

The Water and Power Employees' Retirement Plan of the City of Los Angeles

Actuarial Valuation and Review

As of July 1, 2022



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

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September 23, 2022

Board of Administration
The Water and Power Employees' Retirement Plan of the City of Los Angeles
111 North Hope Street, Room 357
Los Angeles, CA 90012

Dear Board Members:

We are pleased to submit this Actuarial Valuation and Review as of July 1, 2022. It summarizes the actuarial data used in the valuation, analyzes the preceding year's experience, and establishes the funding requirements for fiscal year 2022-2023.

This report was prepared in accordance with generally accepted actuarial principles and practices at the request of the Board to assist in administering the Retirement Plan. The census information and financial information on which our calculations were based was prepared by the Retirement Office. That assistance is gratefully acknowledged.

The actuarial calculations were directed under the supervision of Eva Yum, FSA, MAAA, Enrolled Actuary. We are members of the American Academy of Actuaries and we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of our knowledge, the information supplied in this actuarial valuation is complete and accurate. Further, in our opinion, the assumptions as approved by the Board are reasonably related to the experience of and the expectations for the Plan.

We look forward to reviewing this report at your next meeting and to answering any questions.

Sincerely,

Segal

A handwritten signature in black ink, appearing to read "Paul Angelo", written over a horizontal line.

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

A handwritten signature in black ink, appearing to read "Eva Yum", written over a horizontal line.

Eva Yum, FSA, EA, MAAA
Vice President and Actuary

ST/jl

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Section 1: Actuarial Valuation Summary

Purpose and Basis

This report was prepared by Segal to present a valuation of The Water and Power Employees' Retirement Plan of the City of Los Angeles ("the Plan") as of July 1, 2022. The valuation was performed to determine whether the assets and contribution rates are sufficient to provide the prescribed benefits. The measurements shown in this actuarial valuation may not be applicable for other purposes. In particular, the measures herein are not necessarily appropriate for assessing the sufficiency of current Plan assets to cover the estimated cost of settling the Plan's accrued benefit obligations.

Future actuarial measurements may differ significantly from the current measurements 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; and changes in plan provisions or applicable law.

The contribution requirements presented in this report are based on:

- The benefit provisions of the pension plan, as administered by the Board;
- The characteristics of covered active members, inactive vested members, and retired members and beneficiaries as of March 31, 2022, provided by the Retirement Office;
- The assets of the Plan as of June 30, 2022, provided by the Retirement Office;
- Economic assumptions regarding future salary increases and investment earnings adopted by the Retirement Board for the July 1, 2022 valuation;
- Other actuarial assumptions regarding employee terminations, retirement, death, etc. adopted by the Retirement Board for the July 1, 2022 valuation; and
- The funding policy adopted by the Retirement Board.

In preparing this valuation, we have employed generally accepted actuarial methods and assumptions to evaluate the Plan's assets, liabilities and future contribution requirements. Our calculations are based upon member data and financial information provided to us by the Retirement Office. This information has not been audited by us, but it has been reviewed and found to be consistent, both internally and with prior year's information.

Section 1: Actuarial Valuation Summary

The contribution requirements are determined as a percentage of payroll. The employer rates provide for both Normal Cost and a contribution to amortize any unfunded or overfunded actuarial accrued liabilities. In this valuation, we have applied the funding policy adopted by the Board on May 18, 2000 and most recently amended on December 18, 2019. Details of the funding policy are provided in *Section 4, Exhibit 1* on page 68.

A schedule of current amortization balances and payments may be found in *Section 3, Exhibit G* on page 55. A graphical projection of the Unfunded Actuarial Accrued Liability (UAAL) amortization balances and payments has been included in *Section 3, Exhibit H* starting on page 56.

The rates calculated in this report may be adopted by the Board for the fiscal year that extends from July 1, 2022 through June 30, 2023.

Section 1: Actuarial Valuation Summary

Valuation Highlights

- Pgs. 28, 31, 62
1. The results of this valuation reflect changes in the actuarial assumptions as recommended by Segal and adopted by the Board for the July 1, 2022 valuation. These changes were documented in our Actuarial Experience Study and are also outlined in *Section 4, Exhibit 1* of this report. These assumption changes resulted in an increase in the aggregate required contribution rate (all tiers combined) of 7.22% of payroll. The assumption changes also increased the Unfunded Actuarial Accrued Liability (UAAL) by \$682.9 million. Of the various assumption changes, the most significant cost impact is from the change to the investment return assumption from 7.00% to 6.50% per annum, offset somewhat by the change in the inflation assumption from 2.75% to 2.50% and the changes in mortality assumptions.
- Pgs. 28, 55-57
2. The Actuarial Accrued Liability exceeds the Actuarial Value of Assets, resulting in a UAAL of \$318 million as of July 1, 2022, which is an increase from \$120 million in the previous valuation. The Board's funding policy determines the Department's required contribution as the normal cost increased or offset by a UAAL amortization charge or credit. Under this funding policy, the Plan's UAAL is amortized over various 15-year periods, each beginning with the year that each portion or base of the UAAL was first identified and amortized. A reconciliation of the Plan's UAAL is provided in *Section 2, Subsection E*. A schedule of the current UAAL amortization amounts is provided in *Section 3, Exhibit G*. A graphical projection of the UAAL amortization bases and payments is provided in *Section 3, Exhibit H*.
- Pgs. 35-36
3. The funded ratio (the ratio of the Actuarial Value of Assets to Actuarial Accrued Liability) is 98.03%, compared to the prior year funded ratio of 99.20%. This ratio is one measure of funding status, and its history is a measure of funding progress. The funded ratio measured on a market value basis is 96.18%, compared to 111.05% as of the prior valuation date. These measurements are not necessarily appropriate for assessing the sufficiency of Plan assets to cover the estimated cost of settling the Plan's benefit obligation or the need for, or the amount of, future contributions. A history of the funded ratio for the Plan is provided in *Section 2, Subsection G*.
- Pgs. 30-34
4. The aggregate required contribution rate increased from 26.04% to 29.84% of payroll for the 2022-2023 plan year; those contributions are estimated to be \$390.8 million. This increase is primarily due to changes in actuarial assumptions and individual salary increases greater than expected, offset somewhat by an investment return on actuarial value (i.e., after asset smoothing) higher than the 7.00% rate assumed in the prior valuation, actual 7/1/2021 cost-of-living adjustments (COLAs) for retirees and beneficiaries lower than expected, and the increase in total payroll reducing the UAAL contribution rate. Under the Plan's funding policy, the required contribution rate continues to be larger than the mandatory 110% matching of the employee contribution for Tier 1. A complete reconciliation of the aggregate required contribution rate is provided in *Section 2, Subsection F*.
- Pgs. 23-25, 28, 31
5. The market value of assets earned a return of (5.4)% for the July 1, 2021 to June 30, 2022 plan year. The Actuarial Value of Assets earned a return of 8.1% for the July 1, 2021 to June 30, 2022 plan year due to the deferral of most of the current year investment loss and the recognition of prior investment gains and losses. This resulted in an actuarial gain of \$155.0 million when measured

Section 1: Actuarial Valuation Summary

against the assumed rate of return of 7.00% for 2021-2022. This actuarial investment gain decreased the aggregate required contribution by 1.25% of payroll.

- Pgs. 22, 28 6. The net actuarial gain from investment and contribution experience is \$189.5 million, or 1.22% of Actuarial Accrued Liability. The net experience gain from sources other than investment and contribution experience was 0.23% of the Actuarial Accrued Liability. This gain was primarily due to lower than expected COLA increases for retirees and beneficiaries and higher than expected mortality, offset to some extent by greater than expected individual salary increases for actives.
- Pgs. 28, 31 7. The salaries for continuing actives increased on average by 6.9% from the amounts in effect on March 31, 2021 to the amounts in effect on March 31, 2022. Since this increase is greater than the average assumed rate of approximately 5.6%, the plan experienced an actuarial loss from individual salary experience. This loss amounted to \$58.0 million for the current year, which increased the aggregate required contribution by 0.47% of payroll. There was also a gain from cost-of-living adjustments (COLAs) for retirees and beneficiaries less than assumed which amounted to \$92.3 million, decreasing the aggregate required contribution rate by 0.75% of payroll.
- Pgs. 20-21 8. The net total unrecognized return (i.e., the difference between the market value of assets and the “smoothed” actuarial value of assets) changed by \$2.08 billion during the plan year, from a \$1.78 billion unrecognized net investment gain in 2021 to a \$298 million unrecognized net investment loss in 2022. This net deferred investment loss will be recognized in the determination of the Actuarial Value of Assets for funding purposes over the next four years. This means that, if the Plan earns the assumed rate of investment return of 6.50% per year (net of expenses) on a market value basis, then the net deferred losses will be recognized over the next four years as shown in the footnote in the Determination of Actuarial Value of Assets chart in *Section 2, Subsection B*.
9. The unrecognized net investment losses of \$298 million represent about 1.9% of the Market Value of Assets. Unless offset by future investment gains or other favorable experience, the recognition of the \$298 million in net market losses is expected to have an impact on the Plan’s future funded ratio and the aggregate required contributions. This potential impact may be illustrated as follows:
- a. If the net deferred losses were recognized immediately in the Actuarial Value of Assets, the funded percentage would decrease from 98.0% to 96.2%.
For comparison purposes, if all the deferred gains in the July 1, 2021 valuation had been recognized immediately in the July 1, 2021 valuation, the funded percentage would have increased from 99.2% to 111.1%.
- b. If the net deferred losses were recognized immediately in the Actuarial Value of Assets, the aggregate required contribution rate would increase from 29.8% of covered payroll to 32.2% of covered payroll.
For comparison purposes, if all the deferred gains in the July 1, 2021 valuation had been recognized immediately in the July 1, 2021 valuation, the aggregate employer contribution rate would have decreased from 26.0% of covered payroll to 10.7% of covered payroll.

Section 1: Actuarial Valuation Summary

Pg. 27 10. In this valuation, there were refinements made to the normal cost calculation and the valuation program. These refinements increased the normal cost slightly, with an offsetting decrease in the actuarial accrued liability. These refinements also decreased the present value of benefits slightly. These changes result in a net decrease in the aggregate required employer contribution rate of 0.21% of payroll.

Pg. 42 11. Actuarial Standard of Practice No. 51 (ASOP 51) requires actuaries to identify and assess risks that “may reasonably be anticipated to significantly affect the plan’s future financial condition”. Examples of key risks listed that are particularly relevant to WPERP are asset/liability mismatch risk, investment risk, and longevity risk. The standard also requires an actuary to consider if there is any ongoing contribution risk to the plan, however it does not require the actuary to evaluate the particular ability or willingness of contributing entities to make contributions when due, nor does it require the actuary to assess the likelihood or consequences of future changes in applicable law.

The actuary’s assessment can be qualitative or quantitative (e.g., based on numerical demonstrations). The actuary may use non-numerical methods for assessing risks that might take the form of commentary about potential adverse experience and the likely effect on future results. While the standard does not require that every valuation include a quantitative risk assessment, the actuary may recommend that a more detailed risk assessment be performed. When making that decision, the actuary will take into account such factors as the Plan’s design, maturity, size, funded status, asset allocation, cash flow, possible insolvency and current market conditions.

Because the actuarial valuation results are dependent on a fixed set of assumptions and data as of a specific date, there is risk that emerging results may differ, perhaps significantly, as actual experience is fluid and will not exactly track current assumptions. This potential divergence may have a significant impact on the future financial condition of the plan. We have not been engaged to perform a detailed analysis of the potential range of the impact of risk relative to the Plan’s future financial condition, but have included a brief discussion of some key risks that may affect the Plan in *Section 2, Subsection L*. A more detailed assessment of the risks would provide the Board with a better understanding of the inherent risks and is recommended. This assessment would further discuss and highlight information and risks particular to WPERP such as detailed historical experience and key events, growing plan maturity, heightened contribution sensitivity to asset and liability changes, and projected sensitivity to potential future investment returns.

12. Segal strongly recommends an actuarial funding method that targets 100% funding of the actuarial accrued liability. Generally, this implies payments that are ultimately at least enough to cover normal cost, interest on the unfunded actuarial accrued liability and the principal balance. The funding policy adopted by the Board meets this standard.
13. The actuarial valuation report as of July 1, 2022 is based on financial information as of that date. Changes in the value of assets subsequent to that date, to the extent that they exist, are not reflected. Declines in asset values will increase the actuarial cost of the plan, while increases will decrease the actuarial cost of the plan.

Section 1: Actuarial Valuation Summary

14. It is important to note that this actuarial valuation is based on plan assets as of June 30, 2022. Due to the COVID-19 pandemic, market conditions have changed significantly since the onset of the Public Health Emergency. The Plan's funded status does not reflect short-term fluctuations of the market, but rather is based on the market values on the last day of the Plan Year. Moreover, this actuarial valuation is based on Plan data as of March 31, 2022 (adjusted to June 30, 2022 by adding 3 months of age, service and interest on contribution balance, and increasing benefit by the assumed July 1 COLA for members in pay status) and it does not include any possible short-term or long-term impacts on mortality of the covered population that may emerge after March 31, 2022. While it is impossible to determine how the pandemic will affect market conditions and other demographic experience of the Plan in future valuations, Segal is available to prepare projections of potential outcomes upon request.

