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University of Puerto Rico Retirement System

Actuarial Valuation Report

As of June 30, 2021

Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

November 15, 2022

Retirement Board and Governing Board
University of Puerto Rico
Retirement System
P.O. Box 21769
San Juan, Puerto Rico 00925

Dear Board Members:

We are pleased to submit the results of the annual actuarial valuation of the University of Puerto Rico Retirement System (the System) as of June 30, 2021.

The purpose of this report is to provide a summary of the funded status of the System as of June 30, 2021 and to recommend rates of contribution. While not verifying the data at source, the actuary performed tests for consistency and reasonability.

Since the previous valuation the mortality improvement table has been updated from scale MP-2020 to scale MP-2021.

In the table below, we present the contribution rates and estimated required University contribution amount for fiscal year 2022. For comparison we also present the contribution rates and amounts for fiscal year 2021 based on the 2020 valuation.

Valuation Date	June 30, 2021	June 30, 2020
Recommended Contributions for Fiscal Year	**2022**	**2021**
Total Contribution Rate	48.23%	49.11%
Average Member Contribution Rate	9.00%	8.97%
University Contribution Rate	39.23%	40.14%
Estimated University Contribution ($'s millions)	$ 154.0	$ 163.2
Actuarial Value Assets Funded Status	47.6%	43.7%
Payroll Growth Assumption	0.00%	0.00%

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The promised benefits of the System are included in the actuarially calculated contribution rates, which are developed using the individual entry age normal cost method. A five-year smoothing of the market value of assets is used for actuarial valuation purposes. Gains and losses are reflected in the unfunded accrued liability that is being amortized by regular annual contributions as a level dollar amount over a closed 30-year period, on the assumption that payroll will increase by 0.0% per year and the amortization period will decrease by one year until reaching 0 years. The assumptions recommended by the actuary are, in the aggregate, reasonably related to the experience under the System and to reasonable expectations of anticipated experience under the System.

Future actuarial results may differ significantly from the current results presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Since the potential impact of such factors is outside the scope of a normal annual actuarial valuation, an analysis of the range of results is not presented herein.

In order to prepare the results in this report we have utilized appropriate actuarial models that were developed for this purpose. These models use assumptions about future contingent events along with recognized actuarial approaches to develop the needed results.

The undersigned is a member of the American Academy of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

The Table of Contents, which immediately follows, outlines the material contained in the report.

Respectfully submitted,

Todd B. G

Todd B. Green, ASA, EA, FCA, MAAA
President

1. For convenience of reference, the principal results of the valuation and a comparison with the preceding year's results are summarized in the following table.

SUMMARY OF PRINCIPAL RESULTS

	June 30, 2021	**June 30, 2020**
Number of Active Members	8,252	8,790
Annual Covered Payroll (Salary used for valuation purposes)	$392,498,511	$406,675,782
Number of Retired and Disabled Members and Survivors	9,324	9,359
Annual Benefits	$215,500,780	$218,439,732
Number of Terminated Vested Members	890	755
Number of Non-Vested Terminated Members	5,090	4,951
Total Assets		
Actuarial Value	$1,573,957,130	$1,453,148,609
Market Value	$1,772,586,869	$1,459,232,314
Actuarial Accrued Liability	$3,307,928,535	$3,326,755,832
Unfunded Actuarial Accrued Liability	$1,733,971,405	$1,873,607,223
Actuarial Value Assets Funded Status	47.6%	43.7%
Market Value Assets Funded Status	53.6%	43.9%
CONTRIBUTIONS FOR FISCAL YEAR ENDING	**June 30, 2022**	**June 30, 2021**
Total Contribution Rate:		
Normal (Including Administrative Expenses)	9.87%	9.82%
Unfunded Accrued Liability	38.36%	39.29%
Total Contribution Rate	48.23%	49.11%
Average Member Contribution Rate	9.00%	8.97%
University Contribution Rate	39.23%	40.14%
Amortization Period	23 years	24 years

2. Comments on the valuation results as of June 30, 2021 are given in Section IV and further discussion of the contribution levels is set out in Section V.

3. Schedule B shows the development of the actuarial value of assets. Schedules D and E of this report outline the full set of actuarial assumptions and methods used in the current valuation. The mortality improvement table has been changed to the scale MP-2021.

4. The valuation takes into account the effect of amendments to the System through the valuation date. The Main Provisions of the System, as summarized in Schedule F, were taken into account in the current valuation.

1. Membership data for use in the valuation was furnished by the System. The following table shows the number of active members and their annual compensation for valuation purposes, as of June 30, 2021, on which the valuation was based.

TABLE 1

THE NUMBER AND ANNUAL COMPENSATION OF ACTIVE MEMBERS AS OF JUNE 30, 2021

Number	Compensation	Average Compensation	Average Age	Average Service
8,252	$392,498,511	$47,564	50.9	18.4

2. The following table shows a five-year history of active member valuation data.

TABLE 2

SCHEDULE OF TOTAL ACTIVE MEMBER VALUATION DATA

Valuation Date	Number	Annual Compensation	Average Annual Compensation	% Increase in Average Compensation
6/30/2021	8,252	$392,498,511	$47,564	2.8%
6/30/2020	8,790	406,675,782	46,266	-1.2
6/30/2019	9,140	428,085,691	46,837	-0.6
6/30/2018	9,635	453,802,083	47,099	0.4
6/30/2017	10,204	478,529,460	46,896	0.1

3. The following table shows the number and annual retirement benefits payable to retired members and survivors on the roll of the System as of the valuation date.

