of June 30, 2020 – Retired on Account of Superannuation, Early Retirement and Those in Receipt of Withdrawal Annuities	39
Exhibit III - The Number and Average Annual Annuity as of June 30, 2020 – Beneficiaries and Survivor Annuitants.....	40
Exhibit IV - The Number and Average Annual Annuity as of June 30, 2020 – Retired on Account of Disability.....	41
Exhibit V - Annuitant and Beneficiary Membership Data as of June 30, 2020	42
Exhibit VI - 10-Year History of Membership Data	43
Exhibit VII - Detailed Tabulations of the Data	45
Exhibit VIII – ASOP 51 Disclosures	57
Exhibit IX - Glossary	61

Executive Summary

This report presents the actuarial valuation as of June 30, 2020 for the Pennsylvania Public School Employees' Retirement System.

The principal valuation results include:

- The employer contribution rate for fiscal year 2021/2022, which is 34.94% (33.99% Pension plus 0.80% Premium Assistance plus 0.15% Act 5 DC contribution).
- The 0.15% Act 5 DC contribution rate is an estimated average DC contribution rate. The actual employer DC contribution rate will be based on each employer's Class T-G, Class T-H, and Class DC only membership.
- The unfunded accrued liability as of June 30, 2020 is \$44.0 billion. The decrease in the unfunded accrued liability from \$44.1 billion in the June 30, 2019 valuation is the second consecutive decrease after increasing for over a decade.
- The total funded ratio of the Retirement System determined as of June 30, 2020 under the funding requirements of Section 8328 of the Retirement Code is 59.2%, which is based on the accrued liability and the actuarial value of assets for Pensions and Health Insurance Premium Assistance as of that date. The funded ratio as of June 30, 2019 was 58.1%.
- The determination and analysis of actuarial experience in the year ending June 30, 2020, which consisted of a net experience loss of \$291 million.
- The Act 120 minimum employer pension rate is the normal cost rate of 7.20%.
- For the sixth consecutive year, the PSERS Board has certified the full employer contribution rate calculated by the actuary. This follows 15 years in which contributions to the System were constrained to be less than the actuarially determined amounts. This is an essential step to bring PSERS back to a fully funded status. Full actuarial funding from employers along with member contributions and investment income are necessary sources of funds to pay down the unfunded liability of the System.
- In accordance with the Act 5-2017 Class T-E, Class T-F, Class T-G and Class T-H "shared-risk" contribution provision, the contribution rates for Class T-E, Class T-F, Class T-G and Class T-H members shall increase to 8.00%, 10.80%, 6.25% and 5.25%, respectively, since:
 - The revised geometric average of the time-weighted rate of return, net of fees, for the nine-year period ending June 30, 2020 is 6.34%, as calculated by Aon. The time-weighted rate of return, net of fees, is less than 6.36% (the geometric average of the annual interest rate adopted by the Board over the nine-year period less 1.00%), and
 - The contribution rates for Class T-E, Class T-F, Class T-G and Class T-H members are currently at 7.50%, 10.30%, 5.50% and 4.50%, respectively.

The next Class T-E, Class T-F, Class T-G and Class T-H shared-risk valuation is to be performed for the ten-year period ending June 30, 2023. The Act 5-2017 member shared-risk contribution rates are discussed on page 9

The results of the June 30, 2020 valuation were previously presented to the Budget/Finance Committee of the Board of Trustees at its December 3, 2020 meeting. The Board accepted and certified the results via the Public School Employees' Retirement Board (PSERB) Resolution

2020-52. At the same Board meeting, the Board certified that the Act 5-2017 member shared-risk contributions would not become effective July 1, 2021. In April of 2021, on the basis of revised information provided by the System's investment consultant, the Board certified that the Act 5-2017 member shared-risk contributions would become effective July 1, 2021. The recertification of the Act 5-2017 risk-share came well after June 30, 2020, the measurement date for the valuation, and certification and acceptance of the valuation results but prior to the issuance of the actuarial valuation results. In accordance with section 3.4.2 of the Actuarial Standards of Practice No. 4 (ASOP 4), the occurrence of this post-measurement-date event is disclosed. The member shared risk contributions will be recognized beginning with the June 30, 2021 valuation of the System

- Annual disclosures as of June 30, 2020 in accordance with the Governmental Accounting Standards Board (GASB) Statements No. 67 and 68 for Pensions and Statements No. 74 and 75 for the Health Insurance Premium Assistance Program have been provided in separate reports.

The valuation was completed based upon membership and financial data submitted by the Retirement System. Detailed summaries of the financial results of the valuation and membership data used in preparing the valuation are included in the valuation report. The actuaries prepared supporting schedules included in the Actuarial and Statistical Section of the PSERS Comprehensive Annual Financial Report (Annual Report) and also provided historical data schedules included in the Financial Section of the Annual Report.

Changes Since Last Year

Legislative and Administrative Changes

The benefit provisions and contribution provisions are summarized in Table 13. There were no legislative or administrative changes since the prior valuation.

Actuarial Assumptions and Methods

The actuarial assumptions and methods are outlined in Table 12. As required under Section 8502(j) of the Retirement Code, experience studies are performed once in every five-year period. This valuation was prepared using demographic and economic assumptions that were recommended on the basis of the Experience Review covering the period from July 1, 2010 to June 30, 2015 and adopted by the Board at their June 10, 2016 meeting.

There have been no changes in the actuarial assumptions and methods from those used in the prior valuation.

We have reviewed the assumptions and methods used in completing the June 30, 2020 actuarial valuation and believe that they are reasonable and in compliance with the applicable standards.

Contribution Rates

The results of the valuation as of June 30, 2020 determine the employer contribution rate for fiscal year 2021/2022. The calculated employer contribution rate for the 2021/2022 fiscal year is 34.94% and the Board of Trustees certified this rate at their December 3, 2020 meeting. The 34.94% Employer rate includes a rate of 0.15% for employer DC contributions. This is an average estimated rate based on the assumptions outlined in Table 12 for future Class T-G, Class T-H and Class DC only membership. Actual employer DC contributions will be based on each employer's actual Class T-G, Class T-H and Class DC only membership.

The average base contribution rate payable by the members is 7.56%. The average base member contribution rate of 7.56% is a pay-weighted average of member rates that vary based on date of hire

and Class membership. Effective January 1, 2002, the employee base contribution rate for members who elected to have prior school service and intervening military service converted to Class T-D service increased by 1.25% to 7.50%. Anyone who enrolled after July 1, 2001 and before July 1, 2011 is a member of Class T-D. Any employee who becomes a member after June 30, 2011 and prior to July 1, 2019 is a Class T-E member or, alternatively, may elect to become a Class T-F member. The base contribution rate for Class T-E members is 7.50% of compensation. The base contribution rate for Class T-F members is 10.30% of compensation. Any employee who becomes a member after June 30, 2019 is a Class T-G member or, alternatively may elect to become a Class T-H member or a DC only participant. The base contribution rate for Class T-G members is 5.5% for the defined benefit plan and 2.75% for the defined contribution plan and for Class T-H members is 4.5% for the defined benefit plan and 3.0% for the defined contribution plan. DC only participants contribute 7.50% to the defined contribution plan. In accordance with the Act 5-2017 Class T-E, Class T-F, Class T-G and Class T-H shared-risk contribution provision, the contribution rates for Class T-E, Class T-F, Class T-G and Class T-H members will increase by 0.50%, 0.50%, 0.75% and 0.75%, respectively, effective July 1, 2021. The Act 5-2017 shared-risk provisions are discussed on page 10.

Reasons for Change in the Employer Rate Calculated by the Actuary

The employer contribution rate calculated by the actuary increased from 34.51% for fiscal year 2020/2021 to 34.94% for fiscal year 2021/2022. The reconciliation of the employer contribution rates by source is as follows:

• FY 2020/2021 employer contribution rate	34.51%
• Decrease due to change in normal rate	(0.17)
• Net increase due to total employer payroll growth and liability experience ¹	0.39
• Increase due to actuarial loss on assets	0.26
• Decrease in Act 5 DC employer contribution rate	(0.03)
• Change in health insurance premium assistance contribution rate	<u>(0.02)</u>
• FY 2021/2022 employer contribution rate	34.94%

¹ Reflects increase in total employer payroll and liability gains.

Summary of Principal Results

Summarized below are the principal financial results for the Public School Employees' Retirement System based upon the actuarial valuation as of June 30, 2020. Comparable results from the June 30, 2019 valuation are also shown.

Item	June 30, 2020	June 30, 2019
Demographics		
Active Members		
• Number ¹	256,246	255,749
• Average Annual Pay	\$ 54,535	\$ 53,458
Annuitants		
• Number ²	239,614	237,339
• Average Annual Benefit Payment	\$ 25,753	\$ 25,498
Contribution Rates (as a Percentage of Payroll)		
	(Fiscal Year 2021/2022)	(Fiscal Year 2020/2021)
Employer Contribution Rate:		
• Total Pension Rate Calculated by Actuary ³	33.99%	33.51%
• Health Insurance Premium Assistance Contribution Rate	0.80	0.82
• Act 5 DC Employer Contribution Rate ⁴	<u>0.15</u>	<u>0.18</u>
• Total Contribution Rate	34.94%	34.51%
• Total Contribution Rate Certified by Board	34.94%	34.51%
• Member Average Base Contribution Rate	<u>7.56</u>	<u>7.61</u>
• Total Rate	42.50%	42.12%
Funded Status⁵		
• Accrued Liability	\$ 107,963.8 Mil	\$ 105,324.7 Mil
• Actuarial Value of Assets	63,929.4	61,190.5
• Market Value of Assets	58,687.2	58,859.1
• Unfunded Accrued Liability		
• Actuarial Value of Assets	\$ 44,034.4	\$ 44,134.2
• Market Value of Assets	49,276.6	46,465.6
• Funded Ratio		
• Actuarial Value of Assets	59.2%	58.1%
• Market Value of Assets	54.4%	55.9%

1. Excludes 60 DC only participants as of June 30, 2020.
2. Excludes 1,281 and 1,595 beneficiaries as of June 30, 2020 and June 30, 2019, respectively, who are only entitled to a pending lump sum distribution
3. The Act 120 minimum pension rate for the June 30, 2020 valuation is 7.20% and for the June 30, 2019 valuation is 7.37%.
4. Average DC contribution rate. Actual rate will vary by employer based on Class T-G, Class T-H, and Class DC only memberships.
5. Pensions and Health Insurance Premium Assistance combined.

Five-Year History of Principal Financial Results

Five-Year History of Contribution Rates

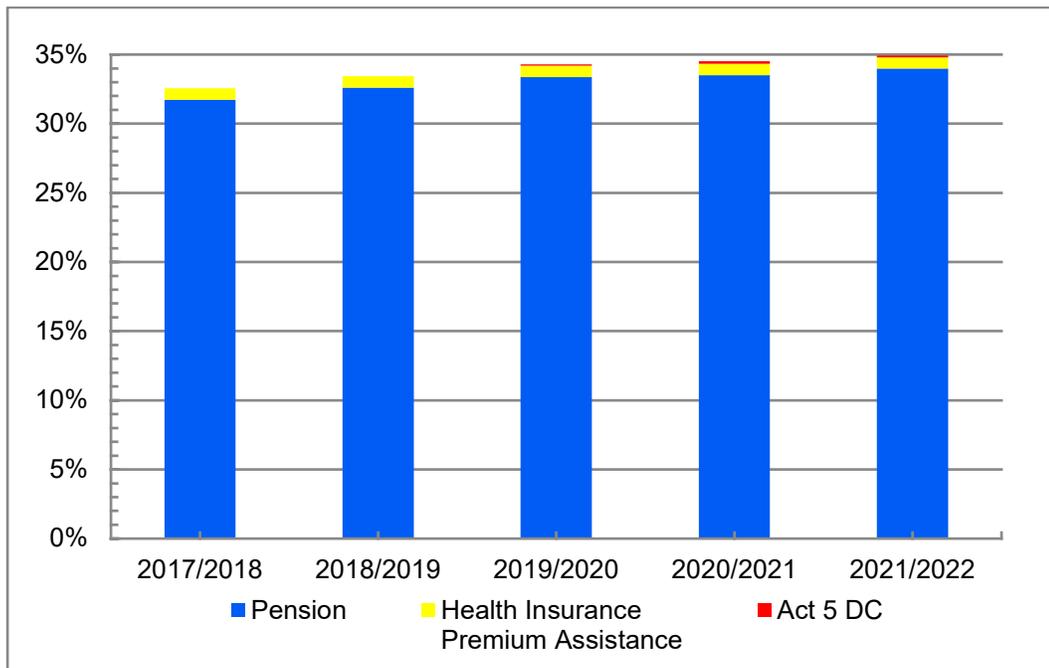
(As a % of Payroll)

Fiscal Year	Member Contributions	Employer Contributions					
		Normal Cost	Unfunded Accrued Liability	Health Insurance Premium Assistance	Act 5 DC Employer Rate ¹	Preliminary Employer Contribution	Final Employer Contribution ²
2021/2022	7.56%	7.20%	26.79%	0.80%	0.15%	34.94%	34.94%
2020/2021	7.61	7.37	26.14	0.82	0.18	34.51	34.51
2019/2020	7.59	7.49	25.87	0.84	0.09	34.29	34.29
2018/2019	7.57	7.59	25.01	0.83	N/A	33.43	33.43
2017/2018	7.54	7.70	24.04	0.83	N/A	32.57	32.57

1. Average DC contribution rate. Actual rate will vary by employer based on Class T-G, Class T-H and Class DC only membership.
2. Certified by the Board.

The following chart shows a five-year history of employer contribution rates:

Five-Year History of Employer Contribution Rates



Funded Ratio

The financing objective of the Retirement System is to:

- Fully fund all current costs based on the normal contribution rate determined under the funding method; and
- Liquidate the unfunded accrued liability based on level-percent-of-pay amortization schedules required by the Retirement Code as amended by Act 120-2010, i.e., a schedule of 24 years for the unfunded accrued liability as of June 30, 2010 and each change in the unfunded accrued liability due to actuarial experience after the June 30, 2010 valuation. Any legislation after June 30, 2010 that increases the liability due to benefit enhancements will be funded over 10 years based on level-percent-of-pay amortization.
- As directed by Act 120-2010, the minimum employer pension contribution rate will be the normal cost rate.
- Fully fund the employer contribution to the Defined Contribution Plan.

The total contribution rate of 34.94% of payroll payable by employers, when taken together with the contributions payable by the members, current assets, and expected future asset returns, is sufficient to achieve the financing objective.

The Retirement System's total funded ratio on this funding basis is measured by comparing the actuarial value of assets (based on a 10-year moving average market value) to the accrued liability. The accrued liability for pensions is the present value of benefits accumulated to date under the Retirement System's funding method and reflects future pay increases for active employees. The accrued liability for Health Insurance Premium Assistance equals the assets in the Health Insurance account.

On this basis, the Retirement System's total funded ratio (for Pensions and Health Insurance Premium Assistance combined) is 59.2% as of June 30, 2020. This funded ratio is based on an actuarial value of assets of \$63.93 billion and an accrued liability of \$107.96 billion. The funded ratio for Pensions alone is 59.2% as of June 30, 2020, based on an actuarial value of assets of \$63.80 billion and an accrued liability of \$107.83 billion.