Section 1: Actuarial Valuation Summary

Summary of Key Valuation Results

		July 1, 2022		July 1, 2021	
		Total Rate	Estimated Annual Dollar Amount	Total Rate	Estimated Annual Dollar Amount
Required Contribution for plan year beginning July 1: ¹	• Tier 1 & Tier 2 Combined (aggregate)	29.84%	\$390,821,605	26.04%	\$321,160,361
	• Tier 1	34.41%	251,698,419	30.15%	225,376,234
	• Tier 2	24.06%	139,123,186	19.72%	95,784,127
				July 1, 2022	July 1, 2021
Actuarial Accrued Liability as of July 1:	• Retired members and beneficiaries			\$9,628,733,394	\$8,889,505,418
	• Inactive vested members ²			265,177,322	243,126,270
	• Active members			6,236,198,041	5,876,185,878
	• Total Actuarial Accrued Liability			16,130,108,757	15,008,817,566
	• Total Normal Cost (beginning of year) for plan year beginning July 1			322,734,117	277,243,581
Assets as of July 1:	• Market Value of Assets (MVA)			\$15,513,924,394	\$16,667,463,956
	• Actuarial Value of Assets (AVA)			15,812,000,418	14,889,255,775
	• Actuarial Value of Assets as a percentage of Market Value of Assets			101.9%	89.3%
Funded status as of July 1:	• Unfunded/(Overfunded) Actuarial Accrued Liability on Market Value of Assets basis			\$616,184,363	(\$1,658,646,390)
	• Funded percentage on MVA basis			96.18%	111.05%
	• Unfunded Actuarial Accrued Liability on Actuarial Value of Assets basis			\$318,108,339	\$119,561,791
	• Funded percentage on AVA basis			98.03%	99.20%
Key assumptions as of July 1:	• Net investment return			6.50%	7.00%
	• Price inflation			2.50%	2.75%
	• Cost of living adjustments				
	– Tier 1			2.75%	2.75%
	– Tier 2			2.00%	2.00%

¹ Required contributions are assumed to be paid at the middle of every year.

² Includes terminated members due a refund of member contributions and members receiving Permanent Total Disability (PTD) benefits.

Section 1: Actuarial Valuation Summary

Summary of Key Valuation Results (continued)

		July 1, 2022	July 1, 2021	Change From Prior Year
Demographic data as of July 1:	Active Members			
	• Number of members	10,799	10,605	1.8%
	• Average age	46.5	46.7	-0.2
	• Average service	13.3	13.8	-0.5
	• Total projected compensation	\$1,309,850,320	\$1,233,265,179	6.2%
	• Average projected compensation	121,294	116,291	4.3%
	Retired Members and Beneficiaries:			
	• Number of members:			
	– Retired members	7,760	7,621	1.8%
	– Beneficiaries	1,956	1,943	0.7%
	– Total	9,716	9,564	1.6%
	• Average age	74.3	74.3	0.0
	• Average monthly benefit	\$6,273	\$6,060	3.5%
	Inactive Vested Members:			
	• Number of members ¹	1,735	1,708	1.6%
	• Average Age	51.8	52.0	-0.2
	Total Members:	22,250	21,877	1.7%

¹ Includes terminated members due a refund of member contributions and members receiving Permanent Total Disability (PTD) benefits.

Section 1: Actuarial Valuation Summary

Important Information About Actuarial Valuations

An actuarial valuation is a budgeting tool with respect to the financing of future projected obligations of a pension plan. It is an estimated forecast – the actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

In order to prepare a valuation, Segal relies on a number of input items. These include:

Plan of benefits	Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. Even where they appear precise, outside factors may change how they operate. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan summary included in our report to confirm that Segal has correctly interpreted the plan of benefits.
Participant data	An actuarial valuation for a plan is based on data provided to the actuary by the Retirement Office. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.
Assets	The valuation is based on the Market Value of Assets as of the valuation date, as provided by the Retirement Office. The Plan uses an “Actuarial Value of Assets” that differs from market value to gradually reflect year-to-year changes in the Market Value of Assets in determining the contribution requirements.
Actuarial assumptions	In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, termination, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan’s assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results, that does not mean that the previous assumptions were unreasonable.
Models	Segal valuation results are based on proprietary actuarial modeling software. The actuarial valuation models generate a comprehensive set of liability and cost calculations that are presented to meet regulatory, legislative and client requirements. Our Actuarial Technology and Systems unit, comprised of both actuaries and programmers, is responsible for the initial development and maintenance of these models. The models have a modular structure that allows for a high degree of accuracy, flexibility and user control. The client team programs the assumptions and the plan provisions, validates the models, and reviews test lives and results, under the supervision of the responsible actuary.

Section 1: Actuarial Valuation Summary

The user of Segal's actuarial valuation (or other actuarial calculations) should keep the following in mind:

The actuarial valuation is prepared at the request of the WPERP. Segal is not responsible for the use or misuse of its report, particularly by any other party.

An actuarial valuation is a measurement of the plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan. Future contribution requirements may differ from those determined in the valuation because of:

- Differences between actual experience and anticipated experience;
- Changes in actuarial assumptions or methods;
- Changes in plan provisions

If the WPERP is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.

Segal does not provide investment, legal, accounting, or tax advice. Segal's valuation is based on our understanding of applicable guidance in these areas and of the plan's provisions, but they may be subject to alternative interpretations. The WPERP should look to their other advisors for expertise in these areas.

As Segal has no discretionary authority with respect to the management or assets of the WPERP, it is not a fiduciary in its capacity as actuaries and consultants with respect to the WPERP.

Section 2: Actuarial Valuation Results

A. Member Data

The Actuarial Valuation and Review considers the number and demographic characteristics of covered members, including active members, inactive vested members, retired members and beneficiaries.

This section presents a summary of significant statistical data on these member groups.

More detailed information for this valuation year and the preceding valuation can be found in *Section 3, Exhibits A, B, and C.*

Member Population: 2013 – 2022

Year Ended June 30	Active Members	Inactive Vested Members ¹	Retired Members and Beneficiaries ²	Total Non-Actives	Ratio of Non-Actives to Actives	Ratio of Retired Members and Beneficiaries to Actives
2013	8,913	1,555	8,642	10,197	1.14	0.97
2014	8,960	1,484	8,739	10,223	1.14	0.98
2015	9,205	1,528	8,843	10,371	1.13	0.96
2016	9,348	1,612	9,265	10,877	1.16	0.99
2017	9,806	1,648	9,272	10,920	1.11	0.95
2018	10,114	1,728	9,165	10,893	1.08	0.91
2019	10,362	1,663	9,315	10,978	1.06	0.90
2020	10,778	1,690	9,443	11,133	1.03	0.88
2021	10,605	1,708	9,564	11,272	1.06	0.90
2022	10,799	1,735	9,716	11,451	1.06	0.90

¹ Includes terminated members due a refund of member contributions and members receiving PTD benefits.

² Starting in the 2018 valuation, assignee records for Options B and C were combined with the benefit for the corresponding retired members. Before 2018, these assignee records were separate from the corresponding retired member records.

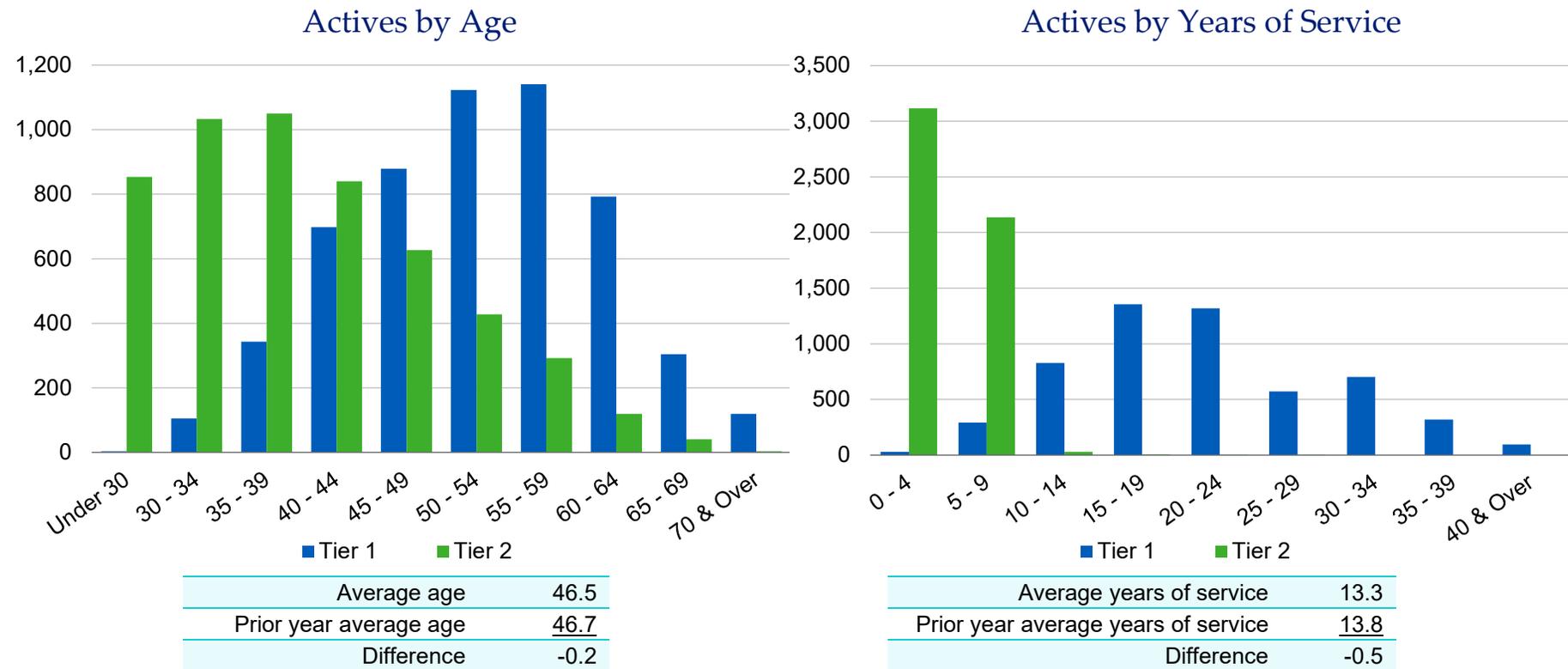
Section 2: Actuarial Valuation Results

Active Members

Plan costs are affected by the age, years of service and compensation of active members. In this year's valuation, there were 10,799 active members with an average age of 46.5, average years of service of 13.3 years and average compensation of \$121,294. The 10,605 active members in the prior valuation had an average age of 46.7, average service of 13.8 years and average compensation of \$116,291.

Among the active members, there were none with unknown age information.

Distribution of Active Members as of July 1, 2022



Inactive Members

In this year's valuation, there were 1,735 members with a vested right to a deferred or immediate vested benefit or entitled to a return of their employee contributions, versus 1,708 in the prior valuation.

Section 2: Actuarial Valuation Results

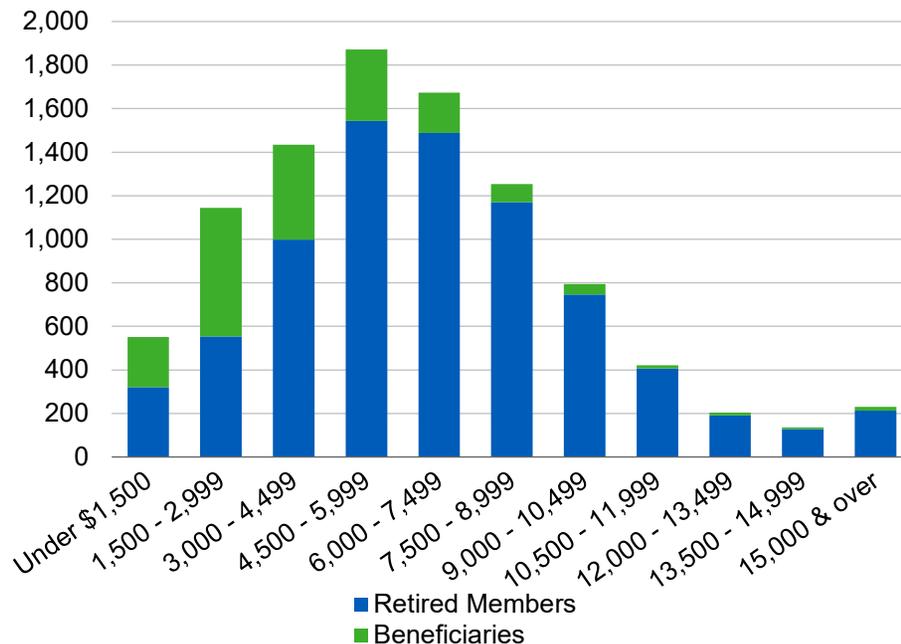
Retired Members and Beneficiaries

As of July 1, 2022, 7,760 retired members and 1,956 beneficiaries were receiving total monthly benefits of \$60,952,218. For comparison, in the previous valuation, there were 7,621 retired members and 1,943 beneficiaries receiving monthly benefits of \$57,954,433.