TABLE 3

THE NUMBER AND ANNUAL RETIREMENT BENEFITS OF RETIRED MEMBERS AND SURVIVORS OF DECEASED MEMBERS AS OF JUNE 30, 2021

Type of Retirement	Number	Annual Benefits	Average Monthly Benefit	Average Age	Actuarial Liabilities
Retiree	7,691	$195,688,517	$2,120	72.7	$1,901,501,316
Disability	956	$7,739,208	$675	70.4	$65,620,045
Beneficiary	677	$12,073,055	$1,486	73.7	$106,707,017
Total	9,324	$215,500,780	$1,926		$2,073,828,378

4. Schedule G shows the distribution by age and service of the number and annual compensation of active members.

Schedule C shows the additions and deductions for the year preceding the valuation date and a reconciliation of the fund balances at market value. The market value of assets as of June 30, 2021 used to determine the actuarial value of assets is shown below. The market related actuarial value of assets used for the current valuation was $1,573,957,130. Schedule B shows the development of the actuarial value of assets. The following table shows historical asset information. The market value return over the 20-year period shown below was 7.66%.

TABLE 4

HISTORICAL ASSET INFORMATION
(in $1,000s)

Plan Year	Market Value as of June 30	Actuarial Value as of June 30	Benefit Payments	Expenses	University and Member Contribs.	Market Value Yield	Actuarial Value Yield
2021	$1,772,587	$1,573,957	$220,633	$3,578	$189,510	24.1%	10.8%
2020	1,459,232	1,453,149	218,290	3,639	195,663	5.9%	6.8%
2019	1,403,702	1,385,992	207,823	3,751	108,112	7.3%	6.5%
2018	1,408,376	1,401,187	198,247	4,458	109,223	8.2%	9.2%
2017	1,385,630	1,371,979	188,311	4,120	112,244	10.3%	10.2%
2016	1,332,668	1,321,210	182,614	4,075	116,643	4.5%	9.6%
2015	1,342,996	1,272,123	176,872	4,172	123,845	5.8%	12.9%
2014	1,325,365	1,179,752	169,163	3,914	129,589	18.2%	14.6%
2013	1,161,569	1,070,402	162,182	3,777	115,333	15.2%	8.1%
2012	1,055,909	1,039,441	153,890	3,518	114,405	4.5%	4.0%
2011	1,052,467	1,041,628	143,198	3,070	110,823	20.9%	4.8%
2010	902,867	1,028,918	133,113	3,709	112,915	13.0%	1.8%
2009	821,867	1,034,645	124,353	3,935	116,436	-12.7%	2.1%
2008	954,307	1,024,987	118,779	3,640	124,518	-5.0%	7.3%
2007	1,002,117	953,197	110,831	3,443	118,341	14.8%	9.2%
2006	869,349	869,211	105,090	3,263	112,368	7.3%	5.4%
2005	806,229	820,501	100,459	3,781	105,755	8.2%	1.9%
2004	743,761	803,498	94,188	2,675	102,369	11.4%	2.5%
2003	662,518	778,265	89,313	2,420	88,988	4.0%	2.1%
2002	639,813	765,329	84,455	2,105	78,220	-5.6%	12.8%

1. The total valuation balance sheet on account of benefits shows that the System has total prospective benefit liabilities of $3,538,700,205, of which $2,073,828,378 is for the prospective benefits payable on account of present retired members, disabled members and survivors of deceased members, $124,264,034 is for the prospective benefits payable on account of inactive members entitled to future benefits, and $1,340,607,793 is for the prospective benefits payable on account of present active members. Against these benefit liabilities the System has a total present actuarial value of assets of $1,573,957,130 as of June 30, 2021. The difference of $1,964,743,075 between the total liabilities and the total present actuarial value of assets represents the present value of contributions to be made in the future on account of benefits. Of this amount, $219,559,366 is the present value of future contributions expected to be made by members, and the balance of $1,745,183,709 represents future University contributions.

2. The University's contributions to the System consist of normal contributions and unfunded actuarial accrued liability (UAAL) contributions. The valuation indicates that employer normal contributions at the rate of 0.87% of payroll are required. Prospective employer normal contributions have a present value of $11,212,304. When this amount is subtracted from $1,745,183,709, which is the present value of the total future contributions to be made by the employers, there remains $1,733,971,405 as the amount of future UAAL contributions.

3. In accordance with Board Certification No. 9, the accrued liability contribution rate payable on account of retirement benefits has been set at 38.36% of payroll. This rate is sufficient to liquidate the unfunded accrued liability of $1,733,971,405 over 23 years beginning June 30, 2021 on a level dollar basis.

The employer contribution rates according to the Rules and Regulations of the System are shown in the following table.

TABLE 5

	June 30, 2021	June 30, 2020
A. Funding Results		
1. Present Value of Future Benefits	$3,538,700,205	$3,570,196,272
2. Actuarial Value of Assets	1,573,957,130	1,453,148,609
3. PV of Future Contributions (1) – (2)	1,964,743,075	2,117,047,663
4. PV of Future Member Contributions	219,559,366	231,325,503
5. PV of Future University Contributions (3) – (4)	1,745,183,709	1,885,722,160
6. PV of Future University Normal Conts.	11,212,304	12,114,937
7. Unfunded Accrued Liability (5) – (6)	1,733,971,405	1,873,607,223
B. Annual Contribution Rate (% of payroll)		
1.Total		
a. Normal rate (including expenses)	9.87%	9.82%
b. Unfunded accrued liability	38.36%	39.29%
c. Sub-total	48.23%	49.11%
2. Members	9.00%	8.97%
3. University	39.23%	40.14%