Reasons for Change in the Total Funded Ratio

The total funded ratio increased from 58.1% as of June 30, 2019 to 59.2% as of June 30, 2020. Employers have been contributing the full actuarially determined contributions since the fiscal year ending June 30, 2017, as shown on page 19. In spite of a net actuarial loss for the year, the employer contributions towards the unfunded accrued liability have continued to decrease the unfunded accrued liability and thus increase the funded ratio of the System.

Table 6 provides an analysis of the change in the unfunded accrued liability as of June 30, 2020.

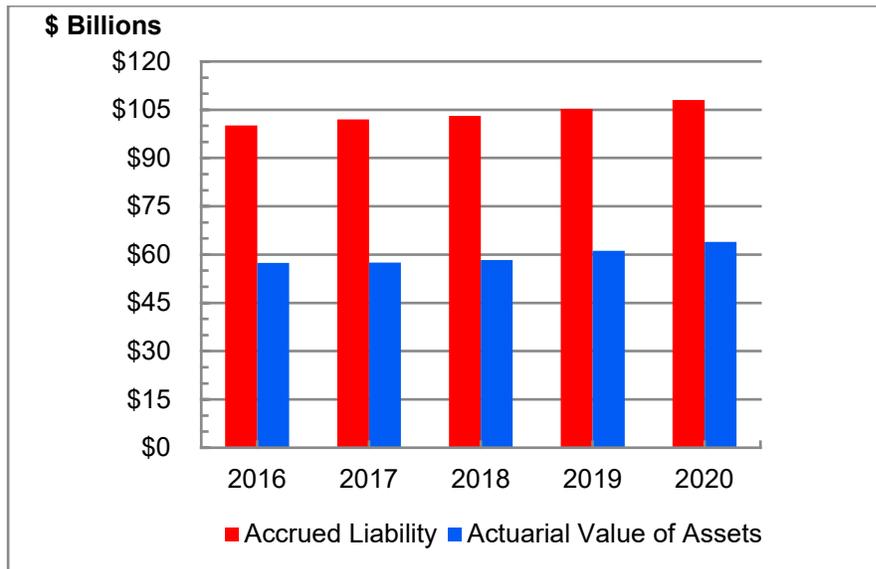
Five-Year History of Total Funded Ratio¹
 (\$ Amounts in Millions)

Valuation as of June 30	Accrued Liability	Actuarial Value of Assets	Unfunded Accrued Liability	Funded Ratio
2020	\$ 107,963.8	\$ 63,929.4	\$ 44,034.4	59.2%
2019	105,324.7	61,190.5	44,134.2	58.1
2018	103,113.6	58,258.3	44,855.3	56.5
2017	101,972.6	57,460.6	44,512.0	56.3
2016	100,114.0	57,390.1	42,723.9	57.3

1. For Pensions and Health Insurance Premium Assistance (under the funding provisions of the Retirement Code).

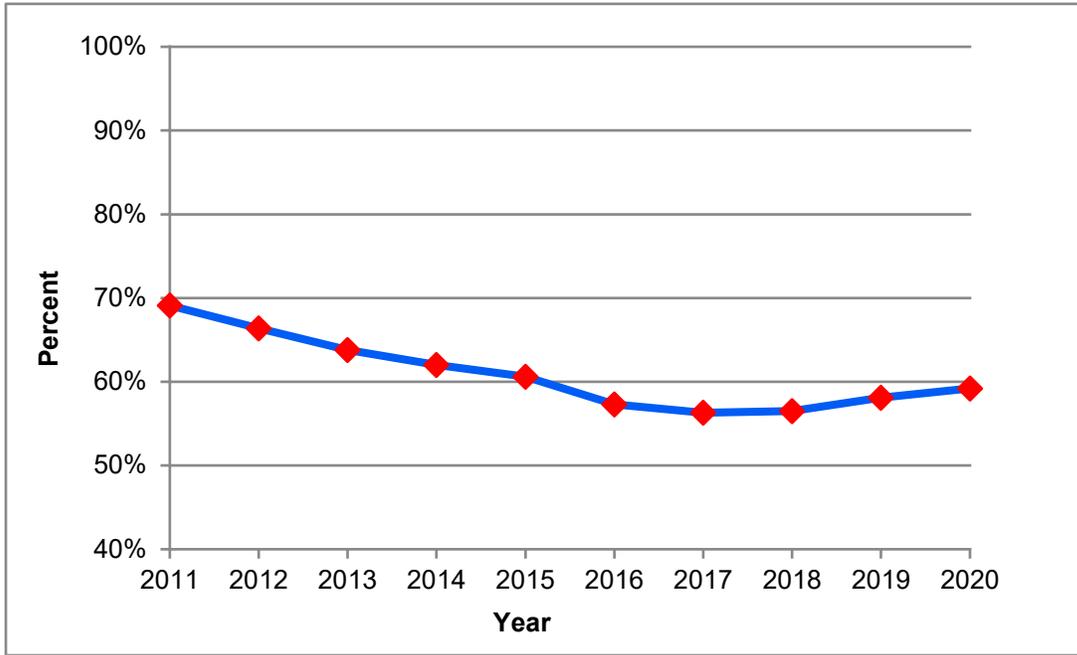
The following chart shows a five-year history of the accrued liability and the actuarial value of assets:

Five-Year History of Accrued Liability and Actuarial Value of Assets



The following chart shows a ten-year history of the total funded ratio based on actuarial value of assets for Pensions and Health Insurance Premium Assistance:

Ten-Year History of Total Funded Ratio (2011 – 2020)



Act 5-2017 Class T-E, Class T-F, Class T-G and Class T-H shared-risk contributions

Commencing with the annual actuarial valuation for the period ending June 30, 2014, and every three years thereafter, the Board compares the actual investment rate of return, net of fees, to the annual interest rate adopted by the Board for the calculation of the normal contribution rate, based on the market value of assets, for the prior ten-year period. Until the Retirement System has accumulated a ten-year period of investment rate of return experience following June 30, 2011, the look-back period used in this calculation will begin not earlier than June 30, 2011.

The shared-risk contribution rates of Class T-E, Class T-F, Class T-G, and Class T-H members are determined as follows:

- If the actual time-weighted investment rate of return, net of fees, is less than the annual interest rate adopted by the Board by an amount of 1% or more, the shared-risk contribution rate of Class T-E and Class T-F members will increase by 0.5% and the shared-risk contribution rate for Class T-G and Class T-H members will increase by .75%.

If the actual time-weighted investment rate of return, net of fees, is equal to or exceeds the annual interest rate adopted by the Board by less than 1%, the shared-risk contribution rate of Class T-E and Class T-F members will decrease by 0.5% and the shared-risk contribution rate for Class T-G and Class T-H members will decrease by .75% provided the total member contribution rate on the date of the actuarial valuation is above the member's basic contribution rate.

- If the actual time-weighted investment rate of return, net of fees, is more than the annual interest rate adopted by the Board by an amount of 1% or more, the shared-risk contribution rate of Class T-E and Class T-F members will decrease by 0.5% and the shared-risk contribution rate for Class T-G and Class T-H members will decrease by .75%.

If the actual time-weighted investment rate of return, net of fees, is equal to or below the annual interest rate adopted by the Board by less than 1%, the shared-risk contribution rate of Class T-E and Class T-F members will increase by 0.5% and the shared-risk contribution rate for Class T-G and Class T-H members will increase by .75% provided the total member contribution rate on the date of the actuarial valuation is below the member's basic contribution rate.

The total member contribution rate for Class T-E members shall not be less than 5.5%, nor more than 9.5%. The total member contribution rate for Class T-F members shall not be less than 8.3%, nor more than 12.3%. The total member contribution rate for Class T-G members shall not be less than 2.5% nor more than 8.5% and the total member contribution rate for Class T-H members shall not be less than 1.5% nor more than 7.5%.

If the Retirement System's total funded ratio based on the actuarial value of assets is at least 100% as of the measurement date, the shared risk contribution rate shall not be greater than zero. If the annual interest rate adopted by the Board for the calculation of the normal contribution rate is changed during the period used to determine the shared-risk contribution rate, the Board, with the advice of the actuary, shall determine the applicable rate during the entire period, expressed as an annual rate. For any fiscal year in which the employer contribution rate is lower than the final contribution rate under section 8328(h), the total member contribution rate for Class T-E, T-F, T-G and T-H members shall be prospectively reset to the basic contribution rate provided the total member contribution rate is at or above the basic contribution rate. There shall be no increase in the member contribution rate if there has not been an equivalent increase to the employer contribution rate over the previous three-year period.

In accordance with Section 8328 of the Retirement Code, member shared-risk contributions cannot be used to offset the employer normal contribution rate. Instead, any increase or decrease in the unfunded accrued liability due to member shared-risk contributions shall be recognized as part of the System's actuarial experience and amortized as a level percentage of compensation over a period of 24 years beginning with the July 1 second succeeding the actuarial valuation in which the shared-risk contribution was recognized.

The time-weighted market rates of return, net of fees, and annual interest rate adopted by the Board for the nine-year period ending June 30, 2020 were as follows:

Valuation as of June 30	Time-Weighted Rate of Return (Market Value) ¹	Annual Interest Rate Adopted by the Board
2020	1.12%	7.25%
2019	6.66	7.25
2018	9.26	7.25
2017	10.20	7.25
2016	1.31	7.25
2015	3.08	7.50
2014	14.82	7.50
2013	7.95	7.50
2012	3.44	7.50
Nine-Year Geometric Average	6.34%	7.36%

1. As provided by the Retirement System's investment consultant. The original geometric average time-weighted rate of return, net of fees, was reported to be 6.38%.

The revised geometric average time-weighted rate of return, net of fees, for the nine-year period ending June 30, 2020 is 6.34%, as calculated by Aon. Since the geometric average time-weighted rate of return is less than 6.36% (the geometric average of the annual interest rate adopted by the Board over the nine-year period less 1.00%), the contribution rates for Class T-E, Class T-F, Class T-G and Class T-H members shall increase to 8.00%, 10.80%, 6.25% and 5.25%, respectively, effective July 1, 2021.

The next Class T-E, Class T-F, Class T-G and Class T-H shared-risk valuation is to be performed for the ten-year period ending June 30, 2023.

Rate of Return

The investment return of the trust fund (i.e., total return including both realized and unrealized gains and losses) for fiscal years 2010/2011 through 2019/2020 is shown in the table below.

The rate of return on market value reflects the investment earnings on the market value of assets from the beginning of the fiscal year to the end of the fiscal year.

Fiscal Year	Rate of Return Based on Market Value¹
2019/2020	1.1%
2018/2019	6.7
2017/2018	9.3
2016/2017	10.2
2015/2016	1.3
2014/2015	3.1
2013/2014	14.8
2012/2013	8.0
2011/2012	3.4
2010/2011	20.4

1. Provided by PSERS' investment consultants (Aon for fiscal years 2013/2014 - 2019/2020 and Wilshire Associates for prior years).

Table 1

Summary of Results of Actuarial Valuation as of June 30, 2020
 (\$ Amounts in Thousands)

Item	June 30, 2020	June 30, 2019
Member Data		
1. Number of Members		
a) Active Members ¹	256,246	255,749
b) Vestees ²	25,903	25,514
c) Annuitants, Beneficiaries and Survivor Annuitants ³	239,614	237,339
d) Total	521,763	518,602
2. Annualized Salaries (\$ Amounts in Thousands) ⁴	\$ 13,974,295	\$ 13,671,927
3. Annual Annuities (\$ Amounts in Thousands)	\$ 6,170,896	\$ 6,051,632
Valuation Results		
4. Present Value of Future Pension Benefits		
a) Active Members	\$ 66,004,231	\$ 64,673,835
b) Inactive Members and Vestees	2,444,758	2,258,815
c) Annuitants, Beneficiaries and Survivor Annuitants	58,415,383	57,413,088
d) Total	\$ 126,864,372	\$ 124,345,738
5. Present Value of Future Pension Normal Cost		
a) Active Members	\$ 10,044,827	\$ 10,182,324
b) Employer	8,986,146	8,963,909
c) Total	\$ 19,030,973	\$ 19,146,233
6. Pension Accrued Liability		
a) Active Members (4a) - (5c)	\$ 46,973,258	\$ 45,527,602
b) Inactive Members and Vestees	2,444,758	2,258,815
c) Annuitants, Beneficiaries and Survivor Annuitants	58,415,383	57,413,088
d) Total	\$ 107,833,399	\$ 105,199,505
7. Health Insurance Assets for Premium Assistance	\$ 130,417	\$ 125,185
8. Total Accrued Liability for Funding (6) + (7)	\$ 107,963,816	\$ 105,324,690
9. Actuarial Value of Assets	\$ 63,929,354	\$ 61,190,489
10. Funded Status (9) / (8)	59.2 %	58.1 %
11. Unfunded Accrued Liability (8) - (9)	\$ 44,034,462	\$ 44,134,201
12. Total Normal Cost Rate	14.76 %	14.98 %
13. Member Contribution Rate	7.56 % ⁴	7.61 %
14. Employer Normal Cost Rate (12) - (13)	7.20 %	7.37 %
Employer Annual Funding Requirement		
15. Employer Contribution Rate Calculated by Actuary	Fiscal 2021/2022	Fiscal 2020/2021
a) Normal Cost	7.20 %	7.37 %
b) Unfunded Accrued Liability	26.79	26.14
c) Preliminary Pension Rate	33.99 %	33.51 %
d) Health Insurance Premium Assistance	0.80	0.82
e) Act 5 DC ⁵	0.15	0.18
f) Total Rate ⁶ = (15c) + (15d) + (15e)	34.94 %	34.51 %

1. Excludes 60 Class DC only participants as of June 30, 2020.

2. Excludes 135,613 and 132,854 inactive members and non-members as of June 30, 2020 and June 30, 2019, respectively, who are no longer participating and are valued for their accumulated deductions only.

3. Excludes 1,281 and 1,595 beneficiaries as of June 30, 2020 and June 30, 2019, respectively, who are only entitled to a pending lump sum distribution.

4. The salaries shown represent an annual rate of pay for members who were in active service on the valuation date.

5. Average DC contribution rate. Actual rate will vary by employer based on Class T-G, Class T-H, and Class DC only memberships.

6. The Act 120 minimum pension rate for the June 30, 2020 valuation is 7.20% and for the June 30, 2019 valuation is 7.37%.