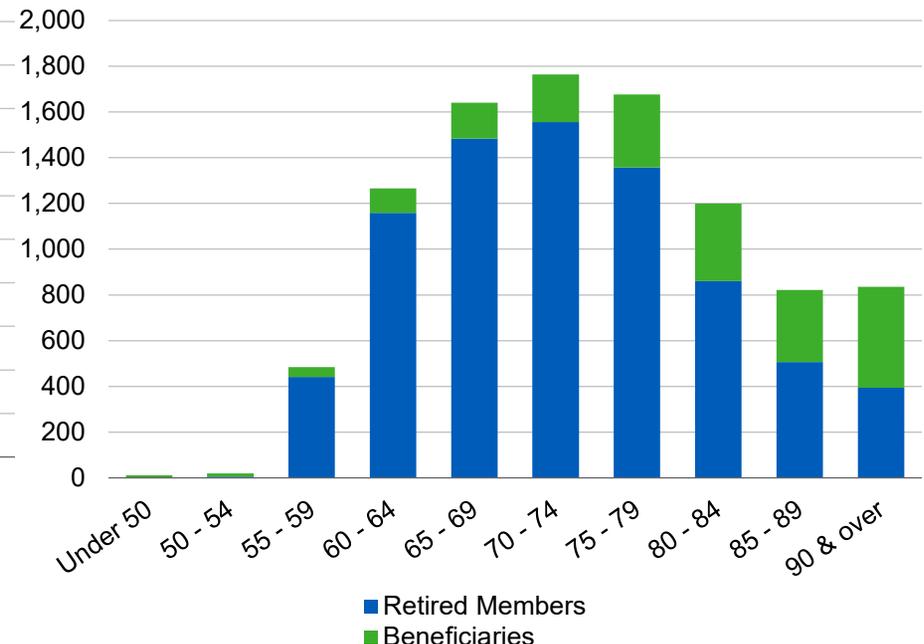
As of July 1, 2022, the average monthly benefit for retired members and beneficiaries is \$6,273, compared to \$6,060 in the previous valuation. The average age for retired members and beneficiaries is 74.3 in the current valuation, compared with 74.3 in the prior valuation.

Distribution of Retired Members and Beneficiaries as of July 1, 2022

Retired Members and Beneficiaries
by Type and Monthly Amount



Retired Members and Beneficiaries
by Type and Age



Section 2: Actuarial Valuation Results

Historical Plan Population

The chart below demonstrates the progression of the active population over the last ten years. The chart also shows the growth among the retired population over the same time period.

Member Data Statistics: 2013 – 2022

Year Ended June 30	Active Members			Retired Members and Beneficiaries		
	Count	Average Age	Average Service	Count	Average Age	Average Monthly Amount
2013	8,913	49.3	18.4	8,642	74.9	\$4,339
2014	8,960	49.3	18.3	8,739	74.8	4,526
2015	9,205	48.9	17.6	8,843	74.7	4,679
2016	9,348	48.0	16.3	9,265	74.4	4,861
2017	9,806	47.9	15.7	9,272	74.5	4,972
2018	10,114	47.5	15.1	9,165	74.6	5,251
2019	10,362	47.2	14.6	9,315	74.5	5,483
2020	10,778	46.7	13.9	9,443	74.5	5,763
2021	10,605	46.7	13.8	9,564	74.3	6,060
2022	10,799	46.5	13.3	9,716	74.3	6,273

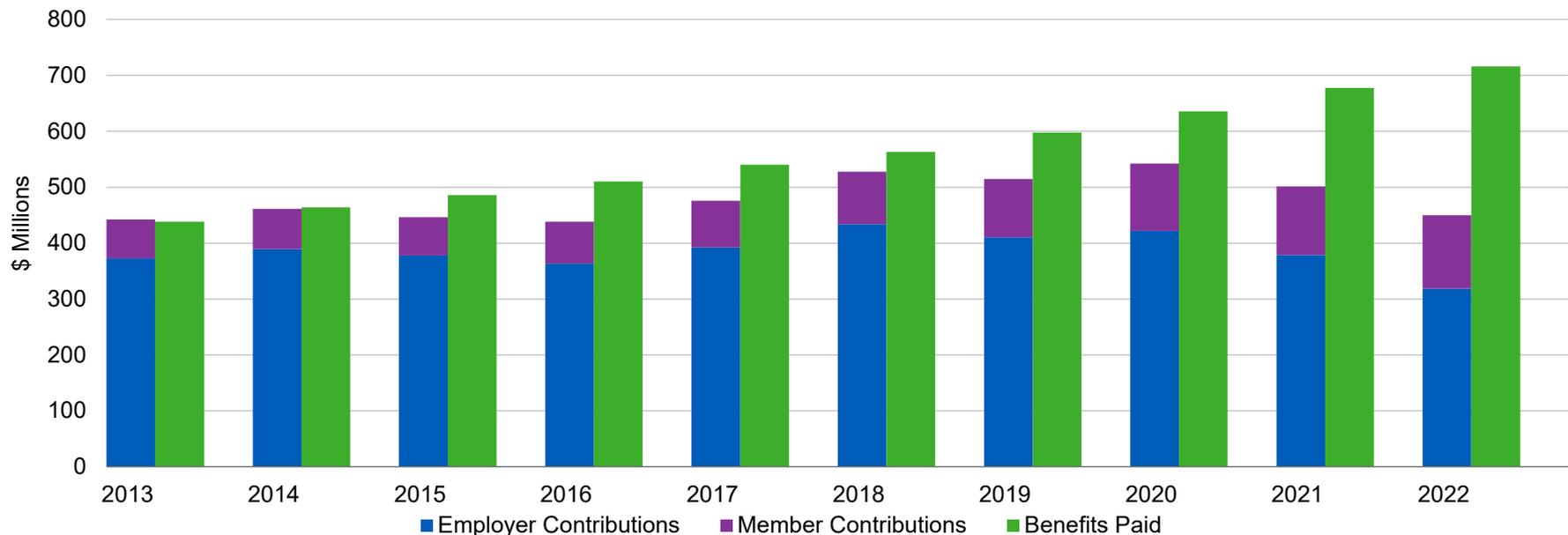
Section 2: Actuarial Valuation Results

B. Financial Information

Retirement plan funding anticipates that, over the long term, both contributions and investment earnings (less investment fees) will be needed to cover benefit payments. Retirement plan assets change as a result of the net impact of these income and expense components. Additional financial information, including a summary of transactions for the valuation year, is presented in *Section 3, Exhibits D, E, and F*.

It is desirable to have level and predictable plan costs from one year to the next. For this reason, the Board has approved an asset valuation method that gradually adjusts to market value. Under this valuation method, the full value of market fluctuations is not recognized in a single year and, as a result, the valuation asset value and the plan costs are more stable. The amount of the adjustment to recognize market value is treated as income, which may be positive or negative. Realized and unrealized gains and losses are treated equally and, therefore, the sale of assets has no immediate effect on the actuarial value.

Comparison of Contributions Made with Benefits for Years Ended July 1, 2013 – 2022



Section 2: Actuarial Valuation Results

Determination of Actuarial Value of Assets

1 Market Value of Assets as of June 30, 2022							\$15,513,924,394
2		Total Actual Market Return (net)	Expected Market Return (net)	Investment¹ Gain (Loss)	Deferred Factor	Deferred Return²	
a.	Year ended June 30, 2018	\$998,777,227	\$818,967,517	\$179,809,710	0.0	\$0	
b.	Year ended June 30, 2019	791,832,113	887,122,330	(95,290,217)	0.2	(19,058,043)	
c.	Year ended June 30, 2020	459,024,099	905,861,985	(446,837,886)	0.4	(178,735,154)	
d.	Year ended June 30, 2021	3,489,200,333	928,619,010	2,560,581,323	0.6	1,536,348,794	
e.	Year ended June 30, 2022	(888,348,728)	1,157,440,798	(2,045,789,526)	0.8	(1,636,631,621)	
f.	Total unrecognized return ³					\$(298,076,024)	
3 Actuarial Value of Assets as of June 30, 2022 (1) – (2f)							<u>\$15,812,000,418</u>
4	Actuarial Value of Assets as a percentage of Market Value of Assets (3) ÷ (1)						101.9%

¹ Total return minus expected return on a market value basis.

² Recognition at 20% per year over 5 years.

³ Deferred return as of June 30, 2022 recognized in each of the next four years:

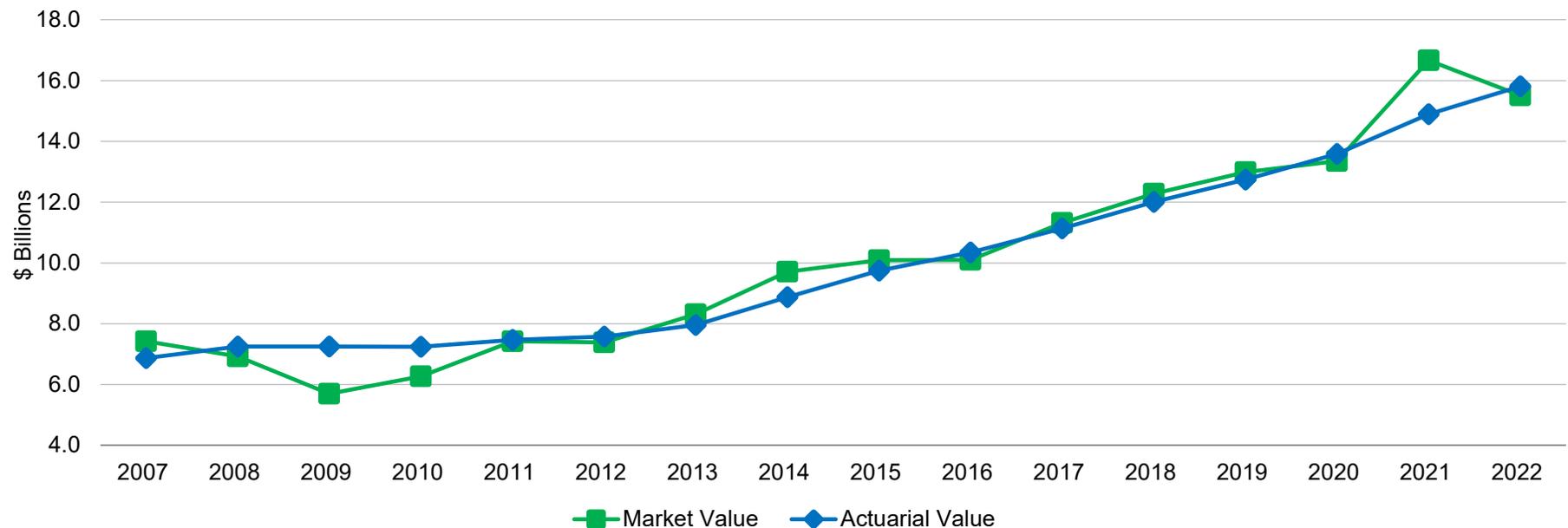
a.	Amount recognized during 2022/2023	\$(5,467,260)
b.	Amount recognized during 2023/2024	13,590,781
c.	Amount recognized during 2024/2025	102,958,360
d.	Amount recognized during 2025/2026	<u>(409,157,905)</u>
e.	Total unrecognized return as of June 30, 2022	\$(298,076,024)

Section 2: Actuarial Valuation Results

The Market Value and Actuarial Value of Assets are representations of the WPERP's financial status. As investment gains and losses are gradually taken into account, the Actuarial Value of Assets tracks the Market Value of Assets. The Actuarial Value of Assets is significant because the WPERP's liabilities are compared to these assets to determine what portion, if any, remains unfunded. Amortization of the Unfunded Actuarial Accrued Liability is an important element in determining the contribution requirement.

Note that in the chart below, the Actuarial Value of Assets prior to June 30, 2020 are exclusive of a small portion of the General Reserve (and Reserve for Investment Gains and Losses prior to June 30, 2017) while that Reserve is included in the Market Value of Assets.

Market Value and Actuarial Value of Assets as of June 30, 2007 – 2022



Section 2: Actuarial Valuation Results

C. Actuarial Experience

To calculate the required contribution, assumptions are made about future events that affect the amount and timing of benefits to be paid and assets to be accumulated. Each year actual experience is measured against the assumptions. If overall experience is more favorable than anticipated (an actuarial gain), the contribution requirement will decrease from the previous year. On the other hand, the contribution requirement will increase if overall actuarial experience is less favorable than expected (an actuarial loss).

Taking account of experience gains or losses in one year without making a change in assumptions reflects the belief that the single year's experience was a short-term development and that, over the long term, experience will return to the original assumptions. For contribution requirements to remain stable, assumptions should approximate experience.