CHANGES IN UNFUNDED ACTUARIAL ACCRUED LIABILITIES (UAAL) DURING PLAN YEAR

1) Beginning of Year:	
a) Unfunded Actuarial Accrued Liability	$1,873,607,223
b) Total Normal Cost (including expenses)	35,174,422
c) Expected Total Contributions based on prior valuation contribution rate with Administrative Expenses	195,137,939
d) Actual Total Contributions based on contribution rate applicable to current fiscal year	189,510,018
2) End of Year:	
a) Expected UAAL from previous valuation	$1,835,900,562
[(1a) + (1b)] * 1.0675 – (1c) * 1.03375	
b) Expected UAAL on actual contributions	1,841,718,425
[(1a) + (1b)] * 1.0675 – (1d) * 1.03375	
c) Increase (Decrease) in UAAL due to deficiency (surplus)	5,817,863
(2b) – (2a)	
3) Gains / (Losses) on Year's Activities	
a) Liability – Assumed vs. Actual	$54,992,039
b) Assets – Assumed vs. Actual	58,593,216
c) Change in Plan Assumptions	(5,838,235)
d) Change in Plan Provisions	0
e) Change in Methods	0
f) Total	$107,747,020
4) Actual UAAL at End of Year	$1,733,971,405
(2a) + (2c) – (3f)	

* Expected Total Contributions are based on the Annual Required Contribution (ARC) rate, the average member contribution rate, and annual covered payroll as of the previous valuation date.

GAINS & (LOSSES) IN ACTUARIAL ACCRUED LIABILITIES DURING PLAN YEAR

Type of Activity	Gain (or Loss)
Age & Service Retirements. If members retire at older ages, there is a gain. If younger ages, a loss.	$(23,935,515)
Disability Retirements. If disability claims are less than assumed, there is a gain. If more, a loss.	243,081
Death-in Service Benefits. If survivor claims are less than assumed, there is a gain. If more claims, there is a loss.	(644,725)
Withdrawal From Employment. If more liabilities are released by withdrawals than assumed, there is a gain. If smaller releases, a loss.	48,032,672
Pay Increases. If there are smaller pay increases than assumed, there is a gain. If greater increases, a loss.	1,078,652
New Members. Additional unfunded accrued liability will produce a loss.	(4,497,492)
Contribution Income. If more contributions are received than expected, there is a gain. If less, a loss	(5,817,863)
Investment Income. If there is a greater investment income than assumed, there is a gain. If less income, a loss.	58,593,216
Death After Retirement. If retirees live longer than assumed, there is a loss. If not as long, a gain.	30,845,369
Other. Miscellaneous gains and losses resulting from changes in valuation software, data adjustments, timing of financial transactions, etc.	3,869,997*
Gain (or Loss) During Year From Financial Experience	$107,767,392
Non-Recurring Items. Adjustments for plan amendments, assumptions changes and method changes.	(5,838,235)
Composite Gain (or Loss) During Year	$101,929,157

*Includes gains and losses resulting from database clean up.

Actuarial Standards of Practice are issued by the Actuarial Standards Board and are binding on credentialed actuaries practicing in the United States. These standards generally identify what the actuary should consider, document and disclose when performing an actuarial assignment. In September 2017, Actuarial Standard of Practice Number 51, Assessment and Disclosure of Risk in Measuring Pension Obligations, (ASOP 51) was issued as final with application to measurement dates on or after November 1, 2018. This ASOP, which applies to funding valuations, actuarial projections, and actuarial cost studies of proposed plan changes, was first applicable for the June 30, 2019 actuarial valuation for the System.

A typical retirement plan faces many different risks, but the greatest risk is the inability to make benefit payments when due. If the System's assets are depleted, benefits may not be paid which could create legal and litigation risk or the plan could become "pay as you go." The term "risk" is most commonly associated with an outcome with undesirable results. However, in the actuarial world, risk can be translated as uncertainty. The actuarial valuation process uses many actuarial assumptions to project how future contributions and investment returns will meet the cash flow needs for future benefit payments. Of course, we know that actual experience will not unfold exactly as anticipated by the assumptions and that uncertainty, whether favorable or unfavorable, creates risk. ASOP 51 defines risk as the potential of actual future measurements to deviate from expected results due to actual experience that is different than the actuarial assumptions.

The various risk factors for a given plan can have a significant impact – positive or negative – on the actuarial projection of liability and contribution rates.

There are a number of risks inherent in the funding of a defined benefit plan. These include:

- economic risks, such as investment return and price inflation;
- demographic risks such as mortality, payroll growth, aging population including impact of baby boomers, and retirement ages;
- contribution risk, i.e., the potential for contribution rates to be too high for the plan sponsor/employer to pay and
- external risks such as the regulatory and political environment.

There is a direct correlation between healthy, well-funded retirement plans and consistent contributions equal to the full actuarial contribution rate each year. The System is primarily funded by member and employer contributions to the trust fund, together with the earnings on these accumulated contributions. These contributions fund benefit accruals for current active members and administrative expenses. The remainder of the contributions amortizes the unfunded actuarial accrued liability. The required contribution rate is the sum of the rates for the normal cost for the plan and the amortization of the unfunded actuarial accrued liability. The required contribution rate is sensitive to increases in the UAAL and periods of lower-than-expected returns would lead to much higher contribution rates as a percentage of payroll.

The other significant risk factor for the System is investment return because of the volatility of returns and the size of plan assets compared to payroll. A perusal of historical returns over 10-20 years reveals that the actual return each year is rarely close to the average return for the same period. This is to be expected, given the underlying capital market assumptions and the Plan's asset allocation. To the extent market rates of interest affect the expected return on assets, there is a risk of change to the discount rate which determines the present value of liabilities and actuarial valuation results.