Table 2

Summary of Sources of Employer Contribution Rate as of June 30, 2020
 (\$ Amounts in Thousands)

	Funding Period (Years)	Beginning July 1	Initial Liability	6/30/2020 Outstanding Balance	Annual Payment		
					Amount	Percent ¹	
1. Amortization of:							
a) Act 120 Fresh Start Unfunded Accrued Liability and Asset Method Change	24	2011	\$ 16,279,283	\$ 17,497,828	\$ 1,641,749	11.49 %	
b) 2010 Experience	24	2011	3,419,297	3,661,133	343,509	2.40 %	
c) 2011 Experience	24	2012	564,642	606,799	54,245	0.38 %	
d) 2011 Assumption Changes	24	2012	4,592,397	4,935,277	441,191	3.09 %	
e) 2012 Experience	24	2013	2,372,550	2,573,434	220,027	1.54 %	
f) 2013 Experience	24	2014	2,707,494	2,954,173	242,386	1.70 %	
g) 2014 Experience	24	2015	2,170,432	2,375,165	187,573	1.31 %	
h) 2015 Experience	24	2016	1,941,277	2,125,007	161,958	1.13 %	
i) 2016 Experience	24	2017	2,666,236	2,905,686	214,238	1.50 %	
j) 2016 Assumption Changes	24	2017	2,521,326	2,747,761	202,595	1.42 %	
k) 2017 Experience	24	2018	1,433,915	1,557,343	111,322	0.78 %	
l) 2017 Act 5	24	2018	(6,867)	(7,458)	(533)	0.00 %	
m) 2018 Experience	24	2019	348,881	376,873	26,169	0.18 %	
n) 2019 Experience	24	2020	(527,527)	(565,773)	(38,232)	(0.27)%	
o) 2020 Experience	24	2021	291,214	<u>291,214</u>	<u>20,392</u>	<u>0.14 %</u>	
Total Amortization Payments				\$ 44,034,462	\$ 3,828,589	26.79 %	
2. Employer Normal Cost Rate						<u>7.20 %</u>	
3. Pension Rate (1) + (2) ²						33.99 %	
4. Health Insurance Premium Assistance Rate						0.80 %	
5. Act 5 DC Rate ³						<u>0.15 %</u>	
6. Final Total Employer Contribution Rate Calculated by Actuary: (3) + (4) + (5)						34.94 %	

1. Based on Estimated Employer Payroll for Fiscal Year Ending 2022 of \$14,289,000.

2. Cannot be less than the Act 120 Fiscal Year 2022 Minimum Employer Pension Rate (Employer Normal Cost Rate) of 7.20%.

3. Average DC contribution rate. Actual rate will vary by employer based on Class T-G, Class T-H, and Class DC only memberships.

Table 3

**Determination of Health Insurance Premium Assistance Contribution Rate for Fiscal Year
2021/2022**

(\$ Amounts in Thousands)

Item			
1. June 30, 2020 Balance in Health Insurance Premium Assistance Account			\$ 130,417
2. Estimated Fiscal 2020/2021 Contribution			
(a) Contribution Rate Certified in 2019 Valuation			0.82%
(b) Estimated Fiscal 2020/2021 payroll			\$ 14,025,000
(c) Estimated Contribution = (a) x (b)			\$ 115,005
3. Estimated Number of Annuitants whc	Are Eligible	Elect Percent	Elect Coverage
(a) Fiscal 2020/2021	154,300	63.00%	97,209
(b) Fiscal 2021/2022	156,400	63.00%	98,532
(c) Fiscal 2022/2023	158,300	62.00%	98,146
4. Estimated Disbursements:	Administration	Assistance	Total
(a) Fiscal 2020/2021	\$ 2,001	\$ 116,651	\$ 118,652
(b) Fiscal 2021/2022	1,901	118,238	120,139
(c) Fiscal 2022/2023	<u>1,996</u>	<u>117,775</u>	<u>119,771</u>
(d) Total	\$ 5,898	\$ 352,664	\$ 358,562
5. Required Fiscal 2021/2022 Contribution			\$ 113,140
(4d) - (1) - (2c)			
6. Required Health Insurance Premium Assistance Contribution Rate			
(a) Estimated 2021/2022 Payroll			\$ 14,289,000
(b) Required Health Insurance Premium Assistance Contribution Rate (5) / (6a)			0.80%
(rounded up)			

Notes:

- Current estimates of fiscal 2020/2021 membership payroll and administrative expenses, and of fiscal 2021/2022 administrative expenses, were provided by PSERS staff.
- Beginning in fiscal year 2022/2023, 62% of eligible annuitants are assumed to elect coverage. For fiscal years 2020/2021 and 2021/2022, the assumption remains at 63%.
- Premium Assistance payments equal \$100 per month per eligible annuitant.

Table 4

Summary of Market Value of Plan Assets as of June 30, 2020
(\$ Amounts in Thousands)

Market Value	
1. Market Value of Assets as of June 30, 2019	\$ 58,859,069
2. Contributions During Fiscal 2019/2020	5,862,277
3. Disbursements During Fiscal 2019/2020	6,989,794
4. Investment Return During Fiscal 2019/2020	
a) Investment Return (Net of Investment Expenses)	\$ 1,003,598
b) Administrative Expenses	<u>47,947</u>
c) Investment Return After Expenses (a) - (b)	\$ 955,651
5. Market Value of Assets as of June 30, 2020 (1) + (2) - (3) + (4c)	\$ 58,687,203
6. Rate of Return (per Aon)	1.11 %
Asset Allocation by Account	
1. Members' Savings Account	\$ 17,558,412
2. Annuity Reserve Account	58,415,383
3. State Accumulation Account	(17,417,009)
4. Health Insurance Account	<u>130,417</u>
5. Total (1) + (2) + (3) + (4)	\$ 58,687,203

Table 5

Derivation of Actuarial Value of Assets as of June 30, 2020
(\$ Amounts in Thousands)

1. Market Value of Assets as of June 30, 2020							\$ 58,687,203
2. Determination of Deferred Gain (Loss)							
		Return on Assets					
Fiscal					Recognized		Deferred
<u>Year</u>	<u>Actual</u>	<u>Expected</u>	<u>Difference</u>		<u>Amount</u>	<u>% Deferred</u>	<u>Amount</u>
2019/2020	\$ 955,651	\$ 4,395,438	\$ (3,439,787)		\$ (343,979)	90.00%	\$ (3,095,808)
2018/2019	3,580,178	4,179,951	(599,773)		(59,977)	80.00%	(479,818)
2017/2018	4,666,466	4,115,904	550,562		55,056	70.00%	385,393
2016/2017	4,948,659	4,101,830	846,829		84,683	60.00%	508,097
2015/2016	426,974	4,220,500	(3,793,526)		(379,353)	50.00%	(1,896,763)
2014/2015	1,284,258	4,202,212	(2,917,954)		(291,795)	40.00%	(1,167,182)
2013/2014	7,057,089	4,193,490	2,863,599		286,360	30.00%	859,080
2012/2013	4,086,520	4,239,172	(152,652)		(15,265)	20.00%	(30,530)
2011/2012	1,057,435	4,303,637	(3,246,202)		(324,620)	10.00%	(324,620)
2010/2011	9,207,766	4,609,422	4,598,344		459,834	0.00%	0
			\$ (5,290,560)		\$ (529,056)		\$ (5,242,151)
3. Preliminary Actuarial Value of Assets ^{1,2} (1) - (2)							\$ 63,929,354
4. 70% of the Market Value of Assets (1) x 70%							\$ 41,081,042
5. 130% of the Market Value of Assets (1) x 130%							\$ 76,293,364
6. Actuarial Value of Assets: (3) not less than (4) and not greater than (5)							\$ 63,929,354

- The amounts reported include assets for both Pension and Health Insurance Premium Assistance.
- The rate of return on the actuarial value of assets was 6.38%. This investment return is based on the change in the actuarial value of assets from the June 30, 2019 valuation to the June 30, 2020 valuation. The actuarial value of assets developed above is a rolling ten-year average. The impact of investment gains and losses is not fully realized in the year the gain or loss arose but is smoothed in over a ten-year period.

Table 6

Analysis of Change in Unfunded Accrued as of June 30, 2020¹
(\$ Amounts in Thousands)

Item	Amount
1. Unfunded Accrued Liability at June 30, 2019	\$ 44,134,201
2. Interest Credit to June 30, 2020	3,199,730
3. Expected Contributions Toward Unfunded Accrued Liability	<u>3,590,683</u>
4. Expected Unfunded Accrued Liability at June 30, 2020 (1) + (2) - (3)	\$ 43,743,248
5. Actual Unfunded Accrued Liability at June 30, 2020	<u>44,034,462</u>
6. Increase (Decrease) from Expected (5) - (4)	\$ 291,214
7. Reasons for Increase (Decrease)	
(i) Loss from Investment Return on Actuarial Value of Assets	\$ 529,056
(ii) Loss from New Entrants and Pickups	252,843
(iii) Gain from Salary Increases Less than Expected	(562,563)
(iv) Gain from Mortality Experience	(63,202)
(v) Loss from Terminations (retirement/disability/terminations) Experience	36,151
(vi) Loss from Data/Miscellaneous	<u>98,929</u>
Total	\$ 291,214

1. The amounts reported include assets and liabilities for Pensions only.

Table 7

Schedule of Funding Progress for Pensions¹
(\$ Amounts in Thousands)

Valuation as of June 30	Actuarial Value of Assets	Actuarial Accrued Liability	Unfunded Actuarial Accrued Liability	Funded Ratio	Covered Payroll ²	Unfunded Accrued Liability as a Percentage of Covered Payroll
2020	\$ 63,798,937	\$ 107,833,399	\$ 44,034,462	59.2 %	\$ 13,974,295	315.1 %
2019	61,065,304	105,199,505	44,134,201	58.0	13,671,927	322.8
2018	58,135,539	102,990,908	44,855,369	56.4	13,379,041	335.3
2017	57,336,856	101,848,817	44,511,961	56.3	13,033,919	341.5
2016	57,265,506	99,989,401	42,723,895	57.3	12,851,289	332.4
2015	57,240,946	94,576,710	37,335,764	60.5	12,678,213	294.5

1. The amounts reported above include assets and liabilities for Pensions.
2. The salaries shown represent an annual rate of pay for the year ended June 30th for members who were in active service on June 30th.

The above schedule is not required by current GASB standards for pension plans. The information is provided for historical perspective as PSERS has transitioned to GASB Statement No. 67.

Table 8

Solvency Test for Pensions
Comparative Summary of Accrued Liability and Actuarial Value of Assets
(\$ Amounts in Thousands)

Valuation as of June 30	(1) Active Member Contributions	(2) Retirees and Beneficiaries	(3) Active Member Employer Financed	Actuarial Value of Assets	Portion of Accrued Liability Covered by Valuation Assets		
					(1)	(2)	(3)
2020	\$ 17,558,412	\$ 58,415,383	\$ 31,859,604	\$ 63,798,937	100%	79%	0%
2019	16,839,956	57,413,088	30,946,461	61,065,304	100	77	0
2018	16,120,538	56,742,925	30,127,445	58,135,539	100	74	0
2017	15,500,215	56,184,146	30,164,456	57,336,856	100	74	0
2016	14,907,731	55,314,858	29,766,812	57,265,506	100	77	0
2015	14,079,658	52,739,489	27,757,563	57,240,946	100	82	0

Table 9

Schedule of Employer Contributions For Pensions
(\$ Amounts in Thousands)

Fiscal Year Ended June 30	Actuarially Determined Contribution	Actual Contributions Related to the Actuarially Determined Contribution	Contribution Deficiency (Excess)	Percentage Contributed
2020	\$ 4,671,931	\$ 4,671,931	\$ 0	100.0%
2019	4,478,236	4,478,236	0	100.0%
2018	4,243,328	4,243,328	0	100.0%
2017	3,824,908	3,824,908	0	100.0%
2016	3,540,304	3,181,438	358,866	89.9%

Valuation date: Actuarially determined contributions are calculated as of the June 30 preceding the fiscal year in which contributions are made. That is, the contribution calculated as of the June 30, 2020 actuarial valuation will be made during the fiscal year ended June 30, 2022

**Schedule of Employer Contributions For
Postemployment Benefits Other Than Pensions**
(\$ Amounts in Thousands)

Fiscal Year Ended June 30	Actuarially Determined Contribution	Actual Contributions Related to the Actuarially Determined Contribution	Contribution Deficiency (Excess)	Percentage Contributed
2020	\$ 138,776	\$ 117,723	\$ 21,053	84.8%
2019	139,484	114,571	24,913	82.1%
2018	134,607	111,724	22,883	83.0%
2017	125,694	110,985	14,709	88.3%
2016	129,494	113,307	16,187	87.5%

Valuation date: Actuarially determined contributions are calculated as of the June 30 preceding the fiscal year in which contributions are made. That is, the contribution calculated as of the June 30, 2020 actuarial valuation will be made during the fiscal year ended June 30, 2022

The Actuarially Determined Contribution is based on the Entry Age Normal Accrued Liability and assets as of the valuation date and a 30-year amortization of the unfunded accrued liability. See the Information Required Under Governmental Accounting Standards Board Statement No. 74 as of June 30, 2020 (published September 10, 2020) for additional information.

Table 10

History of Contribution Rates and Funded Ratios

Fiscal Year Ending June	Budgeted Total Employer Payroll (thousands)	Contribution Rates ¹								Funded Ratio
		Employee	Employer Normal Cost	Employer Unfunded Liability	Preliminary Employer Pension	Final Employer Pension ²	Act 5 Employer DC ⁷	Employer Health Insurance	Total Employer	
2011 ^{3 4}	\$ 13,510,000	7.34 %	8.08 %	(0.50) %	7.58 %	5.00 %		0.64 %	5.64 %	69.1 %
2012	14,112,000	7.37	8.12	10.15	18.27	8.00		0.65	8.65	66.4
2013 ⁵	14,297,000	7.40	8.66	12.99	21.65	11.50		0.86	12.36	63.8
2014	13,720,000	7.43	8.57	15.25	23.82	16.00		0.93	16.93	62.0
2015	13,482,000	7.46	8.46	17.51	25.97	20.50		0.90	21.40	60.6
2016	13,375,000	7.49	8.38	19.44	27.82	25.00		0.84	25.84	57.3
2017	13,549,000	7.52	8.31	20.89	29.20	29.20		0.83	30.03	56.3
2018 ⁶	13,449,000	7.54	7.70	24.04	31.74	31.74		0.83	32.57	56.5
2019	13,775,000	7.57	7.59	25.01	32.60	32.60		0.83	33.43	58.1
2020	13,880,000	7.59	7.49	25.87	33.36	33.36	0.09 %	0.84	34.29	59.2
2021	14,078,000	7.61	7.37	26.14	33.51	33.51	0.18	0.82	34.51	
2022	14,289,000	7.56	7.20	26.79	33.99	33.99	0.15	0.80	34.94	

- In general, the Preliminary Employer Pension Rate equals the sum of the rates for the Employer Normal Cost and the Unfunded Liability; and the Final Employer Pension Rate is the greater of the Preliminary Pension Rate and any Pension Rate Floor or Collar stated in the Retirement Code. The Total Employer Rate is the sum of the Final Employer Pension Rate, Act 5 Employer DC Rate and the Employer Health Insurance Premium Assistance Rate.
- The Final Employer Pension rate is limited by the Act 2010-120 pension rate collars for fiscal years 2012 through 2016.
- At its January 2009 meeting, the Board voted to reduce the interest rate from 8.50% to 8.25% for the June 30, 2008 valuation and to 8.00% for subsequent valuations.
- Act 2010-46 recertified the fiscal year ended June 30, 2011 pension rate from 7.58% to 5.00%.
- Revised actuarial assumptions based on a five-year experience review ended June 30, 2010 were used to determine the contributions for the fiscal year ending June 30, 2013 and thereafter, which include an interest rate of 7.50%.
- Revised actuarial assumptions based on a five-year experience review ended June 30, 2015 were used to determine the contributions for the fiscal year ending June 30, 2018 and thereafter, which include an interest rate of 7.25%.
- Act 5 new member assumptions:

Valuation	Class T-G	Class T-H	DC Only
2018	65%	30%	5%
2019	65%	30%	5%
2020	98%	1%	1%

In addition, the above rates are average DC contribution rates. The actual rate will vary by employer based on Class T-G and Class T-H membership and Class DC only participation.