If assumptions are changed, the contribution requirement is adjusted to take into account a change in experience anticipated for all future years.

The total gain is \$225.2 million, which includes \$155.0 million from investment gains, a gain of \$34.5 million from contribution experience and \$35.7 million in gains from all other sources. The net experience variation from individual sources other than investments and contributions was 0.23% of the Actuarial Accrued Liability. A discussion of the major components of the actuarial experience is on the following pages.

Actuarial Experience for Year Ended June 30, 2022

1	Net gain from investments ¹	\$154,969,252
2	Net gain from contribution experience ²	34,538,099
3	Net gain from other experience ³	<u>35,733,831</u>
4	Net experience gain: 1 + 2 + 3	\$225,241,182

¹ Details on next page.

² Includes member contributions toward service purchases and Additional Annuity program contributions. The increase in liability due to service purchases and Additional Annuity program contributions is included in (3) *Net gain from other experience*.

³ See *Section 2, Subsection E* for further details. Does not include the effect of plan, method or assumption changes, if any.

Section 2: Actuarial Valuation Results

Investment Experience

A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on the WPERP's investment policy. The rate of return on the Market Value of Assets was (5.37)% for the year ended June 30, 2022.

For valuation purposes, the assumed rate of return on the Actuarial Value of Assets was 7.00% for the 2021-2022 plan year (based on the July 1, 2021 valuation). The actual rate of return on an actuarial basis for the 2021-2022 plan year was 8.05%. Since the actual return for the year was more than the assumed return, the WPERP experienced an actuarial gain during the year ended June 30, 2022 with regard to its investments.

Investment Experience for Year Ended June 30, 2022

	Market Value	Actuarial Value
1 Net investment income	\$(888,348,728)	\$1,187,935,477
2 Average value of assets	16,534,868,539	14,756,660,358
3 Rate of return: 1 ÷ 2	(5.37)%	8.05%
4 Assumed rate of return	7.00%	7.00%
5 Expected investment income: 2 x 4	<u>\$1,157,440,798</u>	<u>\$1,032,966,225</u>
6 Actuarial gain/(loss): 1 - 5	\$(2,045,789,526)	\$154,969,252

Section 2: Actuarial Valuation Results

Because actuarial planning is long term, it is useful to see how the assumed investment rate of return has followed actual experience over time. The chart below shows the rate of return on an actuarial basis compared to the actual market value investment return for the last ten years, including averages over select time periods.

Investment Return – Market Value and Actuarial Value: 2013 – 2022

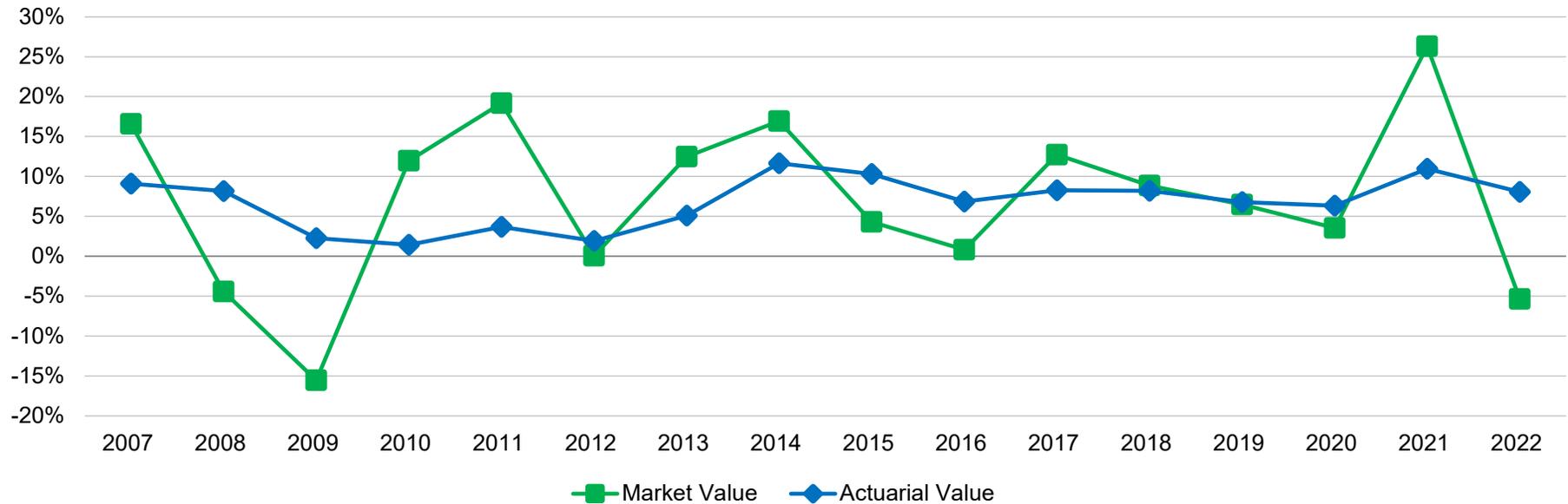
Year Ended June 30	Net Interest and Dividend Income		Recognition of Capital Appreciation		Actuarial Value Investment Return		Market Value Investment Return	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
2013	\$173,531,364	2.29%	\$211,568,037	2.79%	\$385,099,401	5.08%	\$922,455,661	12.48%
2014	165,507,432	2.08	760,631,032	9.56	926,138,464	11.64	1,406,480,292	16.93
2015	156,994,160	1.77	755,549,754	8.53	912,543,914	10.30	416,474,352	4.30
2016	146,128,493	1.50	520,157,840	5.36	666,286,333	6.86	82,810,914	0.82
2017	177,862,393	1.72	676,239,873	6.56	854,102,266	8.28	1,281,254,293	12.73
2018	187,896,485	1.69	723,985,458	6.51	911,881,943	8.20	998,777,227	8.84
2019	219,107,479	1.83	591,868,832	4.95	810,976,311	6.78	791,832,113	6.47
2020	200,449,228	1.58	605,392,310	4.77	805,841,538	6.35	459,024,099	3.55
2021	193,417,986	1.43	1,285,161,681	9.52	1,478,579,667	10.95	3,489,200,333	26.30
2022	<u>228,669,490</u>	1.55	<u>959,265,987</u>	6.50	<u>1,187,935,477</u>	8.05	<u>(888,348,728)</u>	(5.37)
Total	\$1,849,564,510		\$7,089,820,804		\$8,939,385,314		\$8,959,960,556	
					Most recent five-year average return	8.11%		7.32%
					Most recent ten-year average return	8.24%		8.01%

Note: Each year's yield is weighted by the average asset value in that year.

Section 2: Actuarial Valuation Results

Section 2, Subsection B described the actuarial asset valuation method that gradually recognizes fluctuations in the market value rate of return. The goal of this is to stabilize the actuarial rate of return and to produce more level pension plan costs.

Market and Actuarial Rates of Return for Years Ended June 30, 2007 – 2022



Section 2: Actuarial Valuation Results

Contributions

Contributions for the year ended June 30, 2022 totaled \$450.8 million, compared to the projected amount of \$417.4 million. This resulted in a gain of \$34.5 million for the year, when adjusted for timing. The \$34.5 million contribution gain includes \$38.3 million member contributions to Additional Annuity Program and a \$3.8 million contribution loss due to actual contributions less than expected for the Retirement Plan, both adjusted for interest to the end of the year.

Non-Investment Experience

There are other differences between the expected and the actual experience that appear when the new valuation is compared with the projections from the previous valuation. These include:

- the extent of turnover among participants,
- retirement experience (earlier or later than projected),
- mortality (more or fewer deaths than projected),
- salary increases (greater or smaller than projected),
- service increases (greater or smaller than projected),
- cost-of-living adjustments (COLAs) higher or lower than anticipated, and
- increase in liability due to Additional Annuity Program contributions.

The net gain from this other experience for the year ended June 30, 2022 amounted to \$35.7 million, which is 0.23% of the Actuarial Accrued Liability. This gain was mainly due to lower than expected COLA increases for retirees and beneficiaries and higher than expected mortality, offset to some extent by greater than expected individual salary increases for actives. See *Subsection E* for a detailed development of the Unfunded Actuarial Accrued Liability.

Section 2: Actuarial Valuation Results

D. Other Changes in the Actuarial Accrued Liability

Actuarial Assumptions

- The assumption changes reflected in this report were based on the July 1, 2018 through June 30, 2021 Actuarial Experience Study report dated May 20, 2022.
 - These changes increased the Actuarial Accrued Liability by about \$682.9 million (or a 4.42% increase) and increased the Normal Cost by 1.62% of payroll (an increase of about 6.78%).
 - The assumption changes include changes for inflation, investment return, merit and promotion salary increases, retirement from active employment, percent married, pre-retirement mortality, healthy life post-retirement mortality, disabled life mortality, beneficiary mortality, termination (vested and ordinary), disability, and future service accruals.
- Details on actuarial assumptions and methods are in *Section 4, Exhibit 1*.

Plan Provisions

- There were no changes in plan provisions since the prior valuation.
- A summary of plan provisions is in *Section 4, Exhibit 2*.

Methodology Changes

- We have included the following refinements in the June 30, 2022 valuation:
 - In the normal cost calculation, we have included pre-employment eligibility service for certain members when determining when the members are expected to be eligible to receive benefits.
 - We have used recently provided information on combined service credit for determining the applicable retirement factor under the retirement benefit formulas. In previous valuations, Department service was used as an estimate for combined service credit.
 - We have reflected the optional form for Additional Annuity for certain retirees whose Additional Annuity optional form is different from the optional form for their normal pension.
- These refinements slightly decreased the present value of benefits (about \$19 million), slightly increased the normal cost rate and decreased the actuarial accrued liability. These changes result in a net decrease in the aggregate required employer contribution rate of 0.21% of payroll.

Section 2: Actuarial Valuation Results

E. Development of Unfunded Actuarial Accrued Liability

Development for Year Ended June 30, 2022

1	Unfunded Actuarial Accrued Liability at beginning of year	\$119,561,791
2	Total Normal cost at beginning of year	277,243,581
3	Expected employer and employee contributions	(417,446,922)
4	Interest	
	a. For whole year on 1 + 2	27,776,376
	b. For half year on 3	<u>(14,610,642)</u>
	c. Total interest	<u>13,165,734</u>
5	Expected Unfunded Actuarial Accrued Liability at end of year	\$(7,475,816)
6	Changes due to:	
	a. Investment return greater than expected (after asset smoothing)	\$(154,969,252)
	b. Actual contributions less than expected in item 3 ¹	3,783,836
	c. Member contributions to Additional Annuity Program ²	(38,321,935)
	d. Individual salary increases higher than expected	57,991,153
	e. 2021 COLA increases lower than expected	(92,327,599)
	f. Mortality higher than expected	(27,828,600)
	g. Other experience loss ³	26,431,215
	h. Methodology changes ⁴	(132,113,077)
	i. Assumption changes	<u>682,938,414</u>
	Total changes	<u>325,584,155</u>
7	Unfunded Actuarial Accrued Liability at end of year	\$318,108,339

Note: The sum of items 6d through 6g equals the “Net gain from other experience” shown in *Section 2, Subsection C*.

Notes are provided on the next page.

Section 2: Actuarial Valuation Results

Notes

1. Includes member contributions toward service purchases. The increase in liability due to service purchases is included in (6g) *Other experience loss*.
2. The offsetting increase in liability due to member contributions to Additional Annuity Program is included in (6g) *Other experience loss*.
3. Other differences in actual versus expected experience including (but not limited to) retirement, disability, termination and service purchases, as well as increases in liability from member contributions to Additional Annuity Program.
4. We have included the following refinements in the June 30, 2022 valuation:
 - a. In the normal cost calculation, we have included pre-employment eligibility service for certain members when determining when the members are expected to be eligible to receive benefits.
 - b. We have used recently provided information on combined service credit for determining the applicable retirement factor under the retirement benefit formulas. In previous valuations, Department service was used as an estimate for combined service credit.
 - c. We have reflected the optional form for Additional Annuity for certain retirees whose Additional Annuity optional form is different from the optional form for their normal pension.

These refinements slightly decreased the present value of benefits (about \$19 million), slightly increased the normal cost rate and decreased the actuarial accrued liability. These changes result in a net decrease in the aggregate required employer contribution rate of 0.21% of payroll, as shown on page 31.

Section 2: Actuarial Valuation Results

F. Required Contribution

The required Department contribution is equal to (a) the employer Normal Cost and (b) the amortization of the Unfunded or Overfunded Actuarial Accrued Liability. For this year, amortization bases were created for the actuarial gain during the plan year ending June 30, 2022 and for the changes in actuarial assumptions. This produces a net total amortization charge of \$156,602,059.

Under the current funding policy, the Department's required contribution rate increased as a percentage of pay. This was mainly the result of changes in actuarial assumptions and individual salary increases greater than expected, offset somewhat by an investment return on actuarial value (i.e., after asset smoothing) higher than the 7.00% assumed rate, actual 7/1/2021 cost-of-living adjustments (COLAs) for retirees and beneficiaries lower than expected, and the increase in total payroll reducing the UAAL contribution rate.