A key demographic risk for the System is improvements in mortality (longevity) greater than anticipated. While the actuarial assumptions reflect a margin for improvement in mortality experience and these assumptions are refined every experience study, the risk arises because there is a possibility of some sudden shift, perhaps from a significant medical breakthrough that could quickly increase liabilities. Likewise, as we have recently seen with COVID-19, a public health crisis can result in a significant number of additional deaths in a short period of time, which can influence plan liabilities and future funding needs. While either of these events could happen, it represents a small probability and thus represents much less risk than the volatility associated with investment returns.

VALUATION BALANCE SHEET
SHOWING THE PRESENT AND PROSPECTIVE ASSETS AND LIABILITIES
AS OF JUNE 30, 2021

PRESENT AND PROSPECTIVE ASSETS		
Actuarial Value of Present Assets		$1,573,957,130
Present Value of Future Member Contributions		$219,559,366
Present Value of Future Employer Contributions		
Normal Contributions	11,212,304	
Unfunded Accrued Liability Contributions	$1,733,971,405	
Total Prospective Employer Contributions		$1,745,183,709
Total Present and Prospective Assets		$3,538,700,205
ACTUARIAL LIABILITIES		
Present Value of Benefits Payable on Account of Retired Members and Survivors of Deceased Members Now Drawing Retirement Benefits		$2,073,828,378
Present Value of Prospective Benefits Payable on Account of Inactive Members		$124,264,034
Present Value of Prospective Benefits Payable on Account of Present Active Members:		
Service Retirement Benefits	$1,280,935,179	
Disability Retirement Benefits	$17,131,484	
Death Benefits	$9,795,636	
Separation Benefits	$32,745,494	
Total		$1,340,607,793
Total Actuarial Liabilities		$3,538,700,205

SCHEDULE OF FUNDING PROGRESS

Actuarial Valuation Date	Value of Plan Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded AAL (UAAL) (b – a)	Funded Ratio (a / b)	Covered Payroll (c)	UAAL as a Percentage of Covered Payroll ((b – a) / (c))
6/30/2021	$1,573,957,130	$3,307,928,535	$1,733,971,405	47.6%	$392,498,511	441.8%
6/30/2020	1,453,148,609	3,326,755,832	1,873,607,223	43.7	406,675,782	460.7%
6/30/2019	1,385,992,022	3,236,419,538	1,850,427,516	42.8	428,085,691	432.3%
6/30/2018	1,401,187,212	3,207,632,525	1,806,445,313	43.7	453,802,083	398.1%
6/30/2017	1,371,979,452	2,807,476,917	1,435,497,465	48.9	478,529,460	300.0%
6/30/2016	1,321,209,628	2,762,852,807	1,441,643,179	47.8	488,774,924	295.0%

SUMMARY OF ASSUMPTIONS AND METHODS

Valuation Date	June 30, 2021
Actuarial Cost Method	Individual Entry Age Normal
Amortization Method	Level dollar, closed
Asset Valuation Method	5-Year Smoothed Market
Actuarial Assumptions:	
Investment rate of return*	6.75%
Projected salary increases*	2.75%
Cost-of-living adjustments	None
*Includes inflation at	2.40%

DEVELOPMENT OF THE JUNE 30, 2021 ACTUARIAL VALUE OF ASSETS

	Valuation date June 30:	2017	2018	2019	2020	2021
A.	Actuarial Value Beginning of Year	$1,321,209,628	$1,371,979,452	$1,401,187,212	$1,385,992,022	$1,453,148,609
B.	Market Value End of Year	1,385,629,773	1,408,375,956	1,403,702,320	1,459,232,314	1,772,586,869
C.	Market Value Beginning of Year	1,332,667,782	1,385,629,773	1,408,375,956	1,403,702,320	1,459,232,314
	Audit Adjustment	0	5,870,247	0	0	0
	Adjusted Market Value Beginning of Year	1,332,667,782	1,391,500,020	1,408,375,956	1,403,702,320	1,459,232,314
D.	Cash Flow					
	D1. Contributions	112,244,122	109,223,431	108,111,563	195,662,930	189,510,018
	D2. Benefit Payments	(188,310,782)	(198,246,775)	(207,822,961)	(218,289,504)	(220,632,884)
	D3. Administrative Expenses	(4,172,828)	(4,457,620)	(3,750,583)	(3,639,007)	(3,578,199)
	D4. Investment Expenses	0	0	0	0	0
	D5. Net	(80,239,488)	(93,480,964)	(103,461,981)	(26,265,581)	(34,701,065)
E.	Investment Income					
	E1. Market Total: B.-C.-D5.	133,201,479	116,227,147	98,788,345	81,795,575	348,055,620
	E2. Assumed Rate	7.75%	6.75%	6.75%	6.75%	6.75%
	E3. Amount for Immediate Recognition	100,172,473	104,218,864	91,573,535	93,863,443	97,327,020
	E4. Amount for Phased-In Recognition	33,029,006	12,008,283	7,214,810	(12,067,868)	250,728,600
F.	Phased-In Recognition of Investment Income					
	F1. Current Year: 0.20*E4.	6,605,801	2,401,657	1,442,962	(2,413,574)	50,145,720
	F2. First Prior Year	(8,478,121)	6,605,801	2,401,657	1,442,962	(2,413,574)
	F3. Second Prior Year	(5,279,043)	(8,478,121)	6,605,801	2,401,657	1,442,962
	F4. Third Prior Year	23,219,566	(5,279,043)	(8,478,121)	6,605,801	2,401,657
	F5. Fourth Prior Year	14,768,636	23,219,566	(5,279,043)	(8,478,121)	6,605,801
	F6. Total Recognized Investment Gain	30,836,839	18,469,860	(3,306,744)	(441,275)	58,182,566
G.	Actuarial Value End of Year:					
	A.+D5.+E3.+F6.	$1,371,979,452	$1,401,187,212	$1,385,992,022	$1,453,148,609	$1,573,957,130
H.	Difference Between Market & Actuarial Values	$ 13,650,321	$ 7,188,744	$ 17,710,298	$ 6,083,705	$ 198,629,739
I.	Market Value Rate of Return	10.31%	8.21%	7.28%	5.88%	24.14%
J.	Actuarial Value Rate of Return	10.23% [1]	9.26% [1]	6.54% [1]	6.80% [1]	10.83% [1]

[1] Reflects phase-in of 5-year "smoothed" market value of assets.