Table 11

History of Annuitants, Beneficiaries, Survivor Annuitants and Active Members

Valuation as of June 30	Annuitants at End of Year	Beneficiaries and Survivor Annuitants at End of Year	Total Annuitants, Beneficiaries and Survivor Annuitants	Active Members
2011	183,665	10,957	194,622	279,152
2012	190,560	11,455	202,015	273,504
2013	197,735	11,469	209,204	267,428
2014	203,756	10,144	213,900	263,312
2015	209,266	10,509	219,775	259,868
2016	214,019	10,809	224,828	257,080
2017	218,886	11,128	230,014	255,945
2018	221,879	11,409	233,288	256,362
2019	225,479	11,860	237,339	255,749
2020	227,542	12,072	239,614	256,246

Table 12

Description of Actuarial Assumptions and Methods

Assumptions

Interest Rate: 7.25% per annum, compounded annually (adopted as of June 30, 2016). The components are 2.75% for inflation and 4.50% for the real rate of return. Actuarial equivalent benefits are determined based on an interest rate of 4% per year (since 1960) except, in accordance with Act 5-2017, an interest rate of 7.25% per year is used for Class T-E, Class T-F, Class T-G and Class T-H and members' Option 4 partial withdrawal of accumulated member contributions.

Separation from Service: Illustrative rates of assumed separation from service are shown in the following table (adopted as of June 30, 2016).

Age	Annual Rate of:						
	Withdrawal less than 5 Years of Service	Withdrawal		Death ¹	Disability	Early Retirement ²	Superannuation Retirement
		Between 5 and 10 Years of Service	10 or More Years of Service				
Males							
25	14.85%	5.70%	2.57%	.041%	.020%		
30	12.74	3.37	2.57	.039	.020		
35	13.39	3.21	1.50	.044	.058		
40	14.49	3.97	1.34	.050	.116		
45	14.42	4.53	1.37	.084	.160		19.16%
50	14.31	4.45	1.92	.138	.284		19.16
55	12.17	4.43	3.38	.233	.442	18.57%	26.59
60	12.43	5.58	5.57	.379	.582	14.42	30.87
65				.700	.087		21.39
69				1.067	.135		19.34
Females							
25	13.41%	7.47%	5.02%	.013%	.018%		
30	13.81	6.05	4.02	.017	.023		
35	14.22	5.53	2.85	.024	.055		
40	11.79	4.87	1.60	.032	.096		
45	11.54	4.51	1.65	.051	.135		15.00%
50	11.66	4.43	2.06	.088	.229		15.00
55	11.75	4.38	3.11	.133	.368	18.59%	10.02
60	12.25	5.97	6.40	.196	.360	17.05	35.77
65				.327	.082		22.23
69				.443	.115		22.79

1. These base mortality tables will then be projected on a generational basis using the Buck Modified 2015 projection scale from 2013 to the valuation date and thereafter.
2. Early Retirement – Age 55 with 25 years of service, but not eligible for Superannuation retirement.

Death after Retirement:

Male annuitants: RP-2014 male mortality table adjusted backward to 2006 with the MP-2014 improvement scale and projected to the valuation date with the Buck Modified 2015 projection scale.

Female Annuitants: RP-2014 female mortality table adjusted backward to 2006 with the MP-2014 mortality improvement scale, projected to 2013 with the Buck Modified 2015 projection scale adjusted for credibility. This base mortality table will then be projected on a generational basis using the Buck Modified 2015 projection scale from 2013 to the valuation date.

Disabled annuitants: RP-2014 male and female disabled mortality tables adjusted backward to 2006 with the MP-2014 mortality improvement scale and projected from 2013 to the valuation date with the Buck Modified 2015 projection scale.

The above base mortality tables are projected on a fully generational basis using the Buck Modified 2015 projection scale from the valuation date.

For determination of actuarial equivalence, a unisex table based on the above base tables, with weightings of 25% of male and 75% of female mortality probabilities, is utilized. This table is then projected on a generational basis to 2020 using the Buck Modified 2015 projection scale.

Salary Increase: Effective average of 5.00% per annum, compounded annually (adopted as of June 30, 2016). The components are 2.75% for inflation, and 2.25% for real wage growth and merit or seniority increases. Representative values are as follows:

Age	Annual Rate of Salary Increase
20	10.25%
30	7.75
40	5.75
50	3.75
55	3.25
60	3.25
65	3.25
70	3.25

Payroll Growth: A 3.50% per annum payroll growth assumption is used to liquidate the unfunded accrued liability based on level-percent-of-pay amortization schedules required by the Retirement Code as amended by Act 2010-120 and Act 2017-5, i.e., a schedule of 24 years for the unfunded accrued liability as of June 30, 2010 and each change in the unfunded accrued liability due to actuarial experience after the June 30, 2010 valuation. Any legislation after June 30, 2010 that increases the liability due to benefit enhancements will be funded over 10 years based on level-percent-of-pay amortization.

Miscellaneous:

Annuity Optional Forms Assumption for Retiring Active Members:

- 50% will elect Maximum Straight Life Annuity (MSLA)
- 20% will elect OPTION 1 (Straight life annuity with guaranteed payments equal to present value of MSLA)
- 20% will elect OPTION 2 (100% Joint and Survivor with males 3 years older than females)
- 10% will elect OPTION 3 (50% Joint and Survivor with males 3 years older than females)
- 0% will elect OPTION 4 annuity

Option 4 Lump Sum Elections: 80% of Class T-C, Class T-D, Class T-E and Class T-F members are assumed to elect a refund of contributions and a reduced annuity.

Withdrawal Annuity: 90% of members are assumed to commence payment immediately and 10% are assumed to defer payment to superannuation age.

Health Insurance Premium Assistance:

Elections: 63% of eligible retirees are assumed to elect premium assistance for fiscal years 2020/2021 and 2021/2022. Beginning in fiscal year 2022/2023, 62% of eligible retirees are assumed to elect premium assistance.

Administrative Expenses: Assumed equal to \$2,001,000 for fiscal year 2020/2021, \$1,901,000 for fiscal year 2021/2022 and \$1,996,000 for Fiscal year 2022/2023.

Summary of Changes since the June 30, 2019 Valuation:

Beginning in fiscal year 2022/2023, 62% of eligible retirees are assumed to elect premium assistance.

Assumed administrative expenses for the Health Insurance Premium Assistance Plan changed from \$2,101,000 for fiscal year 2021/2022 to \$1,901,000, and the amount of \$1,996,000 was added for the fiscal year 2022/2023.

Methods

Calculations: The actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures, based on the current provisions of the retirement system, and on actuarial assumptions that are internally consistent and reasonable based on the actual experience of the System.

Asset Valuation Method: A ten-year moving market average value of assets that recognizes the 7.25% (7.50% prior to June 30, 2016) actuarial expected investment return immediately and spreads the difference between the actual return on the market value of assets and the expected return on the actuarial value of assets over a period of ten years. The actuarial value of assets can be no less than 70% and no more than 130% of the market value of assets.

Actuarial Cost Method for Pension Funding: Entry Age Normal Cost Method (modified slightly as of June 30, 2005 to use a pay-weighted average normal contribution rate). The results of each June 30 valuation normally determine the employer contribution rate for the second succeeding fiscal year. Act 120 revised the funding method effective with the June 30, 2010 valuation. Act 120 mandated that the outstanding balance of the unfunded accrued liability as of June 30, 2010, including changes in the unfunded accrued liability due to the funding reforms of Act 120, be amortized over a 24-year period, as a level percent of pay, beginning July 1, 2011. Future valuation gains and losses, and changes in the unfunded accrued liability resulting from changes in actuarial assumptions and methods, are amortized over a 24-year period, as a level percent of pay. As provided by Act 5-2017, future increases in the unfunded accrued liability due to benefit enhancement legislation will be amortized over 10-year periods, as a level percent of pay. Act 120 also modified the employer pension contribution requirements by imposing collars on the rate for fiscal years ending June 30, 2012, June 30, 2013, and on or after June 30, 2014; the pension contribution rate was limited to 3%, 3.5% and 4.5%, respectively, of total compensation of all active members, greater than the prior year's final contribution rate. Beginning with the fiscal year ending June 30, 2017, the actuarially required contribution rate was less than the collared rate and the final contribution rate was the actuarially determined contribution rate. However, as provided by Act 120, the final contribution rate cannot be less than the employer normal contribution rate.

In accordance with Act 5-2017, member shared-risk contributions cannot be used to offset the employer normal contribution rate. Instead, any increase or decrease in the unfunded accrued liability due to member shared-risk contributions shall be recognized as part of the System's actuarial experience and amortized as a level percentage of compensation over a period of 24 years beginning with the July 1 second succeeding the actuarial valuation in which the shared-risk contribution was recognized.

Actuarial Cost Method for Health Insurance Premium Assistance Funding: The actuarial liability equals the assets in the health insurance account, and the results of the June 30 valuation determine the contribution rate for the second succeeding fiscal year. The rate so determined is the rate necessary to establish reserves sufficient to cover administrative expenses and provide premium assistance payments for all participating eligible annuitants during the third fiscal year that follows the valuation date.

Data

Census and Assets: The pension valuation was based on members of the Retirement System as of June 30, 2020 and does not take into account future members. All census data was supplied by the Retirement System and was subject to reasonable consistency checks. The actuaries adjust the data to account for service and pay earned by members on or before the valuation that is not reported by the Retirement System until after the actuarial valuation is performed. Asset data was supplied by the Retirement System.

For employer DC contributions, it is assumed among new employees hired on or after July 1, 2020 that 98% will become Class T-G members, 1% will become Class T-H members and 1% will become Class DC only participants. This assumption has been modified to reflect the actual Class T-G, Class T-H and Class DC only elections are known for the period July 1, 2019 to June 30, 2020. The prior valuation assumed that among new employees hired on or after July 1, 2019: 65% will become Class T-G members, 30% will become Class T-H members and 5% will become Class DC only participants; which is the same assumption used in the development of the Cost Note (published May 23, 2017) for the passage of Act 5 of 2017. This assumption may be updated for the June 30, 2021 valuation of the System as historical data for actual Class T-G, Class T-H and Class DC only elections is accumulated through June 30, 2021.

Table 13

Summary of Benefit and Contribution Provisions

Membership

For valuation purposes, all employees are considered to be full coverage members. All employees who become members on and after January 1, 1966 are members of the dual coverage group. Dual coverage members contribute to both PSERS and to Social Security.

Benefits

Superannuation Annuity

Eligibility

Age 62, or age 60 with 30 years of service, or 35 years of service regardless of age. For Class T-E and Class T-F members, age 65 with a minimum of three years of service credit, or any combination of age and service that totals 92 with at least 35 years of credited service. For Class T-G members, age 67 with a minimum of three years of service, or any combination of age and service that totals 97 with at least 35 years of credited service. For Class T-H members, age 67 with a minimum of three years of service credit.

Amount

Class	Accrual	Final Average Salary
T-C	2.00%	For any 3 years of service
T-D	2.50%	For any 3 years of service
T-E	2.00%	For any 3 years of service
T-F	2.50%	For any 3 years of service
T-G	1.25%	For any 5 years of service
T-H	1.00%	For any 5 years of service

Based on the above table, Accrual Rate times the Final Average Salary times years of school service and intervening military service. Minimum of \$100 per year of service. The "final average salary" means the highest average annual salary.

Annual salary is subject to a limit of \$200,000, as adjusted under Section 401(a)(17) of the Internal

Revenue Code. As of June 30, 2020, the adjusted limit is \$285,000.

For members who elect coverage under Class T-D, the maximum benefit is equal to the limit established by Section 415 of the Internal Revenue Code.

For Class T-E, Class T-F, Class T-G and Class T-H members, the maximum benefit is equal to the lesser of the limit established by Section 415 of the Internal Revenue Code or 100% of final average salary.

Early Retirement Annuity

Eligibility	Age 55 with 25 years of service. For Class T-G members, age 57 with 25 years of service.
Amount	Accrued benefit as of date of retirement, reduced 1/4% for each month by which commencement of payments precedes Superannuation Age. For members who elect coverage under Class T-D, the maximum benefit is equal to the limit established by Section 415 of the Internal Revenue Code. For Class T-E, Class T-F, Class T-G and Class T-H members, the maximum benefit is equal to the lesser of the limit established by Section 415 of the Internal Revenue Code or 100% of final average salary.

Withdrawal Annuity

Eligibility	5 years of service. For Class T-E, Class T-F, Class T-G and Class T-H members, ten years of service.
Amount	Accrued benefit deferred to superannuation retirement age or an actuarially reduced benefit payable immediately. For Class T-C, Class T-D, Class T-E and Class T-F members, PSERS early retirement factors are based on the statutory interest rate of 4%. For Class T-G and T-H members, PSERS early retirement factors from age 62 to superannuation are based on the statutory interest rate of 4%. From commencement age to age 62, PSERS early retirement factors are based on the assumed long-term return on plan assets as adopted by the Board.

Disability Annuity

Eligibility	5 years of service.
Amount	The standard single life annuity if the total number of years of credited service is greater than 16.667,

otherwise the standard single life annuity multiplied by the lesser of the following ratios: (Y^*/Y) or $(16.667/Y)$ where Y is the number of years of credited service and Y* is the total years of credited service if the member were to continue as a school employee until superannuation retirement age (or at current age, if later). For Class T-G and Class T-H members, the standard single life annuity for this provision is based on a 2.0% accrual rate. Minimum of \$100 per year of service.

Return of Contributions

Eligibility	Death or separation from service and member does not qualify for other benefits.
Amount	Refund of accumulated deductions includes interest (less annuity payments received prior to death in the case of a retired member).

Death Benefit

Eligibility	Death of an active member or vestee who was eligible to receive an annuity.
Amount	The present value of the annuity that would have been effective if the member retired on the day before death. Option 1 assumed payable if no other option elected.

Normal and Optional Forms of Benefits

Normal Form (Maximum):	Life annuity with a guaranteed payment equal to member contributions with interest.
Option 1:	Reduced benefit with refund of balance of present value of annuity at retirement over payments received. If balance is less than \$5,000, benefit is paid in lump sum; otherwise, beneficiary may elect annuity and/or lump sum.
Option 2:	Joint and 100% survivorship annuity.
Option 3:	Joint and 50% survivorship annuity.
Option 4:	Benefit of equivalent actuarial value, including lump sum payment of member contributions.

Health Insurance Premium Assistance

Eligibility	Retired members who: (a) have 24½ or more years of service, or (b) are disability annuitants, or
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- (c) have 15 or more years of service and who both terminated school service and retired after attaining superannuation age and
- (d) participate in the PSERS health options program or in an employer-sponsored health insurance program.

DC Only participants who terminate employment, are eligible for Medicare, have received all or part of their individual investment account and who:

- (a) have 24½ or more eligibility points, or
- (b) have 15 or more eligibility points and who both terminated school service and retired after attaining age 67 and
- (c) participate in the PSERS health options program or in an employer-sponsored health insurance program.