The Board sets the funding policy used to calculate the required contribution based on layered amortization periods. See *Section 4, Exhibit 1* for further details on the elements of the funding policy.

The contribution requirements as of July 1, 2022 are based on the data previously described, the actuarial assumptions and Plan provisions described in Section 4, including all changes affecting future costs adopted at the time of the actuarial valuation, actuarial gains and losses, and changes in the actuarial assumptions.

The chart below shows the required Department contribution for the total Plan. At the end of this subsection, the development of the aggregate required contribution is shown, along with similar information for Tier 1 and Tier 2 separately.

Aggregate Required Contribution for Year Beginning July 1, 2022

	Amount	% of Payroll
1 Total normal cost	\$322,734,117	24.64%
2 Expected employee contributions	<u>100,816,462</u>	<u>7.70%</u>
3 Employer normal cost: 1 - 2	\$221,917,655	16.94%
4 Amortization of Unfunded Actuarial Accrued Liability	156,602,059	11.96%
5 Total required contribution: 3 + 4, adjusted for timing¹	<u>\$390,821,605</u>	<u>29.84%</u>
6 Projected compensation	\$1,309,850,320	

¹ Required contributions are assumed to be paid at the middle of every year.

Section 2: Actuarial Valuation Results

Reconciliation of Aggregate Required Contribution Rate

The chart below details the changes in the aggregate required employer contribution rate from the prior valuation to the current year's valuation.

Reconciliation of Aggregate Required Contribution Rate from July 1, 2021 to July 1, 2022

	Contribution Rate
1 Aggregate Required Contribution Rate as of July 1, 2021	26.04%
2 Effect of investment return greater than expected (after asset smoothing)	(1.25)%
3 Effect of actual contributions less than expected ¹	0.03%
4 Effect of member contributions to Additional Annuity Program ²	(0.31)%
5 Effect of individual salary increases higher than expected	0.47%
6 Effect of 2021 COLA increases lower than expected	(0.75)%
7 Effect of mortality higher than expected	(0.23)%
8 Effect of changes in member demographics (including increase in Tier 2 membership) on Normal Cost	(0.50)%
9 Effect of net other experience losses ³	0.22%
10 Effect of increase in total payroll on UAAL amortization rate	(0.63)%
11 Effect of the 2007 UAAL layer becoming fully amortized	(0.26)%
12 Effect of methodology changes ⁴	(0.21)%
13 Effect of assumption changes	<u>7.22%</u>
14 Total change	3.80%
15 Aggregate Required Contribution Rate as of July 1, 2022	29.84%

¹ Includes member contributions toward service purchases. The increase in contribution rates due to service purchases is included in (9) *Effect of net other experience losses*.

² The offsetting increase in contribution rates due to member contributions to Additional Annuity Program is included in (9) *Effect of net other experience losses*.

³ Other differences in actual versus expected experience including (but not limited to) retirement, disability, termination and service purchases, as well as increases in liability from member contributions to Additional Annuity Program.

⁴ We have included refinements in the June 30, 2022 valuation as detailed on page 27.

Section 2: Actuarial Valuation Results

Required Contribution

Required Aggregate Contribution Rate for Year Beginning July 1

All Tiers Combined (Aggregate)	2022		2021	
	Amount	% of Payroll	Amount	% of Payroll
1 Total Normal Cost	\$322,734,117	24.64%	\$277,243,581	22.48%
2 Expected employee contributions	<u>100,816,462</u>	<u>7.70%</u>	<u>93,492,251</u>	<u>7.58%</u>
3 Employer Normal Cost: 1 - 2	\$221,917,655	16.94%	\$183,751,330	14.90%
4 Actuarial Accrued Liability	16,130,108,757		15,008,817,566	
5 Actuarial Value of Assets	<u>15,812,000,418</u>		<u>14,889,255,775</u>	
6 Unfunded Actuarial Accrued Liability: 4 - 5	\$318,108,339		\$119,561,791	
7 Amortization of Unfunded Actuarial Accrued Liability ¹	\$156,602,059	11.96%	\$126,548,535	10.26%
8 Total required contribution: 3 + 7, adjusted for timing ²	<u>\$390,821,605</u>	<u>29.84%</u>	<u>\$321,160,361</u>	<u>26.04%</u>
9 Projected compensation	\$1,309,850,320		\$1,233,265,179	

¹ The amortization of the UAAL in accordance with the funding policy is determined as the sum of the amortization amount from the separate UAAL amortization layers created in each valuation and amortized over 15-year periods. As of July 1, 2021 this amount was slightly greater than the UAAL of \$120 million.

² Required contributions are assumed to be paid at the middle of every year.

Section 2: Actuarial Valuation Results

Required Contribution (continued)

Required Tier 1 Contribution Rate for Year Beginning July 1

Tier 1	2022		2021	
	Amount	% of Payroll	Amount	% of Payroll
1 Total Normal Cost	\$200,000,566	27.34%	\$186,671,715	24.97%
2 Expected employee contributions	<u>43,684,701</u>	<u>5.97%</u>	<u>45,618,014</u>	<u>6.10%</u>
3 Employer Normal Cost: 1 - 2	\$156,315,865	21.37%	\$141,053,701	18.87%
4 Actuarial Accrued Liability	15,562,308,094		14,564,030,506	
5 Amortization of Unfunded Actuarial Accrued Liability ¹	\$87,459,843	11.96%	76,701,114	10.26%
6 Total required contribution: 3 + 5, adjusted for timing ²	<u>\$251,698,419</u>	<u>34.41%</u>	<u>\$225,376,234</u>	<u>30.15%</u>
7 Employer match (110% of 2), adjusted for timing ²	\$49,614,899	6.78%	\$51,936,109	6.95%
8 Greater of employer match 7 or total required contribution 6	<u>\$251,698,419</u>	<u>34.41%</u>	<u>\$225,376,234</u>	<u>30.15%</u>
9 Projected compensation	\$731,531,274		\$747,482,480	

¹ The same UAAL contribution rate is charged to both Tier 1 and Tier 2.

² Required contributions are assumed to be paid at the middle of every year.

Section 2: Actuarial Valuation Results

Required Contribution (continued)

Required Tier 2 Contribution Rate for Year Beginning July 1

Tier 2	2022		2021	
	Amount	% of Payroll	Amount	% of Payroll
1 Total Normal Cost	\$122,733,551	21.22%	\$90,571,866	18.64%
2 Expected employee contributions	<u>57,131,761</u>	<u>9.88%</u>	<u>47,874,237</u>	<u>9.86%</u>
3 Employer Normal Cost: 1 - 2	\$65,601,790	11.34%	\$42,697,629	8.78%
4 Actuarial Accrued Liability	567,800,663		444,787,060	
5 Amortization of Unfunded Actuarial Accrued Liability ¹	\$69,142,216	11.96%	49,847,421	10.26%
6 Total required contribution: 3 + 5, adjusted for timing ²	<u>\$139,123,186</u>	<u>24.06%</u>	<u>\$95,784,127</u>	<u>19.72%</u>
7 Projected compensation	\$578,319,046		\$485,782,699	

¹ The same UAAL contribution rate is charged to both Tier 1 and Tier 2.

² Required contributions are assumed to be paid at the middle of every year.

Section 2: Actuarial Valuation Results

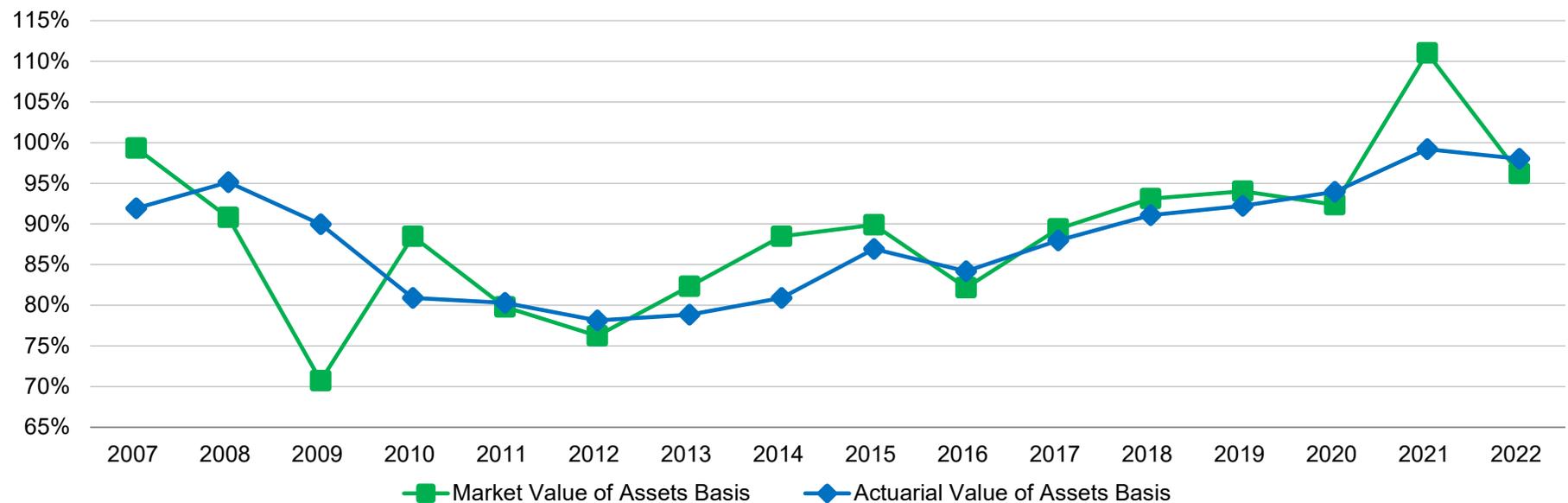
G. Funded Status

A commonly reported piece of information regarding the Plan's financial status is the funded ratio. These ratios compare the Market and Actuarial Value of Assets to the Actuarial Accrued Liability of the Plan. Higher ratios indicate a relatively well-funded plan while lower ratios may indicate recent changes to actuarial assumptions, funding of the plan below actuarial requirements, poor asset performance, or a variety of other causes.

The chart below depicts a history of the funded ratio for the Plan. The chart on the next page shows the Plan's schedule of funding progress for the last ten years.

The funded status measures shown in this valuation are appropriate for assessing the need for or amount of future contributions. However, they are not necessarily appropriate for assessing the sufficiency of Plan assets to cover the estimated cost of settling the Plan's benefit obligations. As the chart below shows, the measures are different depending on whether the Market or Actuarial Value of Assets is used.

Funded Ratio for Years Ended June 30, 2007 – 2022



Section 2: Actuarial Valuation Results

Schedule of Funding Progress for Years Ended June 30, 2013 – 2022

Actuarial Valuation Date as of July 1	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded AAL (UAAL) (b) - (a)	Funded Ratio (%) (a) / (b)	Projected Covered Payroll (c)	UAAL as a Percentage of Projected Covered Payroll (%) [(b) - (a)] / (c)
2013	\$7,958,487,587	\$10,094,867,871	\$2,136,380,284	78.84%	\$900,254,454	237.31%
2014	8,877,594,529	10,975,550,617	2,097,956,088	80.89%	900,126,274	233.07%
2015	9,750,343,300	11,218,445,567	1,468,102,267	86.91%	920,781,074	159.44%
2016	10,344,355,801	12,289,229,001	1,944,873,200	84.17%	928,888,680	209.38%
2017	11,133,708,386	12,657,101,266	1,523,392,880	87.96%	991,814,994	153.60%
2018	12,009,999,030	13,187,542,730	1,177,543,700	91.07%	1,073,554,607	109.69%
2019	12,739,144,966	13,811,956,483	1,072,811,517	92.23%	1,141,875,615	93.95%
2020	13,586,120,581	14,465,349,538	879,228,957	93.92%	1,211,798,340	72.56%
2021	14,889,255,775	15,008,817,566	119,561,791	99.20%	1,233,265,179	9.69%
2022	15,812,000,418	16,130,108,757	318,108,339	98.03%	1,309,850,320	24.29%

Section 2: Actuarial Valuation Results

H. Actuarial Balance Sheet

An overview of the Plan's funding is given by an Actuarial Balance Sheet. In this approach, the amount and timing of all future payments that will be made by the Plan for current participants is determined first. Then these payments are discounted at the valuation interest rate to the date of the valuation, thereby determining the present value, referred to as the Actuarial Present Value of Future Benefits of the Plan.

Second, this Actuarial Present Value of Future Benefits is compared to the assets. The "assets" for this purpose include the net amount of assets already accumulated by the Plan, the present value of future member contributions, the present value of future Department Normal Cost contributions, and the present value of future Department amortization payments (or credits) for the Unfunded (or Overfunded) Actuarial Accrued Liability.