SUMMARY OF CHANGES IN NET ASSETS
FOR THE YEAR ENDING JUNE 30, 2021

Additions for the Year		
Contributions		
Members	$29,153,522	
University	$160,356,496	
Other	$ 0	
Total		$189,510,018
Net Investment Income		$348,055,620
TOTAL		$537,565,638
Deductions for the Year		
Benefit Payments	($220,632,884)	
Administrative Expenses	($3,578,199)	
TOTAL		($224,211,083)
Excess of Additions Over Deductions		
TOTAL		$313,354,555
Reconciliation of Asset Balances		
Market Value of Assets as of June 30, 2020		$1,459,232,314
Audit Adjustment		$0
Excess of Additions over Deductions		$313,354,555
Market Value of Assets as of June 30, 2021*		$1,772,586,869

* The Market Value of Assets shown above is used in the determination of the Actuarial Value of Assets (Schedule B).

INVESTMENT RATE OF RETURN: 6.75% per annum, compounded annually (net of investment expenses).

INFLATION ASSUMPTION: 2.40% per year.

ADMINISTRATIVE EXPENSE ASSUMPTION: Actual prior year expenses

PERCENT MARRIED: 80% of employees are assumed to be married, and wives are assumed to be the same age as their husbands.

ACTUARIAL METHOD: Individual Entry Age Normal cost method. Actuarial gains and losses are reflected in the unfunded actuarial accrued liability. The unfunded actuarial accrued liability is amortized over a closed 30-year period beginning June 30, 2014. See Schedule E for a detailed explanation.

DECREMENTS:

- **PRE-RETIREMENT MORTALITY:** Pub 2010 Teachers Employees Amount-Weighted Mortality Table, projected generationally using scale MP-2021.
- **POST-RETIREMENT HEALTHY MORTALITY:** Pub 2010 Teachers Retirees Amount-Weighted Mortality Table, projected generationally using scale MP-2021.
- **POST-RETIREMENT DISABLED MORTALITY:** Pub 2010 Teachers Disabled Retirees Amount-Weighted Mortality Table, projected generationally using scale MP-2021.
- **BENEFICIARY MORTALITY:** Pub 2010 Teachers Amount-Weighted Contingent Survivors Mortality Table, projected generationally using scale MP-2021.

- **DISABILITY:** Representative values are presented below (65% of the projected disabilities are assumed to be due to occupational causes).

Age	Men	Women
20	0.007%	0.007%
25	0.020%	0.020%
30	0.037%	0.037%
35	0.053%	0.053%
40	0.070%	0.070%
45	0.105%	0.105%
50	0.140%	0.140%
55	0.210%	0.210%
60	0.140%	0.140%

- **TERMINATION:** Assumed rates are presented below.

Years of Service	Rate
0	25.0%
1	22.0%
2	16.0%
3	11.5%
4	9.0%
5	7.0%
6	4.5%
7	4.0%
8	3.5%
9	3.0%
10	2.5%
11-15	2.0%
16+	1.0%

- **RETIREMENT:** Representative values are presented below.

Members with Less than 25 Years of Service as of July 1, 2015:

Age	Less than 25 Years of Service	25 Years of Service or More, but Less than 30	30 Years of Service	31 or More Years of Service
45			9.5%	9.5%
50			9.5%	9.5%
55		5%	15%	15%
58	5%	5%	45%	25%
60	5%	5%	45%	25%
61	10%	10%	45%	25%
62	11%	11%	45%	25%
63	10%	10%	45%	25%
64	10%	10%	45%	25%
65	20%	20%	50%	30%
66	15%	15%	50%	30%
67	15%	15%	50%	30%
68	15%	15%	50%	30%
69	15%	15%	50%	30%
70+	100%	100%	100%	100%

Members with 25 or More Years of Service as of July 1, 2015:

Age	Less than 25 Years of Service	25 Years of Service or More, but Less than 30	30 or More Years of Service
45			9.5%
50			9.5%
55		5.0%	42.0%
58	5.0%	5.0%	32.0%
60	5.0%	5.0%	26.0%
61	9.0%	9.0%	20.7%
62	9.9%	9.9%	25.2%
63	9.0%	9.0%	25.2%
64	9.0%	9.0%	25.2%
65	18.0%	18.0%	25.2%
66	13.5%	13.5%	27.0%
67	13.5%	13.5%	27.0%
68	13.5%	13.5%	27.0%
69	13.5%	13.5%	27.0%
70+	100.0%	100.0%	100.0%

ASSETS: The method of valuing assets is intended to recognize a "smoothed" market value of assets. Under this method, the difference between actual return on market value from investment experience and the expected return on market value is recognized over a 5-year period.