Amount

Participating eligible annuitants receive health insurance premium assistance payments from the Health Insurance Account equal to the lesser of \$100 per month or the actual monthly premium. All administrative expenses necessary to operate the health insurance premium assistance program are to be funded by the Health Insurance Account. The Health Insurance Account is credited with contributions of the Commonwealth and the employers.

Contributions

By Members

Regular member contribution:

Class	Enrollment	Contribution Rate
Members who did not elect Class T-D	Prior to July 22, 1983	5.25%
Members who did not elect Class T-D	After to July 21, 1983 but prior to July 1, 2001	6.25%
T-D	Prior to July 22, 1983	6.50%
T-D	After to July 21, 1983	7.50%
T-E		7.50%
T-F		10.30%
T-G		5.50%
T-H		4.50%

Shared-Risk contribution:

Class T-E, Class T-F, Class T-G and Class T-H members are subject to a “shared-risk” employee contribution rate. Members benefit when investments of the fund are doing well and share some of the risk when investments underperform. The member contribution rate will stay within the specified range allotted for Class T-E, Class T-F, Class T-G or Class T-H members, but could increase or decrease every three years starting July 1, 2015 depending on investment performance.

1. If the investment rate of return (less investment fees) is equal to or exceeds the assumed rate of return by more than 1.0% based on the prior ten-year period:

Class	Decrease in Contribution Rate	Minimum Contribution Rate
T-E	0.50%	5.50%
T-F	0.50%	8.30%
T-G	0.75%	2.5%
T-H	0.75%	1.5%

Provided the total member contribution rate is less than the member’s basic contribution rate, if the investment rate of return (less investment fees) is less than the assumed rate of return by less than 1.0% based on the prior ten-year period:

Class	Increase in Contribution Rate
T-E	0.50%
T-F	0.50%
T-G	0.75%
T-H	0.75%

2. If the investment rate of return (less investment fees) is less than assumed rate of return by more than 1.0% based on the prior ten-year period:

Class	Increase in Contribution Rate	Maximum Contribution Rate
T-E	0.50%	9.50%
T-F	0.50%	12.30%
T-G	0.75%	8.5%
T-H	0.75%	7.5%

Provided the total member contribution rate is greater than the member's basic contribution rate, if the investment rate of return (less investment fees) is equal to or exceeds the assumed rate of return by less than 1.0% based on the prior ten-year period:

Class	Decrease in Contribution Rate
T-E	0.50%
T-F	0.50%
T-G	0.75%
T-H	0.75%

If the Retirement System is fully funded at the time of the comparison, the increase in member contribution rate shall not be greater than zero. There shall be no increase in the member contribution rate if there has not been an equivalent increase in the employer contribution rate over the previous three-year period.

Until a full ten-year look back period is available, the investment return measurement period will begin on July 1, 2011.

By Commonwealth and School Districts

Balance of required contribution determined as normal contribution, accrued liability contribution, supplemental annuity contribution, experience adjustment factor and premium assistance contribution and the DC Plan contribution, is funded by the Commonwealth and the School District.

Table 14

Summary of Membership Data as of June 30, 2020
(\$ Amounts in Thousands)

Total Active Members¹

Item	Male	Female	Total
Number of Members	69,857	186,389	256,246
Total Annual Salaries ⁸	\$ 4,170,391	\$ 9,803,904	\$ 13,974,295
Average Age ⁹	45.6	45.5	45.5
Average Service ⁹	12.1	11.7	11.8

^{1.} Excludes 161,516 inactive members, non-members and vestees and 60 DC only participants.

Class T-C Members²

Item	Male	Female	Total
Number of Members	715	2,130	2,845
Total Annual Salaries ⁸	\$ 50,593	\$ 114,557	\$ 165,150
Average Age ⁹	52.3	54.7	54.1
Average Service ⁹	23.4	21.7	22.1

^{2.} Excludes 27,496 inactive members, non-members and vestees.

Class T-D Members³

Item	Male	Female	Total
Number of Members	42,608	116,363	158,971
Total Annual Salaries ⁸	\$ 3,152,942	\$ 7,310,705	\$ 10,463,647
Average Age ⁹	48.4	49.0	48.9
Average Service ⁹	17.5	16.4	16.7

^{3.} Excludes 78,401 inactive members, non-members and vestees.

Class T-E Members⁴

Item	Male	Female	Total
Number of Members	18,180	46,478	64,658
Total Annual Salaries ⁸	\$ 653,019	\$ 1,624,190	\$ 2,277,209
Average Age ⁹	41.5	40.0	40.4
Average Service ⁹	3.4	3.7	3.6

^{4.} Excludes 39,530 inactive members and non-members.

Table 14

Summary of Membership Data as of June 30, 2020
 (\$ Amounts in Thousands)

Class T-F Members⁵

Item	Male	Female	Total
Number of Members	4,161	10,398	14,559
Total Annual Salaries ⁸	\$ 210,821	\$ 471,071	\$ 681,892
Average Age ⁹	40.8	38.5	39.2
Average Service ⁹	4.3	4.1	4.1

⁵. Excludes 2,992 inactive members and non-members.

Class T-G Members⁶

Item	Male	Female	Total
Number of Members	4,178	10,944	15,122
Total Annual Salaries ⁸	\$ 102,581	\$ 281,149	\$ 383,730
Average Age ⁹	37.7	36.2	36.6
Average Service ⁹	0.4	0.4	0.4

⁶. Excludes 13,092 inactive members and non-members.

Class T-H Members⁷

Item	Male	Female	Total
Number of Members	15	76	91
Total Annual Salaries ⁸	\$ 434	\$ 2,233	\$ 2,667
Average Age ⁹	30.1	36.4	35.3
Average Service ⁹	0.4	0.5	0.5

⁷. Excludes 5 inactive members and non-members.

Table 14

Summary of Membership Data as of June 30, 2020
(\$ Amounts in Thousands)

DC Only Members

Item	Male	Female	Total
Number of Members	14	46	60
Total Annual Salaries ⁸	\$ 594	\$ 1,018	\$ 1,612
Average Age ⁹	46.8	41.4	42.6
Average Service ⁹	1.1	0.5	0.6

⁸. The salaries shown in the table above represent an annual rate of pay for the year ended June 30, 2020 for members who were in active service on June 30, 2020.

⁹. Average completed years of age and service.

Table 14

Summary of Membership Data as of June 30, 2020
(\$ Amounts in Thousands)

Total Annuitants and Beneficiaries¹

Item	Number	Annual Annuities ²	Average Annuities	Average Age
Annuitants				
Normal	122,379	\$ 3,621,900	\$ 29,596	74.4
Early and Withdrawal	<u>96,099</u>	<u>2,176,796</u>	\$ 22,652	68.3
Total	218,478	\$ 5,798,696	\$ 26,541	71.7
Survivors and Beneficiaries	12,072	182,269	\$ 15,098	76.2
Disabled Annuitants	<u>9,064</u>	<u>189,931</u>	\$ 20,954	66.0
Total	239,614	\$ 6,170,896	\$ 25,753	71.7

New Annuitants and Beneficiaries

Who Retired Between July 1, 2019 and June 30, 2020

Item	Number ³	Annual Annuities ²	Average Annuities	Average Age
Annuitants (Normal, Early and Withdrawal)	8,478	\$ 232,176	\$ 27,386	62.3
Survivors and Beneficiaries	2,250	16,472	\$ 16,947	68.2
Disabled Annuitants	<u>258</u>	<u>7,442</u>	\$ 28,845	55.5
Total	10,986	\$ 256,090	\$ 27,258	63.3

1. The median annual benefit payable to all annuitants and beneficiaries is \$20,692.
2. The annuities shown in the tables above represent the annual amount payable as of July 1, 2020 for participants who were in payment on June 30, 2020.
3. Excludes 105 members who retired after June 30, 2019 but died prior to June 30, 2020.

Table 14

**Distribution of Annuitants, Beneficiaries, and Survivors by Annual Pension Amount
As of June 30, 2020**

1. All annuitants, beneficiaries, and survivors

Annual Pension Amount	Number	Average Years of Service
Under \$10,000	83,543	12
\$10,000 - \$19,999	33,792	21
\$20,000 - \$29,999	26,671	26
\$30,000 - \$39,999	29,511	30
\$40,000 - \$49,999	29,016	32
\$50,000 - \$59,999	19,546	34
\$60,000 - \$69,999	9,810	35
\$70,000 - \$79,999	4,382	36
\$80,000 - \$89,999	1,674	37
\$90,000 - \$99,999	778	37
\$100,000 or more	891	38
Total	239,614	23

2. Excludes annuitants, beneficiaries, and survivors with no service on file

Annual Pension Amount	Number	Average Years of Service
Under \$10,000	80,105	13
\$10,000 - \$19,999	31,974	22
\$20,000 - \$29,999	25,806	27
\$30,000 - \$39,999	29,126	30
\$40,000 - \$49,999	28,771	32
\$50,000 - \$59,999	19,437	34
\$60,000 - \$69,999	9,765	35
\$70,000 - \$79,999	4,366	36
\$80,000 - \$89,999	1,669	37
\$90,000 - \$99,999	774	37
\$100,000 or more	887	38
Total	232,680	24

Table 14

**Distribution of Annuitants, Beneficiaries, and Survivors by Class Membership
As of June 30, 2020**

Status	Class Membership						Missing Class	Total
	TC	TD	TE	TF	TG	TH		
Annuitants (Normal, Early and Withdrawal)	53,479	164,280	611	102	3	-	3	218,478
Disabled Annuitants	2,656	6,369	32	6	-	-	1	9,064
Survivors and Beneficiaries*	N/A	N/A	N/A	N/A	N/A	N/A	12,072	12,072
Total	56,135	170,649	643	108	3	-	12,076	239,614

* Class membership for survivors and beneficiaries is not provided on the data used for the valuation.

Exhibit I

**Active Membership Data as of June 30, 2020
Number and Average Annual Salary**

Age	Service									Total
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	
Under 25	6,539 \$26,707	44 \$29,915								6,583 \$26,728
25-29	14,293 \$38,405	4,033 \$53,447	30 \$48,176							18,356 \$41,726
30-34	9,721 \$36,149	11,285 \$57,401	4,870 \$65,300	38 \$51,568						25,914 \$50,905
35-39	8,061 \$31,963	5,701 \$55,196	14,463 \$69,656	5,306 \$78,438	31 \$59,736					33,562 \$59,526
40-44	7,936 \$26,927	4,269 \$47,093	6,631 \$67,662	12,990 \$81,946	3,535 \$88,593	14 \$59,856				35,375 \$63,375
45-49	7,595 \$25,235	4,531 \$40,205	4,934 \$57,481	6,495 \$76,693	10,859 \$89,085	2,384 \$90,954	51 \$64,599			36,849 \$63,585
50-54	6,276 \$25,262	4,539 \$35,624	5,382 \$48,114	5,397 \$63,855	5,932 \$81,931	6,598 \$90,529	1,862 \$87,275	27 \$65,640	1 \$81,016	36,014 \$60,296
55-59	4,806 \$23,090	3,724 \$33,075	5,194 \$41,451	5,967 \$52,029	4,662 \$64,257	3,079 \$77,977	3,308 \$86,528	532 \$78,481	35 \$51,739	31,307 \$52,044
60-64	3,549 \$20,977	2,600 \$30,358	3,334 \$39,646	4,338 \$48,474	4,033 \$54,739	2,003 \$62,153	1,072 \$73,296	540 \$80,370	184 \$72,423	21,653 \$45,093
Over 64	3,071 \$15,229	1,751 \$23,371	1,578 \$33,065	1,415 \$41,835	1,212 \$50,023	750 \$53,121	452 \$54,864	180 \$63,378	224 \$78,338	10,633 \$33,226
Total	71,847 \$29,628	42,477 \$46,313	46,416 \$58,553	41,946 \$69,263	30,264 \$77,629	14,828 \$82,237	6,745 \$82,343	1,279 \$76,882	444 \$73,796	256,246 \$54,535

Exhibit II

The Number of Average Annual Annuity as of June 30, 2020

**Retired on Account of Superannuation, Early Retirement and Those
in Receipt of Withdrawal Annuities**

Age	Years of Service									Total
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	
Under 50		4,294	1,458	413	117	10	1			6,293
		\$907	\$2,758	\$6,666	\$13,226	\$23,364	\$15,244			\$1,981
50-54		1,798	1,028	458	231	173	37	6		3,731
		\$1,104	\$2,957	\$7,508	\$14,587	\$23,927	\$40,823	\$49,639		\$4,766
55-59		1,882	1,528	851	550	873	1,603	569	5	7,861
		\$1,635	\$3,324	\$8,433	\$15,470	\$34,881	\$49,065	\$57,109	\$42,783	\$21,073
60-64	72	2,589	3,081	2,725	2,592	2,992	4,668	3,087	217	22,023
	\$12,896	\$2,582	\$5,545	\$12,375	\$22,121	\$34,934	\$48,993	\$58,699	\$60,694	\$29,213
65-69	468	3,763	5,711	5,588	5,838	6,533	10,106	8,514	918	47,439
	\$2,496	\$3,647	\$6,625	\$13,791	\$22,865	\$33,408	\$46,447	\$59,014	\$64,725	\$31,889
70-74	1,235	3,405	6,130	5,197	5,250	6,293	13,436	11,783	1,432	54,161
	\$1,588	\$3,745	\$5,662	\$12,360	\$20,925	\$30,324	\$42,464	\$55,606	\$68,920	\$32,104
75-79	1,257	2,152	3,771	3,503	3,310	3,966	9,446	6,045	937	34,387
	\$1,053	\$3,184	\$4,866	\$9,946	\$16,975	\$26,108	\$35,769	\$49,166	\$62,552	\$26,603
80-84	832	1,230	2,392	2,280	2,515	2,867	4,424	3,472	808	20,820
	\$880	\$2,595	\$4,246	\$8,159	\$13,190	\$21,150	\$30,694	\$38,453	\$51,535	\$21,010
85-89	418	718	1,610	1,619	1,838	2,021	2,344	1,645	719	12,932
	\$733	\$1,988	\$3,550	\$6,456	\$11,272	\$18,028	\$26,677	\$36,627	\$42,960	\$17,687
Over 89	332	475	1,236	1,286	1,518	1,461	1,155	941	427	8,831
	\$918	\$1,754	\$3,401	\$6,316	\$11,022	\$16,669	\$23,232	\$30,189	\$40,143	\$14,373
Total	4,614	22,306	27,945	23,920	23,759	27,189	47,220	36,062	5,463	218,478
	\$1,457	\$2,440	\$5,017	\$10,887	\$18,558	\$28,445	\$40,488	\$52,438	\$58,535	\$26,541