Actuarial Balance Sheet

	July 1, 2022	July 1, 2021
Actuarial Present Value of Future Benefits		
• Present value of benefits for retired members and beneficiaries	\$9,628,733,394	\$8,889,505,418
• Present value of benefits for inactive vested members	265,177,322	243,126,270
• Present value of benefits for active members	<u>9,964,873,317</u>	<u>8,945,047,642</u>
Total Actuarial Present Value of Future Benefits	<u>\$19,858,784,033</u>	<u>\$18,077,679,330</u>
Current and future assets		
• Total Actuarial Value of Assets	\$15,812,000,418	\$14,889,255,775
• Present value of future contributions by members	1,338,199,223	1,186,434,779
• Present value of future employer contributions for:		
• Entry Age Normal Cost	2,390,476,053	1,882,426,985
• Unfunded Actuarial Accrued Liability	<u>318,108,339</u>	<u>119,561,791</u>
Total of Current and Future Assets	<u>\$19,858,784,033</u>	<u>\$18,077,679,330</u>

Section 2: Actuarial Valuation Results

I. Reserves and Designated Balances

	June 30, 2022	June 30, 2021
1. Reserve for retirement allowance for retired members	\$9,452,278,935	\$8,980,604,243
2. Contribution accounts:		
a. Members	1,960,534,961	1,867,587,227
b. Department of Water and Power	(1,990,108,896)	(1,783,003,111)
3. General Reserve	3,959,044,331	3,221,540,568
4. Total	\$13,381,749,331	\$12,286,728,927

Section 2: Actuarial Valuation Results

J. Adjusted Reserves

Each year the Retirement Board adjusts its retired reserves to agree with the value calculated during the valuation. The following table presents the required transfers.

	Adjusted Reserves	June 30, 2022	June 30, 2021
1.	Retired reserve balance	\$9,452,278,935	\$8,980,604,243
2.	Actuarially computed present value	9,628,733,394	8,889,505,418
3.	Actuarial gain (loss): 1 - 2	(176,454,459)	91,098,825
4.	Transfer from (to) DWP contribution accounts to (from) retired reserves	176,454,459	(91,098,825)

Section 2: Actuarial Valuation Results

K. Volatility Ratios

Retirement plans are subject to volatility in the level of required contributions. This volatility tends to increase as retirement plans become more mature.

The Asset Volatility Ratio (AVR), which is equal to the Market Value of Assets divided by total payroll, provides an indication of the potential contribution volatility for any given level of investment volatility. A higher AVR indicates that the plan is subject to a greater level of contribution volatility. This is a current measurement since it is based on the current level of assets.

The current AVR is about 11.8. This means that a 1% asset gain or loss (relative to the assumed investment return) translates to about 11.8% of one-year's payroll. Since actuarial gains and losses are amortized over 15 years, there would be a 1.2% of payroll decrease/(increase) in the required contribution for each 1% asset gain/(loss).

The Liability Volatility Ratio (LVR), which is equal to the Actuarial Accrued Liability divided by payroll, provides an indication of the longer-term potential for contribution volatility for any given level of investment volatility. This is because, over an extended period of time, the plan's assets should track the plan's liabilities. For example, if a plan is 50% funded on a market value basis, the liability volatility ratio would be double the asset volatility ratio and the plan sponsor should expect contribution volatility to increase over time as the plan becomes better funded.

The LVR also indicates how volatile contributions will be in response to changes in the Actuarial Accrued Liability due to actual experience or to changes in actuarial assumptions. The current LVR is about 12.3. This is about 4% higher than the AVR. Therefore, we would expect that contribution volatility will increase over the long term.

The chart on the next page shows how the asset and liability volatility ratios have varied over time.

Section 2: Actuarial Valuation Results

Volatility Ratios for Years Ended June 30, 2013 – 2022

Year Ended June 30	Asset Volatility Ratio	Liability Volatility Ratio
2013	9.2	11.2
2014	10.8	12.2
2015	11.0	12.2
2016	10.9	13.2
2017	11.4	12.8
2018	11.4	12.3
2019	11.4	12.1
2020	11.0	11.9
2021	13.5	12.2
2022	11.8	12.3

Section 2: Actuarial Valuation Results

L. Risk Assessment

Because the actuarial valuation results are dependent on a fixed set of assumptions and data as of a specific date, there is risk that emerging results may differ, perhaps significantly, as actual experience is fluid and will not exactly track current assumptions. This potential divergence may have a significant impact on the future financial condition of the plan.

This report does not contain a detailed analysis of the potential range of future measurements, but does include a concise discussion of some of the primary risks that may affect the Plan's future financial condition. We recommend a more detailed assessment of the risks to provide the Board with a better understanding of the risks inherent in the Plan that can inform both financial preparation and future decision making. This assessment would enable us to work with the Board to highlight and illustrate particular risks or potential future outcomes they may be interested in discussing and could include scenario testing, sensitivity testing, stress testing and stochastic modeling.

This section provides descriptions and basic assessments of the primary risks that are likely to have an ongoing influence on the Plan's financial health, as well as a discussion of historical trends and maturity measures:

Risk Assessments

- Asset/Liability Mismatch Risk (the potential that future plan experience does not affect asset and liability values in the same way, causing them to diverge)

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

Asset/liability mismatch can also be caused by demographic assumption risk such as longevity, which affects liabilities but have no impact on asset levels. This risk is also discussed below.

- Investment Risk (the risk that investment returns will be different than expected)

The investment return assumption is a long-term, static assumption for valuation purposes even though in reality market experience can be quite volatile in any given year. That volatility can cause significant changes in the financial condition of the Plan, affecting both funded status and contribution rates. The inherent year-to-year volatility is reduced by smoothing through the actuarial value of assets, however investment experience can still have a sizable impact. As discussed in *Section 2, Subsection K, Volatility Ratios* on page 40, a 1% asset gain or loss (relative to the assumed investment return) translates to about 11.8% of one-year's payroll. Because actuarial

Section 2: Actuarial Valuation Results

gains and losses are amortized over 15 years, there would be a 1.2% of payroll decrease/(increase) in the required contribution for each 1% asset gain/(loss).

The year-by-year market value rate of return over the last 10 years has ranged from a low of (5.37)% to a high of 26.30%.

- Longevity Risk (the risk that mortality experience will be different than expected)

The actuarial valuation includes current life expectancy assumptions and an expectation of future improvement in life expectancy, which are significant assumptions given the relatively long duration of liabilities for pension plans. Emerging plan experience that does not match these expectations will result in increases or decreases in the actuarially determined contribution over time. This risk can be reduced by using tables appropriate for the Plan (public experience tables) that are weighted by benefit levels, and by using generational mortality projections. Effective with the July 1, 2019 valuation, the Board has adopted amount weighted mortality tables with generational mortality projections.

- Other Risks

In addition to longevity, the valuation includes a variety of other assumptions that are unlikely to match future experience exactly. One example is projected salary scales over time. As salary is central to the determination of benefits paid in retirement, deviations from the projected salary scales could have a material impact on the benefits anticipated for each member. Examples of demographic assumptions include retirement and termination assumptions.

Some plans also carry significant contribution risk, defined as the potential for actual future contributions deviating from expected future contributions. However, the employer has a proven track-record of making the Actuarially Determined Contributions based on the Board's Actuarial Funding Policy, so contribution risk is minimal.

Evaluation of Historical Trends

Past experience can help demonstrate the sensitivity of key results to the Plan's actual experience. Over the past ten years:

- The funded percentage on the actuarial value of assets has increased from 78.8% to 98.0%. This is primarily due to contributions made to amortize the UAAL (i.e., amortizing each layer of UAAL over 15 years in level dollar amounts) and average investment returns over recent years higher than the assumption on a smoothed basis. For a more detailed history see the *Schedule of Funding Progress* in *Section 2, Subsection G* on page 36.
- The average geometric investment return over the last 10 years was 8.01% on a Market Value basis. This includes a high of 26.30% return and a low of (5.37)%. The average over the last 5 years was 7.32%. For more details see the *Investment Return* table in *Section 2, Subsection C* on page 24.

Section 2: Actuarial Valuation Results

- The primary source of new UAAL was the strengthening assumptions through multiple assumption changes. For example, the assumption change in 2016 changed the discount rate from 7.50% to 7.25% and updated mortality tables, adding \$723 million unfunded liability. The assumption change in 2019 changed the discount rate from 7.25% to 7.00% and updated mortality tables, adding \$9 million unfunded liability. The assumption change in 2022 changed the discount rate from 7.00% to 6.50% and updated mortality tables, adding \$683 million unfunded liability. For more details on unfunded liability changes see *Section 3, Exhibit G, Table of Amortization Bases* on page 55.
- The plan's funding policy effectively deals with these unfunded liabilities over time. This can be seen most clearly in *Section 3, Exhibit H, Projection of UAAL Balance and Payment* provided on pages 56 and 57.

Maturity Measures

In the last 10 years the ratio of members in pay status to active participants has decreased slightly from 0.97 to 0.90. This ratio has fluctuated between 0.88 and 0.99 during the last 10 years but has recently decreased due to increased hiring of active members. An increasing ratio indicates that the plan has grown in maturity over time. Unless there will be continued increases in hiring, this is to be expected, but also is informative for understanding plan sensitivity to particular risks. For more details see *Section 2, Subsection A, Member Population* table on page 15.

As pension plans mature, the cash needed to fulfill benefit obligations will increase over time. Therefore, cash flow projections and analysis should be performed to assure that the Plan's asset allocation is aligned to meet emerging pension liabilities. For the prior year, benefits paid were \$265 million more than contributions received. Plans with high levels of negative cash flows may have a need for a larger allocation to income generating assets, which can create a drag on investment return. However, this plan currently has a relatively low level of negative cash flows and is well funded (at a 98.0% funded ratio). The level of negative cash flows should continue be monitored as the employer contribution for UAAL amortization is projected to decrease when the plan gets closer to full funding. For more details on historical cash flows see the *Comparison of Contributions Made with Benefits* on page 19.

A further discussion of plan maturity measures and how they relate to changes in assets and liabilities is included in *Section 2, Subsection K, Volatility Ratios* section starting on page 40.

Section 3: Supplemental Information

Exhibit A: Table of Plan Coverage

Total Plan

Category	Year Ended July 1		Change From Prior Year
	2022	2021	
Active members in valuation:			
• Number	10,799	10,605	1.8%
• Average age	46.5	46.7	-0.2
• Average years of service	13.3	13.8	-0.5
• Total projected compensation	\$1,309,850,320	\$1,233,265,179	6.2%
• Average projected compensation	121,294	116,291	4.3%
• Account balances	1,562,548,088	1,518,336,974	2.9%
Inactive vested members:¹			
• Number	1,735	1,708	1.6%
• Average age	51.8	52.0	-0.2
• Average account balances	\$69,761	\$68,366	2.0%
Retired members:			
• Number in pay status	7,760	7,621	1.8%
• Average age	72.7	72.7	0.0
• Average monthly benefit	\$6,825	\$6,603	3.4%
Beneficiaries:			
• Number in pay status	1,956	1,943	0.7%
• Average age	80.4	80.5	-0.1
• Average monthly benefit	\$4,086	\$3,929	4.0%

¹ Includes terminated members due a refund of member contributions and members receiving PTD benefits

Section 3: Supplemental Information

Exhibit A: Table of Plan Coverage (continued)

Tier 1

Category	Year Ended July 1		Change From Prior Year
	2022	2021	
Active members in valuation:			
• Number	5,510	5,926	-7.0%
• Average age	52.9	52.5	0.4
• Average years of service	21.9	21.6	0.3
• Total projected compensation	\$731,531,274	\$747,482,480	-2.1%
• Average projected compensation	132,764	126,136	5.3%
• Account balances	1,325,682,910	1,343,378,547	-1.3%
Inactive vested members:¹			
• Number	1,145	1,187	-3.5%
• Average Age	56.1	55.7	0.4
• Average account balances	\$97,885	\$93,242	5.0%
Retired members:			
• Number in pay status	7,745	7,609	1.8%
• Average age	72.8	72.7	0.1
• Average monthly benefit	\$6,837	\$6,612	3.4%
Beneficiaries:			
• Number in pay status	1,955	1,942	0.7%
• Average age	80.4	80.5	-0.1
• Average monthly benefit	\$4,088	\$3,931	4.0%

¹ Includes terminated members due a refund of member contributions and members receiving PTD benefits.

Section 3: Supplemental Information

Exhibit A: Table of Plan Coverage (continued)

Tier 2

Category	Year Ended July 1		Change From Prior Year
	2022	2021	
Active members in valuation:			
• Number	5,289	4,679	13.0%
• Average age	39.9	39.4	0.5
• Average years of service	4.4	3.9	0.5
• Total projected compensation	\$578,319,046	\$485,782,699	19.0%
• Average projected compensation	109,344	103,822	5.3%
• Account balances	236,865,178	174,958,427	35.4%
Inactive vested members:¹			
• Number	590	521	13.2%
• Average Age	43.5	43.6	-0.1
• Average account balances	\$15,183	\$11,691	29.9%
Retired members:			
• Number in pay status	15	12	25.0%
• Average age	65.9	64.0	1.9
• Average monthly benefit	\$723	\$656	10.2%
Beneficiaries:			
• Number in pay status	1	1	0.0%
• Average age	75.5	74.5	1.0
• Average monthly benefit	\$91	\$89	2.2%

¹ Includes terminated members due a refund of member contributions and members receiving PTD benefits.