SALARY INCREASES: 2.75% per annum

1. The valuation is prepared on the projected benefit basis, which is used to determine the present value of each member's expected benefit payable at retirement, disability or death. The calculations are based on the member's age, years of service, sex, compensation, expected future salary increases, and an assumed future interest earnings rate (currently 6.75%). The calculations consider the probability of a member's death or termination of employment prior to becoming eligible for a benefit and the probability of the member terminating with a service, disability, or survivor's benefit. The present value of the expected benefits payable to active members is added to the present value of the expected future payments to current benefit recipients to obtain the present value of all expected benefits payable to the present group of members and survivors.

2. The employer contributions required to support the benefits of the System are determined using the individual entry age normal cost method. Under this method, the actuarial present value of the projected benefits of each individual included in the valuation is allocated as a level percentage of the individual's projected compensation between entry age and assumed exit.

   The portion of the actuarial present value allocated to a valuation year is called the normal cost. The normal cost is calculated for each individual member. The normal cost rate is defined as the total of the individual normal cost divided by the total annual covered payroll.

   The portion of the actuarial present value not provided for at a valuation date by the sum of (a) the actuarial value of assets and (b) the actuarial present value of future normal cost is called the Unfunded Actuarial Accrued Liability (UAAL). The UAAL is amortized as a level percentage of the projected salaries of the present and future members of the System, over a 30-year period beginning June 30, 2014 on a closed basis.

1. Provisions applicable to those members who had completed 20 years of service by July 1, 1979 (Certification 7/7 Supplemented)

a) Service retirement annuity payable:

i. After 30 years of service; or

ii. At age 58 after 10 years of service; or

iii. At age 55 after 25 years of service.

b) Amount of service retirement annuity:

i. Before age 65 – member with at least 30 years of service: 75% of average compensation if age 55 at beginning date; 65% if under age 55. If member completed 30 years of service before July 1973, annuity is increased by 2% of average compensation for each year of service beyond 30 and before July 1973, but to not more than 85% of average compensation.

ii. Before age 65 – member with less than 30 years of service: 1.50% of average compensation per year of service for member with 20 or fewer years. Percentage increased by 0.05% for each year in excess of 20 years up to a maximum of 1.95% of average compensation per year of service. Amount reduced by ½% for each month member is under age 58 at time annuity begins.

iii. After age 65 – same as before age 65.

iv. Minimum annuity: $250 per month.

v. Average compensation means the average for the highest-paid 36 months of service without limit on compensation.

vi. Employee contributions:

- Complete supplementation: 7.00% of compensation.
- Coordinated: 4.00% up to $4,200 of compensation plus 6.50% of compensation in excess of $4,200.

2. Provisions applicable to all members who were affected under Certification 37 and who had not completed 20 years of service by July 1, 1979 plus those members who entered the system on or after July 1, 1978 and who did not elect Certification 55 or 94 and did not elect full supplementation under Certification 54 (Certification 37/37 Coordinated)

a) Service retirement annuity payable:

i. After 30 years of service and age 55; or

ii. At age 58 after 10 years of service; or

iii. At age 55 after 25 years of service.

b) Amount of service retirement annuity:

i. Before age 65 – member with at least 30 years of service: 75% of average compensation. Amount reduced by ½% for each month member is under age 58 at time annuity begins.

ii. Before age 65 – member with less than 30 years of service: 1.50% of average compensation per year of service for member with 20 or fewer years. Percentage increased by 0.05% for each year in excess of 20 years up to a maximum of 1.95% of average compensation per year of service. Amount reduced by ½% for each month member is under age 58 at time annuity begins.

iii. After age 65 – Benefit is coordinated. Annuity is reduced by ½% of average compensation not in excess of the Social Security wage base in effect at retirement for each year of service up to 30 years. If member was under age 58 at beginning date, the coordination adjustment is made before application of ½% reduction per month under 58.

iv. Minimum annuity: $250 per month.

v. Average compensation means the average for the highest-paid 36 months of service, excluding that portion of compensation in any year which is in excess of $35,000.

vi. Employee contributions for coordinated benefit: 5.00% of compensation up to maximum salary of $35,000 for members with 25 or more years of service as of July 1, 2015, and 6.00% of compensation up to maximum salary of $35,000 for members with less than 25 years of service as of July 1, 2015.

3. Provision applicable to all members who were affected by Certification 37 and who had not completed 20 years of service by July 1, 1979 as well as those members who entered the system on or after July 1, 1978 and later elected Certification 55 or those who elected full supplementation under Certification 54 (but not Certification 94) (Certification 55/55 Coordinated)

a) Service retirement annuity payable:

i. After 30 years of service; or
ii. At age 58 after 10 years of service; or
iii. At age 55 after 25 years of service.

b) Amount of service retirement annuity:

i. Before age 65 – member with at least 30 years of service: 75% of average compensation. Amount reduced by $^1/_3$% for each month member is under age 58 at time annuity begins if member had less than 25 years of service as of July 1, 2015 and reduced from age 55 for members with 25 or more years of service as of July 1, 2015.

ii. Before age 65 – member with less than 30 years of service: 1.50% of average compensation per year of service for member with 20 or fewer years. Percentage increased by 0.05% for each year in excess of 20 years up to a maximum of 1.95% of average compensation per year of service. Amount reduced by $^1/_3$% for each month member is under age 58 at time annuity begins if member had less than 25 years of service as of July 1, 2015 and reduced from age 55 for members with 25 or more years of service as of July 1, 2015.

iii. After age 65 – if member elected full supplementation, annuity is the same as before age 65. Otherwise, annuity is reduced by ½% of average compensation at time of retirement multiplied by years of service up to 30 years.

iv. Minimum annuity: $250 per month.

v. Average compensation means the average for the highest-paid 36 months of service, excluding that portion of compensation in any year which is in excess of $35,000.

vi. Employee contributions:

1. Complete supplementation: 7.00% of compensation up to $35,000 for members with 25 or more years of service as of July 1, 2015.
2. Complete supplementation: 8.00% of compensation up to $35,000 for members with less than 25 years of service as of July 1, 2015.
3. Coordinated: For members with 25 or more years of service as of July 1, 2015, 4% up to $4,200 of compensation plus 6.50% of the excess up to the compensation limit of $35,000. For members with less than 25 years of service as of July 1, 2015, 5% up to $4,200 of compensation plus 6.50% of the excess up to the compensation limit of $35,000.