1. Includes 56 annuitant records with no service information provided.

Exhibit III

The Number and Average Annual Annuity as of June 30, 2020

Beneficiaries and Survivor Annuitants

Age	Years of Service								Total
	0-9 ¹	10-14	15-19	20-24	25-29	30-34	35-39	40+	
Under 50	229	13	22	9	7	15	15	5	315
	\$8,130	\$4,053	\$4,115	\$6,099	\$7,524	\$10,541	\$11,935	\$21,040	\$7,170
50-54	128	12	22	8	17	12	7	3	209
	\$11,657	\$5,583	\$5,488	\$7,344	\$11,953	\$8,676	\$8,543	\$10,909	\$8,370
55-59	192	13	18	31	35	48	44	8	389
	\$15,272	\$4,046	\$7,369	\$9,275	\$12,346	\$12,719	\$17,090	\$16,598	\$11,537
60-64	382	32	46	34	55	101	94	16	760
	\$18,862	\$7,250	\$9,939	\$11,452	\$15,067	\$17,360	\$18,609	\$20,714	\$14,165
65-69	615	73	81	97	103	210	213	28	1,420
	\$27,379	\$11,985	\$15,374	\$15,650	\$18,356	\$20,164	\$23,366	\$20,285	\$18,290
70-74	979	111	99	107	123	285	275	66	2,045
	\$29,538	\$11,901	\$14,848	\$17,240	\$19,247	\$21,437	\$25,046	\$29,060	\$20,019
75-79	1,149	95	94	91	99	210	167	41	1,946
	\$25,377	\$10,770	\$13,283	\$15,273	\$17,489	\$17,602	\$25,313	\$29,803	\$17,590
80-84	1,247	88	89	91	101	135	106	55	1,912
	\$18,489	\$9,100	\$11,585	\$14,206	\$14,031	\$16,610	\$17,851	\$29,244	\$13,963
85-89	1,094	53	70	84	80	80	82	28	1,571
	\$19,774	\$8,860	\$10,785	\$12,060	\$12,659	\$15,332	\$18,331	\$24,605	\$12,400
Over 89	1,140	53	61	70	57	57	48	19	1,505
	\$17,621	\$8,155	\$11,615	\$11,990	\$13,471	\$12,365	\$17,986	\$18,183	\$10,425
Total ²	7,155	543	602	622	677	1,153	1,051	269	12,072
	\$13,894	\$9,808	\$12,059	\$13,968	\$15,811	\$18,075	\$21,970	\$25,847	\$15,098

1. Includes 6,828 beneficiary or survivor annuitant records with no service information provided.

2. In addition, there are 1,281 beneficiaries who are only entitled to a pending lump sum distribution.

Exhibit IV

The Number and Average Annual Annuity as of June 30, 2020

Retired on Account of Disability

Age	Years of Service									Total	
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+		
Under 50		136	134	94	43	2					409
		\$16,950	\$22,156	\$27,523	\$36,315	\$45,370					\$23,261
50-54		128	148	138	110	56	7				587
		\$13,935	\$18,452	\$24,940	\$35,802	\$57,498	\$59,197				\$26,455
55-59		262	289	231	188	157	39	2			1,168
		\$12,832	\$14,744	\$20,206	\$32,486	\$43,765	\$57,885	\$44,071			\$23,643
60-64		361	427	384	304	214	92	1			1,783
		\$10,179	\$13,645	\$19,104	\$28,911	\$39,844	\$47,372	\$39,632			\$21,621
65-69		352	431	346	356	309	150	2			1,946
		\$9,477	\$13,440	\$18,036	\$26,010	\$38,177	\$48,523	\$57,894			\$22,518
70-74		264	317	249	251	339	174	2	4		1,600
		\$8,374	\$10,908	\$14,740	\$23,813	\$33,094	\$44,881	\$30,125	\$25,930		\$21,568
75-79		140	180	154	166	128	31				799
		\$7,512	\$8,622	\$11,517	\$19,430	\$26,382	\$37,672				\$15,202
80-84		71	109	89	86	53	16	2	1		427
		\$5,391	\$7,543	\$9,559	\$15,510	\$21,919	\$30,889	\$42,997	\$10,189		\$12,041
85-89		40	62	63	38	19	5				227
		\$4,409	\$6,210	\$8,805	\$12,451	\$21,187	\$22,386				\$9,268
Over 89		26	39	23	18	9	2		1		118
		\$3,236	\$6,227	\$7,958	\$12,280	\$20,120	\$18,207		\$54,601		\$8,502
Total		1,780	2,136	1,771	1,560	1,286	516	9	6		9,064
		\$10,319	\$13,127	\$17,676	\$26,209	\$36,428	\$46,373	\$43,312	\$28,085		\$20,954

1. Includes 53 annuitant records with no service information provided.

Exhibit V

Annuitant and Beneficiary Membership Data as of June 30, 2020

**Number and Average Annual Benefit
Excludes Partial Lump Sum Payments**

Age Last Birthday	Number	Annual Benefit (Thousands)	Average Annual Benefit
Annuitants (Normal, Early and Withdrawal)			
Under 60	17,885	\$ 195,899	\$ 10,953
60 - 64	22,023	643,351	29,213
65 - 69	47,439	1,512,784	31,889
70 - 74	54,161	1,738,778	32,104
75 - 79	34,387	914,793	26,603
Over 79	42,583	793,091	18,625
Total	218,478	\$ 5,798,696	\$ 26,541
Survivors and Beneficiaries			
Under 60	913	\$ 8,496	\$ 9,305
60 - 64	760	10,766	14,165
65 - 69	1,420	25,971	18,290
70 - 74	2,045	40,939	20,019
75 - 79	1,946	34,230	17,590
Over 79	4,988	61,867	12,403
Total	12,072	\$ 182,269	\$ 15,098
Disabled Annuitants			
Under 60	2,164	\$ 52,657	\$ 24,333
60 - 64	1,783	38,551	21,621
65 - 69	1,946	43,819	22,518
70 - 74	1,600	34,508	21,568
75 - 79	799	12,147	15,203
Over 79	772	8,248	10,685
Total	9,064	\$ 189,931	\$ 20,954
Grand Total Average Annual Benefit	239,614	\$ 6,170,896	\$ 25,753

Exhibit VI

10-Year History of Membership Data

Active Members

Valuation as of June 30	Number of Active Members	Percentage Change in Membership	Total Annualized Payroll (Thousands) ¹	Percentage Change in Payroll
2020	256,246	0.19%	\$ 13,974,295	2.21%
2019	255,749	(0.24%)	13,671,927	2.19%
2018	256,362	0.16%	13,379,041	2.65%
2017	255,945	(0.44%)	13,033,919	1.42%
2016	257,080	(1.07%)	12,851,289	1.37%
2015	259,868	(1.31%)	12,678,213	0.45%
2014	263,312	(1.54%)	12,620,862	0.35%
2013	267,428	(2.22%)	12,577,105	(1.08%)
2012	273,504	(2.02%)	12,714,371	(1.52%)
2011	279,152	(1.02%)	12,910,043	0.95%

1. The salaries shown represent an annual rate of pay for the year ending June 30th for members who were in active service on June 30th.

Exhibit VI

(Continued)

10-Year History of Membership Data

The Number and Annual Annuities of Annuitant and Survivor Annuitant Members

Year Ended June 30	Number	Annual Annuities ¹ (Millions)	Average Annual Annuities	Additions	Annual Annuities (Millions)	Deletions	Annual Annuities (Millions)	Percentage Change in Membership	Percentage Change in Annuities
2020	239,614	\$ 6,170.9	\$ 25,753	9,708	\$ 256.1	7,433	\$ 115.6	0.96%	1.97%
2019	237,339	6,051.6	25,498	10,553	246.6	6,502	107.0	1.74%	2.11%
2018	233,288	5,926.7	25,405	11,806	235.3	8,532	98.6	1.42%	1.90%
2017	230,014	5,816.4	25,287	12,876	274.2	7,690	102.1	2.31%	2.65%
2016	224,828	5,666.4	25,203	12,686	267.1	7,633	93.5	2.30%	2.64%
2015	219,775	5,520.6	25,119	15,017	297.3	9,142	91.7	2.75%	3.39%
2014	213,900	5,339.5	24,962	15,225	300.5	8,878	84.9	3.06%	3.74%
2013	207,553	5,147.1	24,800	16,404	377.6	10,866	83.7	2.74%	5.63%
2012	202,015	4,872.9	24,121	14,579	332.7	7,186	66.6	3.80%	4.78%
2011	194,622	4,650.8	23,897	16,228	453.7	6,540	76.4	5.24%	7.17%

1. The annual annuities added and deleted are for the annuitants and survivor annuitants who were added and deleted. Changes in annuities for continuing payees may also occur due to finalization of benefit calculations and due to the commencement of supplemental annuity payments.

The Number and Annual Annuities of Annuitant Members

Year Ended June 30	Number	Annual Annuities ² (Millions)	Average Annual Annuities	Additions	Annual Annuities (Millions)	Deletions	Annual Annuities (Millions)	Percentage Change in Membership	Percentage Change in Annuities
2020	227,542	\$ 5,988.6	\$ 26,319	8,841	\$ 239.6	6,778	\$ 123.5	0.91%	1.92%
2019	225,479	5,875.5	26,058	9,575	228.8	5,975	104.0	1.62%	1.97%
2018	221,879	5,762.3	25,970	10,911	220.2	7,918	93.0	1.37%	1.80%
2017	218,886	5,660.4	25,860	11,942	257.9	7,075	95.8	2.27%	2.54%
2016	214,019	5,520.0	25,792	11,807	249.8	7,054	88.1	2.27%	2.54%
2015	209,266	5,383.3	25,725	12,624	279.2	7,114	86.5	2.70%	3.30%
2014	203,756	5,211.4	25,577	12,915	283.9	6,894	80.0		

2. The annual annuities added and deleted are for the annuitants who were added and deleted. Changes in annuities for continuing payees may also occur due to finalization of benefit calculations and due to the commencement of supplemental annuity payments.

Exhibit VII

Detailed Tabulations of the Data

Table 1

**The Number and Annual Salaries of Members in Active Service Distributed
by Age as of June 30, 2020**

Age	Male		Female		Total	
	Number	Salaries	Number	Salaries	Number	Salaries
17	8	\$ 61,307	13	\$ 96,938	21	\$ 158,245
18	35	359,682	23	216,384	58	576,066
19	111	1,428,566	98	1,107,878	209	2,536,444
20	189	2,884,873	217	2,680,013	406	5,564,886
21	253	3,806,650	311	3,823,682	564	7,630,332
22	321	5,802,856	531	11,723,971	852	17,526,827
23	554	14,177,669	1,408	44,684,432	1,962	58,862,101
24	670	19,060,917	1,841	64,035,983	2,511	83,096,900
25	812	27,260,876	2,187	83,223,656	2,999	110,484,532
26	900	32,080,138	2,410	98,193,184	3,310	130,273,322
27	1,050	38,572,581	2,641	114,089,764	3,691	152,662,345
28	1,045	41,898,347	2,955	132,935,791	4,000	174,834,138
29	1,145	48,459,528	3,211	149,199,716	4,356	197,659,244
30	1,271	57,556,407	3,440	163,747,360	4,711	221,303,767
31	1,236	57,692,835	3,487	170,655,657	4,723	228,348,492
32	1,321	66,341,911	3,651	184,920,911	4,972	251,262,822
33	1,498	80,680,967	4,098	214,232,603	5,596	294,913,570
34	1,619	90,191,683	4,293	233,123,952	5,912	323,315,635
35	1,703	101,006,150	4,456	251,951,149	6,159	352,957,299
36	1,657	101,221,300	4,662	266,372,230	6,319	367,593,530
37	1,706	107,096,637	4,972	288,560,586	6,678	395,657,223
38	1,933	126,803,745	5,212	307,560,786	7,145	434,364,531
39	1,958	130,144,579	5,303	317,093,624	7,261	447,238,203
40	1,968	134,649,089	5,330	322,929,539	7,298	457,578,628
41	1,981	136,929,694	5,195	315,155,937	7,176	452,085,631
42	1,930	135,834,993	5,028	304,964,878	6,958	440,799,871
43	2,017	143,550,481	5,098	309,935,480	7,115	453,485,961
44	1,971	142,641,989	4,857	295,300,327	6,828	437,942,316
45	1,936	138,931,910	4,956	300,915,058	6,892	439,846,968
46	1,948	142,707,597	4,957	296,676,088	6,905	439,383,685
47	1,983	146,848,700	5,066	303,560,108	7,049	450,408,808
48	2,155	157,931,073	5,498	327,467,332	7,653	485,398,405
49	2,291	166,848,459	6,059	361,173,186	8,350	528,021,645
50	2,059	149,981,796	5,855	349,222,891	7,914	499,204,687
51	1,996	143,237,521	5,467	315,747,492	7,463	458,985,013
52	1,869	133,936,658	5,177	290,981,217	7,046	424,917,875
53	1,805	124,930,859	5,088	279,347,488	6,893	404,278,347
54	1,862	125,098,253	4,836	259,015,102	6,698	384,113,355
55	1,646	107,978,071	4,953	249,930,213	6,599	357,908,284
56	1,657	108,529,753	4,823	238,597,628	6,480	347,127,381

Table 1
(Continued)

**The Number and Annual Salaries off Members in Active Service Distributed
by Age as of June 30, 2020**

Age	Male		Female		Total	
	Number	Salaries	Number	Salaries	Number	Salaries
57	1,528	\$ 95,037,339	4,587	\$ 223,424,161	6,115	\$ 318,461,500
58	1,446	85,111,418	4,590	221,700,556	6,036	306,811,974
59	1,486	84,700,214	4,591	214,336,101	6,077	299,036,315
60	1,320	71,871,289	4,129	183,426,925	5,449	255,298,214
61	1,290	68,470,742	3,798	170,410,360	5,088	238,881,102
62	1,098	54,257,510	3,194	135,971,456	4,292	190,228,966
63	962	47,937,180	2,784	115,121,758	3,746	163,058,938
64	858	38,415,858	2,220	90,506,443	3,078	128,922,301
65	702	29,805,385	1,617	64,550,805	2,319	94,356,190
66	528	20,318,561	1,131	41,654,757	1,659	61,973,318
67	426	17,042,778	861	31,702,290	1,287	48,745,068
68	399	12,855,098	670	22,282,180	1,069	35,137,278
69	309	9,741,470	531	15,719,305	840	25,460,775
70	250	8,118,802	415	12,132,424	665	20,251,226
71	226	6,263,190	338	8,160,227	564	14,423,417
72	194	5,498,803	288	7,399,707	482	12,898,510
73	191	5,210,661	265	6,080,772	456	11,291,433
74	111	2,787,454	140	3,199,289	251	5,986,743
75	109	3,138,994	113	2,395,053	222	5,534,047
76	88	2,242,588	107	2,191,242	195	4,433,830
77	80	2,079,790	87	1,516,649	167	3,596,439
78	50	1,399,035	73	1,345,700	123	2,744,735
79	37	695,885	59	963,042	96	1,658,927
80	31	620,854	36	796,979	67	1,417,833
81	20	486,096	26	495,432	46	981,528
82	18	467,056	23	428,290	41	895,346
83	12	248,193	16	215,213	28	463,406
84	4	94,641	13	178,172	17	272,813
85	9	177,775	13	214,975	22	392,750
86	4	78,596	7	84,841	11	163,437
87	2	60,484	4	148,343	6	208,827
Total	69,857	\$ 4,170,390,839	186,389	\$ 9,803,903,661	256,246	\$ 13,974,294,500

Table 2

The Number and Annual Salaries of Members in Active Service Distributed by Years of Credited Service as of June 30, 2020