Section 3: Supplemental Information

Exhibit B: Members in Active Service as of July 1, 2022 by Age, Years of Service, and Average Projected Compensation

Total Plan

Age	Years of Service									
	Total	0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30 – 34	35 – 39	40 & over
Under 25	120	118	2	—	—	—	—	—	—	—
	\$102,812	\$102,852	\$100,411	—	—	—	—	—	—	—
25 – 29	738	609	129	—	—	—	—	—	—	—
	112,969	107,988	136,486	—	—	—	—	—	—	—
30 – 34	1,138	698	404	33	3	—	—	—	—	—
	113,526	104,516	126,298	\$142,130	\$175,238	—	—	—	—	—
35 – 39	1,393	601	507	176	105	4	—	—	—	—
	117,760	102,975	120,286	145,959	140,000	\$194,439	—	—	—	—
40 – 44	1,538	438	447	212	320	118	3	—	—	—
	121,644	102,196	112,052	137,245	143,715	141,461	\$154,036	—	—	—
45 – 49	1,506	302	358	133	296	355	60	2	—	—
	122,071	103,754	111,576	127,998	129,883	136,748	136,443	\$179,895	—	—
50 – 54	1,551	205	259	121	256	336	187	176	11	—
	124,224	104,589	108,592	116,405	123,020	124,541	141,878	153,839	\$188,591	—
55 – 59	1,433	111	200	85	190	238	175	301	129	4
	130,550	104,511	109,539	125,623	118,966	124,399	139,227	153,501	151,659	\$137,291
60 – 64	913	51	80	63	131	164	102	146	134	42
	127,171	101,962	118,081	121,145	112,654	120,468	127,413	133,683	151,544	154,611
65 – 69	345	8	39	24	40	74	39	61	33	27
	116,579	105,673	111,939	116,586	104,172	113,142	122,270	128,054	118,224	118,151
70 & over	124	3	4	9	20	30	7	17	11	23
	112,142	62,792	113,298	94,300	104,898	109,592	110,353	116,038	134,838	121,796
Total	10,799	3,144	2,429	856	1,361	1,319	573	703	318	96
	\$121,294	\$104,361	\$116,981	\$131,473	\$128,420	\$128,040	\$136,268	\$146,431	\$148,837	\$135,773

Section 3: Supplemental Information

Exhibit B: Members in Active Service as of July 1, 2022 by Age, Years of Service, and Average Projected Compensation (continued)

Tier 1

Age	Years of Service									
	Total	0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30 – 34	35 – 39	40 & over
Under 25	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—
25 – 29	4	—	4	—	—	—	—	—	—	—
	\$136,140	—	\$136,140	—	—	—	—	—	—	—
30 – 34	105	2	68	32	3	—	—	—	—	—
	136,350	\$84,676	132,984	\$143,086	\$175,238	—	—	—	—	—
35 – 39	343	3	66	166	104	4	—	—	—	—
	142,601	83,602	136,423	146,843	139,459	\$194,439	—	—	—	—
40 – 44	698	4	49	205	320	117	3	—	—	—
	139,687	100,580	124,280	136,518	143,715	141,643	\$154,036	—	—	—
45 – 49	879	7	29	130	296	355	60	2	—	—
	132,353	95,106	120,968	127,906	129,883	136,748	136,443	\$179,895	—	—
50 – 54	1,123	6	36	119	253	336	186	176	11	—
	130,736	92,485	111,196	116,026	122,717	124,541	141,978	153,839	\$188,591	—
55 – 59	1,141	1	23	81	189	238	175	301	129	4
	136,430	64,264	115,514	125,465	119,020	124,399	139,227	153,501	151,659	\$137,291
60 – 64	793	2	11	61	131	164	102	146	134	42
	129,141	63,851	102,241	120,131	112,654	120,468	127,413	133,683	151,544	154,611
65 – 69	304	1	6	23	40	74	39	61	33	27
	117,015	71,543	96,659	117,848	104,172	113,142	122,270	128,054	118,224	118,151
70 & over	120	3	—	9	20	30	7	17	11	23
	112,104	62,792	—	94,300	104,898	109,592	110,353	116,038	134,838	121,796
Total	5,510	29	292	826	1,356	1,318	572	703	318	96
	\$132,764	\$86,035	\$125,184	\$131,266	\$128,340	\$128,046	\$136,291	\$146,431	\$148,837	\$135,773

Section 3: Supplemental Information

Exhibit B: Members in Active Service as of July 1, 2022 by Age, Years of Service, and Average Projected Compensation (continued)

Tier 2

Age	Years of Service									
	Total	0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30 – 34	35 – 39	40 & over
Under 25	120	118	2	—	—	—	—	—	—	—
	\$102,812	\$102,852	\$100,411	—	—	—	—	—	—	—
25 – 29	734	609	125	—	—	—	—	—	—	—
	112,843	107,988	136,497	—	—	—	—	—	—	—
30 – 34	1,033	696	336	1	—	—	—	—	—	—
	111,206	104,573	124,945	\$111,534	—	—	—	—	—	—
35 – 39	1,050	598	441	10	1	—	—	—	—	—
	109,645	103,072	117,871	131,279	\$196,185	—	—	—	—	—
40 – 44	840	434	398	7	—	1	—	—	—	—
	106,651	102,211	110,546	158,539	—	\$120,200	—	—	—	—
45 – 49	627	295	329	3	—	—	—	—	—	—
	107,656	103,959	110,748	132,018	—	—	—	—	—	—
50 – 54	428	199	223	2	3	—	1	—	—	—
	107,137	104,954	108,171	138,946	148,521	—	\$123,269	—	—	—
55 – 59	292	110	177	4	1	—	—	—	—	—
	107,574	104,877	108,762	128,826	108,752	—	—	—	—	—
60 – 64	120	49	69	2	—	—	—	—	—	—
	114,153	103,518	120,606	152,064	—	—	—	—	—	—
65 – 69	41	7	33	1	—	—	—	—	—	—
	113,343	110,548	114,717	87,551	—	—	—	—	—	—
70 & over	4	—	4	—	—	—	—	—	—	—
	113,298	—	113,298	—	—	—	—	—	—	—
Total	5,289	3,115	2,137	30	5	1	1	—	—	—
	\$109,344	\$104,532	\$115,860	\$137,168	\$150,100	\$120,200	\$123,269	—	—	—

Section 3: Supplemental Information

Exhibit C: Reconciliation of Member Data

	Active Members	Inactive Vested Members ¹	Retired Members	Beneficiaries	Total
Number as of July 1, 2021	10,605	1,708	7,621	1,943	21,877
• New members	697	N/A	N/A	N/A	697
• Terminations – with vested rights	-115	115	N/A	N/A	0
• Contribution refunds	-13	-40	N/A	N/A	-53
• Retirements	-370	-35	405	N/A	0
• Rehire	24	-24	0	0	0
• Died with beneficiary	-6	-1	-104	111	0
• Died without beneficiary	-23	-14	-162	-133	-332
• Data adjustments	0	26 ²	0	35 ³	61
Number as of July 1, 2022	10,799	1,735	7,760	1,956	22,250

¹ Includes terminated members due a refund of member contributions and members receiving PTD benefits.

² Terminated members due a refund of member contributions.

³ New beneficiaries from either death of retired members or divorce settlements.

Section 3: Supplemental Information

Exhibit D: Summary Statement of Income and Expenses on a Market Value Basis

	Year Ended June 30, 2022	Year Ended June 30, 2021
Net assets at market value at the beginning of the year	\$16,667,463,956	\$13,353,708,096
Contribution income:		
• Employer contributions	\$318,873,759	\$378,990,511
• Member contributions	131,105,102	122,316,256
• Net administrative expense contributions	<u>838,206</u>	<u>965,774</u>
<i>Net contribution income</i>	<i>\$450,817,067</i>	<i>\$502,272,541</i>
Investment income:		
• Interest, dividends and other income	\$283,291,027	\$244,848,722
• Asset appreciation	(1,117,018,219)	3,295,782,347
• Less investment fees	<u>(54,621,537)</u>	<u>(51,430,736)</u>
<i>Net investment income</i>	<i><u>\$(888,348,728)</u></i>	<i><u>\$3,489,200,333</u></i>
Total income available for benefits	\$(437,531,661)	\$3,991,472,874
Less benefit payments:		
• Retirement benefits paid	\$(706,884,767)	\$(671,277,654)
• Refund of members' contributions	<u>(9,123,135)</u>	<u>(6,439,360)</u>
<i>Net benefit payments</i>	<i><u>\$(716,007,901)</u></i>	<i><u>\$(677,717,014)</u></i>
Change in net assets at market value	\$(1,153,539,562)	\$3,313,755,860
Net assets at market value at the end of the year	\$15,513,924,394	\$16,667,463,956

Note: Results may be slightly off due to rounding.

Section 3: Supplemental Information

Exhibit E: Summary Statement of Plan Assets

	Year Ended June 30, 2022	Year Ended June 30, 2021
<i>Cash equivalents</i>	\$15,282,094	\$18,114,944
Accounts receivable:		
• Accrued investment income	\$41,478,588	\$34,804,188
• Open investment trades and others	172,801,691	181,168,678
• Department of Water and Power	<u>52,090,229</u>	<u>60,754,851</u>
<i>Total accounts receivable</i>	\$266,370,507	\$276,727,717
Investments:		
• Fixed income	3,855,448,612	3,579,967,644
• Equities	6,153,372,081	8,852,563,474
• Other assets	<u>5,554,860,665</u>	<u>4,337,197,560</u>
<i>Total investments at market value</i>	\$15,563,681,357	\$16,769,728,678
Total assets	\$15,845,333,959	\$17,064,571,339
<i>Less accounts payable</i>	\$(331,409,565)	\$(397,107,383)
Net assets at market value	\$15,513,924,394	\$16,667,463,956
Net assets at actuarial value	\$15,812,000,418	\$14,889,255,775

Note: Results may be slightly off due to rounding.

Section 3: Supplemental Information

Exhibit F: Development of the Fund through June 30, 2022

Year Ended June 30	Employer Contributions	Member Contributions ¹	Other Contributions	Net Investment Return ²	Benefit Payments	Market Value of Assets at Year-End	Actuarial Value of Assets at Year-End	Actuarial Value as a Percent of Market Value
2013	\$368,426,348	\$69,633,449	\$4,392,846	\$918,062,815	\$438,557,365	\$8,310,729,662	\$7,958,487,587	95.8%
2014	384,265,892	72,299,526	4,872,432	1,401,607,860	463,596,940	9,710,178,432	8,877,594,529	91.4%
2015	376,902,022	68,552,375	717,370	416,474,352	485,966,910	10,086,857,641	9,750,343,300	96.7%
2016	362,359,894	75,068,523	791,047	82,810,914	510,493,296	10,097,394,723	10,344,355,801	102.4%
2017	391,717,359	83,239,105	655,190	1,281,254,293	540,361,335	11,313,899,335	11,133,708,386	98.4%
2018	433,412,569	93,659,240	549,417	998,777,227	563,212,525	12,277,085,263	12,009,999,030	97.8%
2019	410,165,124	104,741,925	826,142	791,832,113	597,563,566	12,987,087,001	12,739,144,966	98.1%
2020	422,017,394	120,299,327	932,870	459,024,099	635,652,595	13,353,708,096	13,586,120,581	101.7%
2021	378,990,511	122,316,256	965,774	3,489,200,333	677,717,014	16,667,463,956	14,889,255,775	89.3%
2022	318,873,759	131,105,102	838,206	(888,348,728)	716,007,901	15,513,924,394	15,812,000,418	101.9%

¹ Includes member normal contributions, Additional Annuity Program contributions, contributions due to open contracts for purchased service, and member contributions transferred from LACERS.

² On a market value basis. Net of investment fees and administrative expenses prior to 2015. Starting in 2015, administrative expenses are included as an offset to "other contributions."