4. For those entering between January 1, 1990 and June 30, 1998 who did not elect Certification 94 (Certification 55/55 Supplemented)

a) Service retirement annuity payable:

i. After 30 years of service; or
ii. At age 58 after 10 years of service; or
iii. At age 55 after 25 years of service.

b) Amount of service retirement annuity:

i. Before age 65 – member with at least 30 years of service: 75% of average compensation. Amount reduced by $^{1}/_{3}$% for each month member is under age 58 at time annuity begins if member had less than 25 years of service as of July 1, 2015 and reduced from age 55 for members with 25 or more years of service as of July 1, 2015.

ii. Before age 65 – member with less than 30 years of service: 1.50% of average compensation per year of service for member with 20 or fewer years. Percentage increased by 0.05% for each year in excess of 20 years up to a maximum of 1.95% of average compensation per year of service. Amount reduced by $^{1}/_{3}$% for each month member is under age 58 at time annuity begins if member had less than 25 years of service as of July 1, 2015 and reduced from age 55 for members with 25 or more years of service as of July 1, 2015.

iii. After age 65 – Same as before age 65.

iv. Minimum annuity: $250 per month.

v. Average compensation means the average for the highest-paid 36 months of service, excluding that portion of compensation in any year which is in excess of $35,000.

vi. Employee contributions:
- All completely supplemented: 8.00% of compensation up to compensation limit of $35,000 for members with 25 or more years of service as of July 1, 2015.
- All completely supplemented: 9.00% of compensation up to compensation limit of $35,000 for members with less than 25 years of service as of July 1, 2015.

5. Certification 94

a) Increase compensation up to $50,000.

b) Those electing coverage under the above certification agree to pay 9.00% of compensation up to $50,000 for members with 25 or more years of service as of July 1, 2015, and 10.00% of compensation up to maximum salary of $50,000 for members with less than 25 years of service as of July 1, 2015.

6. Certification 139

a) Increase compensation up to a $60,000 maximum. The $60,000 cap was increased by 3.00% every two years until 7/1/2014. Effective 7/1/2014, the maximum compensation is frozen at $69,557.

b) Those electing coverage under the above certification agree to pay 11.00% of compensation up to the applicable indexed maximum for members with 25 or more years of service as of July 1, 2015, and 12% of compensation up to the applicable indexed maximum for members with less than 25 years of service as of July 1, 2015 (see (a) above).

c) Effective July 1, 2015, all new employees will be covered under this certification and will pay 12.00% of compensation up to the applicable indexed maximum (see (a) above).

7. Disability Benefits

a) A disability retirement annuity is payable upon:

i. Disability due to occupational causes, regardless of service, or

ii. Disability due to non-occupational causes after 15 years of service. If member is also eligible for a service retirement annuity, benefit payable is the higher of the two.

b) Amount of disability retirement annuity:

i. Before age 65 – If service connected, 50% of rate of salary (subject to applicable salary cap) at retirement. If not service connected, 90% of the member's regular retirement benefit payable by the applicable retirement benefit formula above.

ii. After age 65 – Reduced to amount payable by the applicable retirement benefit formula above. However, if post 65 retirement benefit plus Primary Social Security benefit is less than pre 65 disability benefit, then post 65 benefit is adjusted (increased) by the amount necessary to match pre 65 disability benefit.

iii. Minimum annuity: $250 per month.

8. Vested Benefits

A member whose employment terminates after ten (10) years of service, and who does not withdraw his contributions, receives a retirement annuity payable beginning at age 60 based on the applicable retirement formula above.

9. Non-vested Termination Benefits

If termination of employment occurs prior to completing ten (10) years of service, member is entitled only to a refund of his/her own contributions. Refund of a member's own contributions can also be obtained after attainment of ten (10) years of service but in that event the vested benefit is forfeited.

10. Pre-retirement Death Benefits

a) A pre-retirement death benefit is payable upon:

i. A service-connected death, or

ii. A non-service-connected death.

b) Amount of pre-retirement death benefit:

i. The widow of a deceased member whose death is service connected receives an annuity of 50% of final salary (subject to applicable salary cap), plus $10 per month for each child under age 18 (21 if at school) or disabled. If no annuity is paid to widow, $20 per month per eligible child. Widow receives annuity until death or remarriage. Maximum family benefit is 75% of final salary (subject to applicable salary cap).

If there is no surviving widow or eligible children, a lump sum amount equal to the member's contributions plus one year's final salary (subject to applicable salary cap), but not less than $6,000, will be payable to the employee's designated beneficiary.

ii. Should the member's death be non-service connected then a lump sum amount is paid which is equal to the member's contributions plus one year's final salary (subject to applicable salary cap), but not less than $6,000.

11. Post-retirement Death Benefits

Member contributions are refunded to the extent that they exceed retirement payments already made unless a reversionary annuity was elected. Minimum payment is $600. In addition, 50% of retirement annuity is payable to the surviving spouse until death, remarriage, or until the spouse begins to receive Social Security benefits. Minimum annuity, $75 per month; maximum annuity, $150 per month.