Service	Male		Female		Total	
	Number	Salaries	Number	Salaries	Number	Salaries
0	5,369	\$ 75,405,121	9,016	\$ 153,659,021	14,385	\$ 229,064,142
1	5,393	146,622,925	13,303	362,527,092	18,696	509,150,017
2	3,970	135,496,055	11,003	356,429,567	14,973	491,925,622
3	3,202	127,288,704	9,310	327,999,821	12,512	455,288,525
4	2,739	117,922,678	8,542	325,351,053	11,281	443,273,731
5	2,435	112,844,740	7,607	310,559,931	10,042	423,404,671
6	2,295	112,687,029	7,011	302,824,341	9,306	415,511,370
7	2,213	115,540,919	6,376	291,453,347	8,589	406,994,266
8	1,783	95,564,617	5,605	264,263,896	7,388	359,828,513
9	1,734	97,517,887	5,417	263,961,317	7,151	361,479,204
10	1,975	117,966,058	6,217	320,721,326	8,192	438,687,384
11	2,134	133,947,035	6,808	370,765,423	8,942	504,712,458
12	2,354	151,242,694	7,353	414,448,607	9,707	565,691,301
13	2,338	159,168,012	7,557	439,540,413	9,895	598,708,425
14	2,338	163,032,428	7,343	446,962,790	9,681	609,995,218
15	2,385	175,504,757	7,151	451,749,478	9,536	627,254,235
16	2,475	188,428,638	6,793	446,230,258	9,268	634,658,896
17	2,028	158,602,922	5,850	390,088,269	7,878	548,691,191
18	1,992	161,395,593	5,821	394,313,421	7,813	555,709,014
19	1,941	157,738,290	5,510	381,254,959	7,451	538,993,249
20	1,816	152,083,617	5,525	387,726,675	7,341	539,810,292
21	2,212	192,214,944	4,996	362,245,288	7,208	554,460,232
22	1,830	158,761,806	4,111	305,931,043	5,941	464,692,849
23	1,759	158,867,931	3,595	273,630,726	5,354	432,498,657
24	1,397	124,852,179	3,023	233,052,215	4,420	357,904,394
25	1,216	109,384,073	2,662	207,064,114	3,878	316,448,187
26	1,022	91,394,711	2,291	181,870,835	3,313	273,265,546
27	1,198	108,903,143	2,069	163,622,878	3,267	272,526,021
28	745	65,265,639	1,547	123,314,142	2,292	188,579,781
29	648	56,309,943	1,430	112,273,634	2,078	168,583,577
30	637	55,325,420	1,256	100,773,238	1,893	156,098,658
31	604	51,724,685	1,101	86,913,888	1,705	138,638,573
32	428	38,397,021	901	72,876,571	1,329	111,273,592
33	366	31,609,923	683	54,505,532	1,049	86,115,455
34	268	22,913,080	501	40,366,883	769	63,279,963
35	159	13,437,245	299	23,444,706	458	36,881,951
36	114	9,394,919	203	15,121,425	317	24,516,344
37	88	6,505,010	121	9,032,860	209	15,537,870
38	69	4,777,822	82	5,974,881	151	10,752,703
39	57	4,189,840	87	6,453,303	144	10,643,143

**Table 2
(Continued)**

**The Number and Annual Salaries of Members in Active Service Distributed by
Years of Credited Service as of June 30, 2020**

Service	Male		Female		Total	
	Number	Salaries	Number	Salaries	Number	Salaries
40	39	\$ 2,984,171	77	\$ 5,497,997	116	\$ 8,482,168
41	37	2,538,417	66	4,734,098	103	7,272,515
42	13	1,227,759	38	2,878,233	51	4,105,992
43	8	674,576	21	1,434,957	29	2,109,533
44	15	1,145,869	22	1,555,220	37	2,701,089
45	2	147,936	27	1,632,482	29	1,780,418
46	4	274,250	17	1,452,135	21	1,726,385
47	4	383,863	15	1,383,486	19	1,767,349
48	2	197,111	7	576,767	9	773,878
49	3	277,923	7	484,603	10	762,526
50	1	50,022	5	237,937	6	287,959
51			4	259,908	4	259,908
52			2	175,093	2	175,093
53	1	40,500	3	190,342	4	230,842
54	1	97,695	1	39,099	2	136,794
55			1	72,137	1	72,137
56						
57						
58						
59	1	120,694			1	120,694
Total	69,857	\$4,170,390,839	186,389	\$9,803,903,661	256,246	\$ 13,974,294,500

Table 3

**The Number and Annual Annuities of Annuitants on the Retired List
as of June 30, 2020**

**Retired on Account of Superannuation, Early Retirement and
Those in Receipt of Withdrawal Annuities**

Age	Male		Female		Total	
	Number	Annunities	Number	Annunities	Number	Annunities
28	1	\$ 515			1	\$ 515
29	1	267	1	205	2	472
30	15	9,586	6	1,630	21	11,216
31	17	12,176	10	6,350	27	18,526
32	26	24,489	30	20,132	56	44,621
33	27	28,152	60	45,800	87	73,952
34	62	66,223	81	62,439	143	128,662
35	74	75,941	113	91,743	187	167,684
36	69	76,210	119	119,136	188	195,346
37	75	93,531	184	210,373	259	303,904
38	121	148,733	178	214,030	299	362,763
39	106	149,580	206	278,386	312	427,966
40	138	218,436	207	316,069	345	534,505
41	136	272,424	262	408,771	398	681,195
42	154	291,570	265	446,294	419	737,864
43	151	348,300	266	474,180	417	822,480
44	140	304,251	307	570,166	447	874,417
45	142	355,486	313	569,275	455	924,761
46	139	435,860	352	744,989	491	1,180,849
47	162	590,145	350	844,974	512	1,435,119
48	185	690,108	371	950,906	556	1,641,014
49	195	662,363	476	1,237,178	671	1,899,541
50	203	885,364	495	1,463,280	698	2,348,644
51	224	1,223,692	505	1,973,258	729	3,196,950
52	189	1,111,521	508	2,133,122	697	3,244,643
53	227	1,435,284	544	2,532,944	771	3,968,228
54	262	2,160,414	574	2,861,443	836	5,021,857
55	291	5,058,945	732	8,260,773	1,023	13,319,718
56	353	7,455,798	942	14,388,067	1,295	21,843,865
57	469	11,559,606	1,084	20,899,415	1,553	32,459,021
58	540	15,682,580	1,306	27,184,341	1,846	42,866,921
59	628	19,689,301	1,516	35,472,854	2,144	55,162,155
60	759	25,029,361	1,831	46,934,290	2,590	71,963,651
61	875	30,306,099	2,134	58,720,252	3,009	89,026,351
62	1,137	39,581,697	3,106	85,214,401	4,243	124,796,098
63	1,446	50,860,751	4,309	116,313,790	5,755	167,174,541
64	1,582	55,542,966	4,844	134,847,824	6,426	190,390,790
65	1,775	61,859,280	5,493	158,175,981	7,268	220,035,261
66	2,098	70,114,210	6,382	183,992,214	8,480	254,106,424
67	2,436	87,877,523	7,211	220,671,772	9,647	308,549,295
68	2,751	99,239,295	7,918	251,706,551	10,669	350,945,846
69	3,118	116,200,324	8,257	262,946,975	11,375	379,147,299

**Table 3
(Continued)**

**The Number and Annual Annuities of Annuitants on the Retired List
as of June 30, 2020**

**Retired on Account of Superannuation, Early Retirement and
Those in Receipt of Withdrawal Annuities**

Age	Male		Female		Total	
	Number	Annunities	Number	Annunities	Number	Annunities
70	3,034	\$ 115,493,265	7,760	\$ 249,008,870	10,794	\$ 364,502,135
71	3,362	127,794,976	7,559	232,993,038	10,921	360,788,014
72	3,609	132,004,071	7,298	221,789,127	10,907	353,793,198
73	4,119	145,296,718	7,766	225,392,679	11,885	370,689,397
74	3,521	120,564,669	6,133	168,440,547	9,654	289,005,216
75	2,801	91,380,010	4,757	126,963,818	7,558	218,343,828
76	2,634	83,054,717	4,506	112,899,035	7,140	195,953,752
77	2,696	83,511,899	4,529	106,673,525	7,225	190,185,424
78	2,592	79,579,849	4,184	94,122,725	6,776	173,702,574
79	2,020	57,045,320	3,668	79,561,631	5,688	136,606,951
80	1,724	48,278,661	3,151	63,969,416	4,875	112,248,077
81	1,547	38,994,752	2,946	56,264,840	4,493	95,259,592
82	1,388	35,843,406	2,780	50,967,578	4,168	86,810,984
83	1,318	33,134,948	2,459	42,448,825	3,777	75,583,773
84	1,169	29,218,981	2,338	38,313,352	3,507	67,532,333
85	1,030	23,829,360	2,130	32,626,110	3,160	56,455,470
86	909	21,470,774	1,818	27,679,484	2,727	49,150,258
87	816	19,450,511	1,649	23,450,414	2,465	42,900,925
88	761	18,165,992	1,643	23,482,925	2,404	41,648,917
89	619	15,237,701	1,557	23,331,258	2,176	38,568,959
90	531	11,713,311	1,314	18,294,745	1,845	30,008,056
91	406	8,502,699	1,113	14,513,507	1,519	23,016,206
92	291	6,464,446	1,027	13,047,932	1,318	19,512,378
93	246	5,170,347	842	10,354,878	1,088	15,525,225
94	196	4,094,684	665	8,249,023	861	12,343,707
95	145	2,825,141	464	5,283,048	609	8,108,189
96	97	1,981,250	402	4,243,521	499	6,224,771
97	62	1,057,553	271	2,748,893	333	3,806,446
98	37	555,461	238	2,277,785	275	2,833,246
99	20	348,616	145	1,529,736	165	1,878,352
100	12	208,302	111	1,190,612	123	1,398,914
101	6	127,093	66	715,919	72	843,012
102	9	97,226	55	677,350	64	774,576
103	2	30,264	23	223,978	25	254,242
104	1	92	16	186,968	17	187,060
105	2	42,712	9	98,756	11	141,468
106			4	33,219	4	33,219
107			1	20,200	1	20,200
108						
109	1	15,242	1	6,825	2	22,067
Total	67,232	\$ 2,070,313,376	151,246	\$ 3,728,382,665	218,478	\$ 5,798,696,041

**Table 3
(Continued)**

**The Number and Annual Annuities of Annuitants on the Retired List
as of June 30, 2020**

**Retired on Account of Superannuation, Early Retirement and
Those in Receipt of Withdrawal Annuities**

<u>OPTION</u>	<u>MALE</u>		<u>FEMALE</u>	
Maximum	29,599	\$ 907,976,687	82,461	\$ 2,030,654,872
1	10,825	257,478,170	34,784	674,624,545
2	17,124	509,647,918	20,191	541,685,669
3	8,067	318,657,484	12,662	434,275,405
4	<u>1,617</u>	<u>76,553,117</u>	<u>1,148</u>	<u>47,142,174</u>
	67,232	\$ 2,070,313,376	151,246	\$ 3,728,382,665

DEFINITION OF OPTIONS

Option 1 A life annuity to the member with a guaranteed payment to the beneficiary equal to the present value of the total maximum single life annuity less any amounts paid to the member prior to death.

Option 2 A joint and one hundred percent (100%) survivor annuity payable during the lifetime of the member with the full amount of such annuity payable thereafter to the designated survivor annuitant, if living at the member's death.

Option 3 A joint and fifty percent (50%) survivor annuity payable during the lifetime of the member with one-half of such annuity payable thereafter to the designated survivor annuitant, if living at the

Option 4 A life annuity to the member with a special death benefit other than the normal option 1, 2, or 3 death benefit.

Note: The Option 4 totals above only reflect annuity elections that differ from the Maximum annuity or Options 1, 2 or 3. The Option 4 totals do not reflect Option 4 elections to withdraw accumulated deductions.

Table 4

The Number and Annual Annuities of Beneficiaries and Survivor Annuitants
as of June 30, 2020

Age	Male		Female		Total	
	Number	Annuities	Number	Annuities	Number	Annuities
10	1	\$ 1,534			1	\$ 1,534
14	1	3,741			1	3,741
17			1	\$ 21,875	1	21,875
19	2	4,036			2	4,036
20	1	1,898	6	51,420	7	53,318
21			2	4,388	2	4,388
22	2	11,957	2	14,723	4	26,680
23	2	3,275	1	8,672	3	11,947
24	1	9,869	2	16,046	3	25,915
25			3	7,630	3	7,630
26	3	22,827	2	10,604	5	33,431
27			2	9,620	2	9,620
28	2	2,899	4	34,730	6	37,629
29	3	19,923	2	18,704	5	38,627
30	2	18,108	5	22,941	7	41,049
31	5	24,013	4	22,733	9	46,746
32	2	5,832	2	6,266	4	12,098
33	11	113,986	3	25,735	14	139,721
34	2	2,839	1	5,316	3	8,155
35	6	37,664	7	87,104	13	124,768
36	6	24,021	5	73,065	11	97,086
37	3	18,257	4	45,835	7	64,092
38	6	60,833	4	25,667	10	86,500
39	6	44,562	5	30,320	11	74,882
40	7	43,959	3	12,775	10	56,734
41	6	31,739	7	63,063	13	94,802
42	14	129,739	9	38,304	23	168,043
43	8	65,623	10	41,806	18	107,429
44	4	15,161	11	70,030	15	85,191
45	8	123,978	13	112,656	21	236,634
46	8	32,969	13	106,127	21	139,096
47	8	30,438	11	76,577	19	107,015
48	6	43,993	9	70,197	15	114,190
49	4	12,413	22	161,429	26	173,842
50	8	43,860	15	182,616	23	226,476
51	9	96,960	25	256,235	34	353,195
52	16	91,578	28	182,376	44	273,954
53	16	98,843	40	328,978	56	427,821
54	14	92,010	38	375,896	52	467,906
55	11	81,041	63	728,682	74	809,723
56	19	135,696	53	621,740	72	757,436
57	22	321,684	49	527,161	71	848,845
58	18	196,297	56	597,683	74	793,980
59	25	238,988	73	1,038,939	98	1,277,927
60	26	342,134	85	1,346,471	111	1,688,605
61	32	392,795	97	1,137,547	129	1,530,342