12. Reversionary Annuity

Member may elect to receive a reduced annuity in order to provide a lifetime benefit after death to a spouse or relative. The benefit to the spouse or relative may be as low as $25 per month or as high as 100% of the member's reduced annuity. This option is not permitted if member retires on a disability annuity.

13. Christmas Bonus

A $400 annual bonus is given to all retired participants.

SCHEDULE OF ACTIVE MEMBER DATA
AS OF JUNE 30, 2021

	Completed Years of Service								
Age	Under 5	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30+	Total	Payroll
Under 20	1	0	0	0	0	0	0	1	14,220
20 to 24	47	0	0	0	0	0	0	47	736,724
25 to 29	231	30	0	0	0	0	0	261	4,964,124
30 to 34	161	219	15	0	0	0	0	395	10,216,712
35 to 39	166	215	134	55	3	0	0	573	20,293,480
40 to 44	113	234	179	375	120	2	0	1,023	39,975,832
45 to 49	90	153	167	304	426	136	0	1,276	56,767,274
50 to 54	74	102	130	285	404	389	66	1,450	69,320,870
55 to 59	46	86	106	200	343	401	220	1,402	73,614,559
60 to 64	27	35	68	108	189	317	251	995	57,692,246
65 to 69	12	24	31	43	78	95	198	481	33,721,227
70+	5	8	12	30	29	48	216	348	25,181,242
Total	973	1,106	842	1,400	1,592	1,388	951	8,252	392,498,511

Average Active Age: **50.9**

Average Service: **18.4**

DISTRIBUTION OF ACTIVE PARTICIPANTS BY PENSION ELIGIBILITY, CONTRIBUTORY MAXIMUM, AND PLAN TYPE

Pension Eligibility Certification	Contributory Maximum Certification	Employee Contribution Wage Base	Plan Type	Participant Count @ 6/30/2021	Participant Count @ 6/30/2020
Cert. #7	Cert. #7	None	Coordinated	-	-
Cert. #55	Cert. #55	None	Coordinated	5	-
Cert. #55	Cert. #55	$35,000	Coordinated	20	24
Cert. #37	Cert. #37	$35,000	Coordinated	308	363
Cert. #55	Cert. #55	$35,000	Supplemented	1,446	1,574
Cert. #7	Cert. #7	None	Supplemented	3	1
Cert. #37	Cert. #94	$50,000	Coordinated	40	40
Cert. #55	Cert. #94	$50,000	Supplemented	3,464	3,654
Cert. #55	Cert. #94	$50,000	Coordinated	13	13
Cert. #37	Cert. #139*	$69,557	Coordinated	42	41
Cert. #55	Cert. #139*	$69,557	Coordinated	12	9
Cert. #55	Cert. #139*	$69,557	Supplemented	2,899	3,071
				8,252	8,790

*Effective 7/1/2014, the Certification 139 contribution wage base is frozen at $69,557.

DATA RECONCILIATION
AS OF JUNE 30, 2021

	Active	Terminated Vested	Receiving Benefits	Total
1. Number of Participants as of June 30, 2020	**8,790**	**755**	**9,359**	**18,904**
2. Change in status during the plan year:				
a. Active to inactive	(261)	261		
b. Active to retiree	(142)		142	
c. Inactive to active	41	(40)		
d. Inactive to retired		(8)	8	
e. Retired to active	3		(3)	
3. No longer participating due to:				
a. Death	(1)		(298)	(299)
b. Termination / Refund	(492)	(78)	(11)	(581)
c. Deletion of duplicate data				
d. Data adjustment				
4. New participant due to:				
a. Initial participation	153			153
b. Omitted in error last year				
c. Pickups and Corrections	161	1	124	286
d. New beneficiaries			3	3
5. Number of Participants as of June 30, 2021	**8,252**	**891**	**9,324**	**18,467**

ESTIMATED PROJECTED BENEFIT PAYMENTS*

Year End	Current In-Pay	Current Not-In-Pay	Total
2022	$218,560,719	$16,767,052	$235,327,771
2023	213,835,925	26,231,749	240,067,674
2024	208,947,932	35,429,593	244,377,525
2025	203,988,731	43,804,742	247,793,473
2026	199,005,398	52,087,043	251,092,441
2027	193,844,218	60,664,836	254,509,054
2028	188,593,405	69,159,268	257,752,673
2029	183,099,976	77,189,331	260,289,307
2030	177,429,417	85,155,441	262,584,858
2031	171,689,953	93,047,045	264,736,998
2032	165,758,249	100,922,860	266,681,109
2033	159,664,349	108,466,114	268,130,463
2034	153,442,507	115,451,366	268,893,873
2035	147,054,305	122,036,495	269,090,800
2036	140,503,804	128,224,682	268,728,486
2037	133,750,384	133,859,901	267,610,285
2038	126,947,056	138,911,055	265,858,111
2039	119,992,281	143,234,938	263,227,219
2040	112,947,449	146,743,171	259,690,620
2041	105,840,219	149,219,443	255,059,662
2042	98,704,794	151,071,595	249,776,389
2043	91,585,166	152,422,817	244,007,983
2044	84,506,158	153,330,079	237,836,237
2045	77,545,598	153,797,173	231,342,771
2046	70,741,243	153,763,794	224,505,037

***Amounts shown are the cash flows for current members only, based on the current benefit structure and assuming that all actuarial assumptions are met each year. To the extent that actual experience deviates from that expected, results will vary. Amounts are shown in future nominal dollars and have not been discounted to the valuation date. Does not include refunds to current non-vested inactive members.