**Table 4
(Continued)**

**The Number and Annual Annuities of Beneficiaries and Survivor Annuitants
as of June 30, 2020**

Age	Male		Female		Total	
	Number	Annuities	Number	Annuities	Number	Annuities
62	32	\$ 366,879	117	\$ 1,619,443	149	\$ 1,986,322
63	52	570,199	137	2,004,543	189	2,574,742
64	54	770,895	128	2,214,735	182	2,985,630
65	57	972,899	176	3,053,783	233	4,026,682
66	69	1,106,205	183	3,183,868	252	4,290,073
67	79	1,242,814	207	3,885,867	286	5,128,681
68	98	2,083,377	213	3,693,183	311	5,776,560
69	115	2,250,900	223	4,498,477	338	6,749,377
70	99	1,893,814	239	4,984,803	338	6,878,617
71	107	2,262,452	271	5,692,445	378	7,954,897
72	111	2,379,392	289	5,742,209	400	8,121,601
73	140	2,930,432	361	6,906,318	501	9,836,750
74	116	2,215,169	312	5,932,070	428	8,147,239
75	79	1,446,464	273	5,298,096	352	6,744,560
76	95	1,927,925	241	4,543,029	336	6,470,954
77	104	1,855,673	312	4,888,931	416	6,744,604
78	110	2,169,170	315	5,043,463	425	7,212,633
79	102	2,014,497	315	5,042,867	417	7,057,364
80	74	1,288,169	324	4,621,404	398	5,909,573
81	73	1,092,837	294	4,384,814	367	5,477,651
82	75	1,252,494	313	4,175,074	388	5,427,568
83	72	771,415	295	3,898,044	367	4,669,459
84	64	954,738	328	4,259,077	392	5,213,815
85	64	590,523	285	3,807,096	349	4,397,619
86	53	705,795	270	3,298,745	323	4,004,540
87	44	543,943	244	2,951,065	288	3,495,008
88	48	484,079	240	3,210,028	288	3,694,107
89	50	564,342	273	3,324,643	323	3,888,985
90	45	504,229	228	2,662,891	273	3,167,120
91	46	578,966	202	2,443,408	248	3,022,374
92	23	205,495	193	1,878,685	216	2,084,180
93	30	384,770	186	1,818,933	216	2,203,703
94	30	242,862	131	1,291,924	161	1,534,786
95	21	251,396	94	1,009,271	115	1,260,667
96	10	88,127	79	685,774	89	773,901
97	17	163,295	48	447,328	65	610,623
98	10	93,666	39	295,495	49	389,161
99	3	53,273	31	275,856	34	329,129
100			18	174,208	18	174,208
101	1	3,412	6	34,172	7	37,584
102			5	42,881	5	42,881
103			5	37,466	5	37,466
104	2	9,895	1	4,912	3	14,807
106			1	6,644	1	6,644
Total	2,830	\$ 44,380,849	9,242	\$ 137,888,650	12,072	\$ 182,269,499

Table 5

The Number and Annual Annuities of Annuitants on the Retired List
as of June 30, 2020

Retired on Account of Disability

Age	Male		Female		Total	
	Number	Annunities	Number	Annunities	Number	Annunities
32			1	\$ 21,325	1	\$ 21,325
33			3	59,799	3	59,799
35			4	72,538	4	72,538
36	1	\$ 21,737	7	160,499	8	182,236
37	2	33,661	4	83,034	6	116,695
38	6	87,950	4	101,598	10	189,548
39	3	72,190	5	107,452	8	179,642
40	5	93,332	7	168,661	12	261,993
41	5	104,568	14	355,009	19	459,577
42	3	61,629	14	331,429	17	393,058
43	7	202,274	25	641,385	32	843,659
44	14	257,387	23	504,997	37	762,384
45	4	106,411	33	779,790	37	886,201
46	6	122,183	40	949,194	46	1,071,377
47	14	308,399	37	808,297	51	1,116,696
48	15	337,054	41	944,021	56	1,281,075
49	9	280,629	53	1,335,114	62	1,615,743
50	26	711,324	71	1,981,193	97	2,692,517
51	26	701,891	88	2,002,065	114	2,703,956
52	47	1,244,458	66	1,846,576	113	3,091,034
53	32	1,074,654	97	2,481,888	129	3,556,542
54	38	852,733	96	2,632,042	134	3,484,775
55	44	1,201,697	126	3,246,322	170	4,448,019
56	68	1,875,373	166	3,853,409	234	5,728,782
57	66	1,593,674	180	4,101,918	246	5,695,592
58	80	1,895,299	179	4,099,888	259	5,995,187
59	64	1,686,139	195	4,060,837	259	5,746,976
60	76	2,197,277	235	4,838,513	311	7,035,790
61	127	3,228,836	241	4,978,068	368	8,206,904
62	99	2,133,367	259	5,637,655	358	7,771,022
63	113	2,580,443	247	5,178,358	360	7,758,801
64	126	2,640,102	260	5,137,934	386	7,778,036
65	121	2,685,353	266	5,697,823	387	8,383,176
66	109	2,491,170	296	6,328,278	405	8,819,448
67	130	2,891,740	278	5,804,521	408	8,696,261
68	109	2,733,014	273	6,232,402	382	8,965,416
69	104	2,667,489	260	6,287,449	364	8,954,938
70	91	1,923,153	247	5,794,251	338	7,717,404
71	127	3,154,701	245	5,454,242	372	8,608,943
72	86	2,069,230	222	4,684,881	308	6,754,111
73	87	2,126,836	233	4,527,986	320	6,654,822
74	72	1,317,081	190	3,455,981	262	4,773,062
75	48	1,040,409	135	2,054,952	183	3,095,361

Table 5
(Continued)

**The Number and Annual Annuities of Annuitants on the Retired List
as of June 30, 2020**

Retired on Account of Disability

Age	Male		Female		Total	
	Number	Annuities	Number	Annuities	Number	Annuities
76	45	\$ 943,140	108	\$ 1,741,916	153	\$ 2,685,056
77	55	924,912	126	1,734,521	181	2,659,433
78	36	512,958	128	1,727,627	164	2,240,585
79	25	303,956	93	1,162,806	118	1,466,762
80	31	478,799	86	930,931	117	1,409,730
81	26	405,697	58	694,452	84	1,100,149
82	24	311,740	67	699,437	91	1,011,177
83	21	246,109	59	679,665	80	925,774
84	15	193,863	40	500,846	55	694,709
85	11	108,921	51	430,714	62	539,635
86	14	158,191	43	381,258	57	539,449
87	12	137,950	26	224,718	38	362,668
88	2	16,678	35	396,051	37	412,729
89	8	77,963	25	171,279	33	249,242
90	1	25,639	24	183,796	25	209,435
91	6	95,985	14	107,315	20	203,300
92	4	54,814	27	212,617	31	267,431
93	2	40,855	9	44,260	11	85,115
94			9	70,703	9	70,703
95	1	3,312	6	30,564	7	33,876
96			5	43,222	5	43,222
97			3	19,484	3	19,484
98			2	16,029	2	16,029
100			1	5,731	1	5,731
101			1	2,321	1	2,321
102			2	36,414	2	36,414
104			1	10,127	1	10,127
Total	2,549	\$ 57,848,329	\$ 6,515	\$ 132,082,378	9,064	\$ 189,930,707

Exhibit VIII : ASOP 51 Disclosures

Funding future retirement benefits prior to when those benefits become due involves assumptions regarding future economic and demographic experience. These assumptions are applied to calculate actuarial liabilities, current contribution requirements and the funded status of the plan. However, to the extent future experience deviates from the assumptions used, variations will occur in these calculated values. These variations create risk to the plan. Understanding the risks to the funding of the plan is important. Actuarial Standard of Practice No. 51 (ASOP 51) requires certain disclosures of potential risks to the plan and provides useful information for intended users of actuarial reports that determine plan contributions or evaluate the adequacy of specified contribution levels to support benefit provisions.

Under ASOP 51, risk is defined as the potential of actual future measurements deviating from expected future measurements resulting from actual future experience deviating from actuarially assumed experience.

It is important to note that not all risk is negative, but all risk should be understood and accepted based on knowledge, judgement and educated decisions. Future measurements may deviate in ways that produce positive or negative financial impacts to the Retirement System.

In the actuary's professional judgment, the following risks may reasonably be anticipated to significantly affect the Retirement System's future financial condition:

- Investment risk – potential that the investment return will be different than the 7.25% expected in the actuarial valuation
- Salary increases – potential that salary increases will be different from that assumed for the actuarial valuation
- Longevity risk – potential that participants live longer than expected from the valuation mortality assumptions
- Declining workforce – potential that future employer contribution rates will be different from expected
- Contribution risk – potential that the contribution will be different than the recommended contribution in the actuarial valuation

The following information is provided to comply with ASOP 51 and furnish beneficial information on potential risks to the plan. This list is not all-inclusive; it is an attempt to identify the most significant risks and how those risks might affect the results shown in this report.

Note that ASOP 51 does not require the actuary to evaluate the ability or willingness of the Retirement System employers to make contributions to the Retirement System when due, or to assess the likelihood or consequences of potential future changes in law. In addition, this valuation report is not intended to provide investment advice or to provide guidance on the management or reduction of risk. Buck welcomes the opportunity to assist in such matters as part of a separate project or projects utilizing the appropriate staff and resources for those objectives.

Exhibit VIII: ASOP 51 Disclosures (continued)

Investment Risk

Retirement System costs are very sensitive to the market return. Any lower than assumed return on assets will increase costs.

- The lower return will cause the assets to be lower than expected. This decrease in assets will increase the Retirement System cost.
- The Retirement System uses an actuarial value of assets that smooths gains and losses on market returns over a ten-year period to help control some of the volatility in costs due to investment risk.
- Historical experience of actual returns is shown on page 11. This historical experience illustrates how returns can vary over time.

Salary increases

Retirement System costs are sensitive to salary increases since benefits at retirement are pay related.

- Salaries greater than expected would lead to higher liabilities, larger unfunded liabilities and larger employer contributions.
- Salaries less than expected would lead to lower liabilities but may increase employer contribution rates due to lower employer payroll.

Longevity Risk

Retirement System costs will be increased as participants are expected to live longer. This is because:

- Benefits are paid over a longer lifetime when life expectancy is expected to increase. The longer duration of payments leads to higher liabilities.
- Health care has been improving, which increases the life expectancy of participants. As health care improves, Retirement System costs will increase.
- The mortality assumption for the Retirement System does assume future improvement in mortality. Any improvement in future mortality greater than that reflected in the current mortality assumption would lead to increased Retirement System costs.

Declining workforce

Employer contributions are based on a percentage of participants' salaries. If the required dollar amount of contributions remains level or increases, a declining active workforce will result in higher contribution rates in order to meet required contribution levels.

Contribution Risk

The Retirement System contribution is a budgeted amount. There is a risk associated with the employer's contribution when the budgeted amount and recommended amount differ. This is because:

- When the budgeted contribution is lower than the recommended contribution the Retirement System may not be sustainable in the long term.
- Any underpayment of the contribution will increase future contribution amounts to help pay off the additional Unfunded Actuarial Accrued Liability associated with any lower than recommended contribution amounts.
- Historical comparison of actuarially determined contributions to actual contributions are shown on page 19. This history shows action has been taken to mitigate this risk by contributing the actuarially determined contribution for pensions since the fiscal year ending June 30, 2017.

Exhibit VIII: ASOP 51 Disclosures (continued)

Other Risk Considerations

Other possible risks (but not an exhaustive list) to be considered that may impact the Retirement System funding:

- The valuation assumes 80% of members at benefit commencement will elect an option 4 lump sum of their member contributions with interest. Actual experience from this assumption could affect the liquidity of the Retirement System if more retirees are electing a lump sum than are expected in the valuation.
- Investment risk is mitigated to some extent by the “shared-risk” provisions of the Retirement System and its potential impact on the member contribution rates for Class T-E, Class T-F, Class T-G and Class T-H members. Poor asset returns over a period of time could trigger increased member contributions for these classes of members. These increased member contributions would offset some of the poor asset returns for the Retirement System.
- Members who retire after 25 years of service and are at least age 55 (age 57 for Class T-G members) may commence their benefits prior to their superannuation date with subsidized early retirement factors. If more retirees retire and commence their benefits under this early retirement provision than are assumed based on the assumptions outlined on page 22, the Retirement System may pay out subsidized benefits for a longer period of time thus increasing liabilities and costs.

Plan Maturity Measures

There are certain measures that may aid in understanding the significant risks to the Retirement System.

Ratio of Retired Liability to Total Liability (Pension Only)	June 30, 2019 (000)	June 30, 2020 (000)
1. Retirees and Beneficiaries	57,413,088	58,415,383
2. Total Accrued Liability	105,199,505	107,833,399
3. Ratio [(1) / (2)]	54.6%	54.2%

A high percentage of liability concentrated in retirees indicates a mature plan. An increasing percentage may indicate a need for less risky and / or more liquid asset allocation which may lead to increased investment risk, a need to lower the long-term return on asset assumption, and increased costs.

Exhibit VIII: ASOP 51 Disclosures (continued)

Ratio of Cash Flow to Assets (Pension Only)	June 30, 2019 (000)	June 30, 2020 (000)
1. Total Contributions	5,551,563	5,744,370
2. Benefit Payments	6,761,173	6,876,515
3. Cash Flow [(1) – (2)]	(1,209,609)	(1,132,145)
4. Market Value of Assets	58,733,884	58,566,786
5. Ratio [(3) / (4)]	(2.1%)	(1.9%)

When this cash flow ratio is negative more cash is being paid out than deposited in the Retirement System fund. Negative cash flow means the fund needs to rely on investment returns to cover benefit payments and at the same time may need to invest in more liquid assets to cover the benefit payments. More liquid assets may not garner the same returns as less liquid assets and therefore increase the investment risk. However, the low magnitude of the ratio implies there may already be enough liquid assets to cover the benefit payments, less investment return is needed to cover the shortfall, or only a small portion of assets will need to be converted to cash. Therefore, the investment risk is likely not amplified at this time. This maturity measure should be monitored for continual negative trend with greater magnitude.

Contribution Volatility (Pension Only)	June 30, 2019 (000)	June 30, 2020 (000)
1. Market Value of Assets	58,733,884	58,566,786
2. Payroll	13,671,927	13,974,295
3. Asset Volatility Ratio (AVR) [(1) / (2)]	4.3	4.2
4. Accrued Liability	105,199,505	107,833,399
5. Liability Volatility Ratio (LVR) [(4) / (2)]	7.7	7.7

Plans that have higher asset-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return. For example, a plan with an asset-to-payroll ratio of 10 may experience twice the contribution volatility due to investment return volatility than a plan with an asset-to-payroll ratio of 5. Plans that have higher liability-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to changes in liability. For example, if an assumption change increases the liability of two plans by the same percent the plan with a liability-to-payroll ratio of 10 may experience twice the contribution volatility than a plan with a liability-to-payroll ratio of 5.

Exhibit IX

Glossary

Accrued Liability	The difference between (a) the present value of future plan benefits, and (b) the present value of future normal cost. It is the portion of the present value of future plan benefits attributable to service accrued as of the valuation date. Sometimes referred to as “actuarial accrued liability”.
Accrued Service	The service credited under the plan that was rendered before the date of the actuarial valuation.
Actuarial Assumptions	Estimates of future plan experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.
Actuarial Cost Method	A mathematical budgeting procedure for allocating the dollar amount of the “present value of future plan benefits” between the present value of future normal cost and the accrued liability. Sometimes referred to as the “actuarial funding method”.
Actuarial Equivalent	A series of payments is called an actuarial equivalent of another series of payments if the two series have the same actuarial present value.
Actuarial Value of Assets	The value of current plan assets recognized for valuation purposes. Based on a smoothed market value that recognizes investment gains and losses over a period of ten years.
Amortization	Paying off an interest-bearing liability by means of periodic payments of interest and principal, as opposed to paying it off with a lump sum payment.
Experience Gain (Loss)	A measure of the difference between actual experience and that expected based upon a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used.
Normal Cost	The annual cost assumed, under the actuarial funding method, for current and subsequent plan years. Sometimes referred to as “current service cost”.
Present Value	The amount of funds presently required to provide a payment or series of payments in the future. The present value is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.
Unfunded Accrued Liability	The difference between the actuarial accrued liability and actuarial value of assets.