Section 3: Supplemental Information

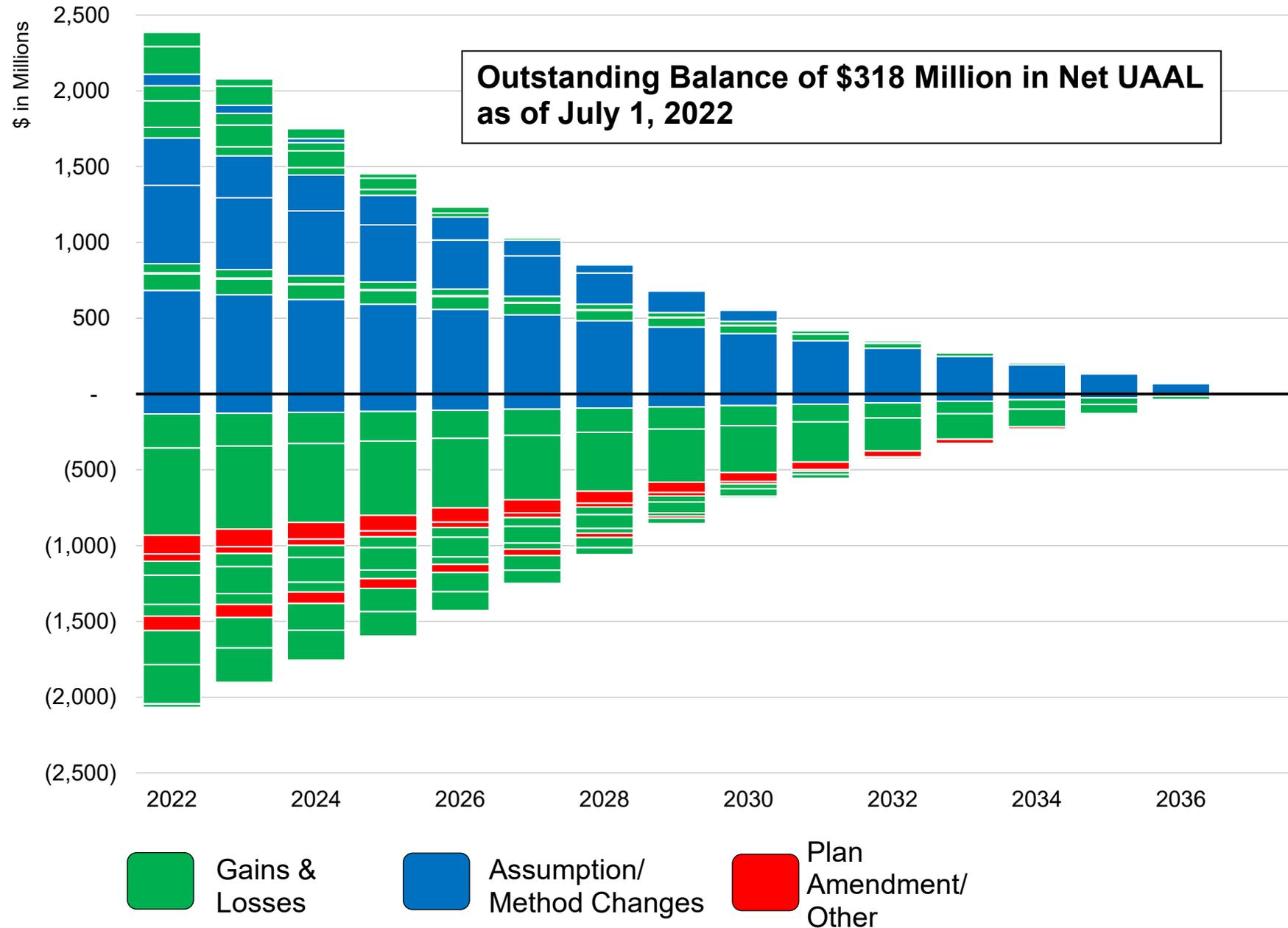
Exhibit G: Table of Amortization Bases

Type	Date Established	Initial Amount	Initial Period	Outstanding Balance	Years Remaining	Annual Payment ¹
Actuarial Loss	07/01/2007	\$47,238,833	15	\$0	0	\$0
Assumption Changes	07/01/2007	(18,102,738)	15	0	0	0
Actuarial Gain	07/01/2008	(204,179,457)	15	(21,450,058)	1	(21,450,058)
Actuarial Loss	07/01/2009	457,336,004	15	92,606,395	2	47,760,683
Plan Amendments	07/01/2009	2,239,982	15	453,576	2	233,927
Actuarial Loss	07/01/2010	626,174,290	15	183,384,643	3	65,015,573
Assumption Changes	07/01/2010	255,885,598	15	74,939,981	3	26,568,560
Actuarial Loss	07/01/2011	268,017,929	15	101,033,879	4	27,692,081
Plan Amendments	07/01/2011	(6,948,892)	15	(2,619,501)	4	(717,971)
Actuarial Loss	07/01/2012	380,800,633	15	173,303,301	5	39,157,521
Actuarial Loss	07/01/2013	133,360,391	15	70,373,933	6	13,649,788
Actuarial Gain	07/01/2014	(434,196,395)	15	(258,410,570)	7	(44,240,707)
Assumption Changes	07/01/2014	525,443,921	15	312,716,240	7	53,538,010
Actuarial Gain	07/01/2015	(341,001,627)	15	(224,482,501)	8	(34,618,215)
Plan Amendments	07/01/2015	(144,007,904)	15	(94,800,880)	8	(14,619,568)
Actuarial Gain	07/01/2016	(109,018,791)	15	(78,176,292)	9	(11,028,218)
Assumption Changes	07/01/2016	722,927,661	15	518,404,249	9	73,130,549
Actuarial Gain	07/01/2017	(248,943,494)	15	(192,281,843)	10	(25,114,841)
Actuarial Gain	07/01/2018	(111,501,612)	15	(91,873,511)	11	(11,219,369)
Plan Amendments	07/01/2018	(59,019,242)	15	(48,629,834)	11	(5,938,557)
Actuarial Loss	07/01/2019	67,815,430	15	59,139,414	12	6,806,206
Assumption Changes	07/01/2019	8,835,790	15	7,705,377	12	886,792
Actuarial Loss	07/01/2020	118,910,357	15	109,115,131	13	11,913,790
Funding Policy Changes	07/01/2020	(133,537,081)	15	(122,536,981)	13	(13,379,261)
Actuarial Gain	07/01/2021	(599,236,350)	15	(575,389,964)	14	(59,938,065)
Actuarial Gain	07/01/2022	(225,241,182)	15	(225,241,182)	15	(22,492,983)
Method Changes	07/01/2022	(132,113,077)	15	(132,113,077)	15	(13,193,045)
Assumption Changes	07/01/2022	682,938,414	15	682,938,414	15	68,199,437
Total				\$318,108,339		\$156,602,059

¹ Level dollar amount.

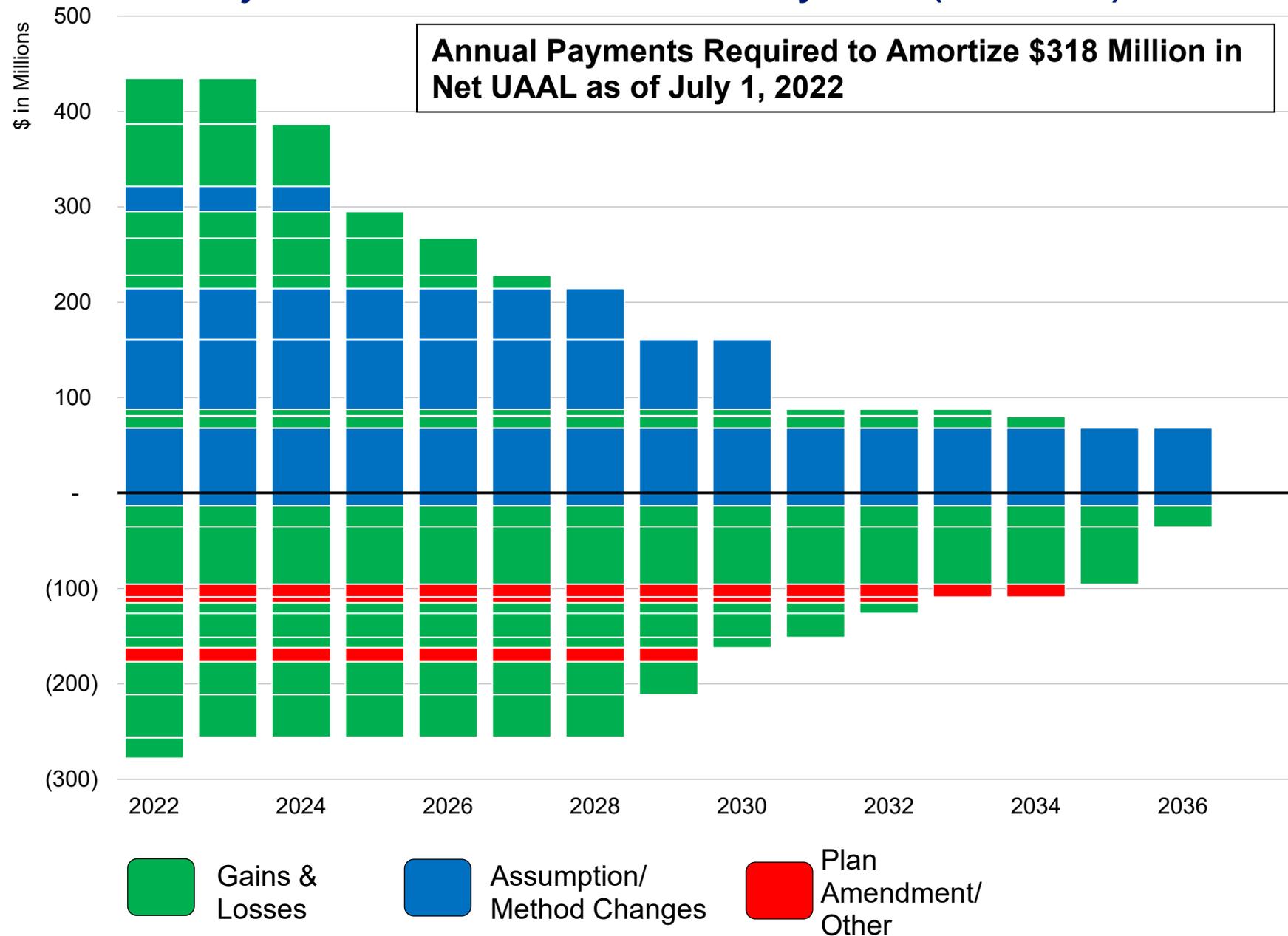
Section 3: Supplemental Information

Exhibit H: Projection of UAAL Balances and Payments



Section 3: Supplemental Information

Exhibit H: Projection of UAAL Balances and Payments (continued)



Section 3: Supplemental Information

Exhibit I: Definition of Pension Terms

The following list defines certain technical terms for the convenience of the reader:

Actuarial Accrued Liability for Actives:	The equivalent of the accumulated Normal Costs allocated to the years before the valuation date.
Actuarial Accrued Liability for Pensioners and Beneficiaries:	Actuarial Present Value of lifetime benefits to existing pensioners and beneficiaries. This sum takes account of life expectancies appropriate to the ages of the annuitants and the interest that the sum is expected to earn before it is entirely paid out in benefits.
Actuarial Cost Method:	A procedure allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability that are used to determine the required contribution.
Actuarial Gain or 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. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., assets earn more than projected, salary increases are less than assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results yield actuarial liabilities that are larger than projected.
Actuarially Equivalent:	Of equal Actuarial Present Value, determined as of a given date and based on a given set of Actuarial Assumptions.
Actuarial Present Value (APV):	<p>The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. Each such amount or series of amounts is:</p> <p>Adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.)</p> <p>Multiplied by the probability of the occurrence of an event (such as survival, death, disability, termination, etc.) on which the payment is conditioned, and</p> <p>Discounted according to an assumed rate (or rates) of return to reflect the time value of money.</p>

Section 3: Supplemental Information

Actuarial Present Value of Future Plan Benefits:	The Actuarial Present Value of benefit amounts expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age, anticipated future compensation, and future service credits. The Actuarial Present Value of Future Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive members entitled to either a refund of member contributions or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.
Actuarial Valuation:	The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan, as well as Actuarially Determined Contributions.
Actuarial Value of Assets (AVA):	The value of the Plan's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly plans use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the Actuarially Determined Contribution.
Actuarially Determined:	Values that have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the Plan.
Actuarially Determined Contribution (ADC):	The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation, determined under the Plan's funding policy. The ADC consists of the employer Normal Cost and the Amortization Payment.
Amortization Method:	A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the Unfunded Actuarial Accrued Liability. Under the Level Percentage of Pay method, the Amortization Payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the Unfunded Actuarial Accrued Liability. Under the Level Percentage of Pay method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.
Amortization Payment:	The portion of the pension plan contribution, or ADC, that is intended to pay off the Unfunded Actuarial Accrued Liability.

Section 3: Supplemental Information

Assumptions or Actuarial Assumptions:	The estimates upon which the cost of the Plan is calculated, including: <u>Investment return</u> - the rate of investment yield that the Plan will earn over the long-term future; <u>Mortality rates</u> - the rate or probability of death at a given age for employees and pensioners; <u>Retirement rates</u> - the rate or probability of retirement at a given age or service; <u>Disability rates</u> - the rate or probability of disability retirement at a given age; <u>Termination rates</u> - the rate or probability at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement; <u>Salary increase rates</u> - the rates of salary increase due to inflation, real wage growth and merit and promotion increases.
Closed Amortization Period:	A specific number of years that is counted down by one each year, and therefore declines to zero with the passage of time. For example, if the amortization period is initially set at 20 years, it is 19 years at the end of one year, 18 years at the end of two years, etc. See Open Amortization Period.
Decrements:	Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or termination.
Defined Benefit Plan:	A retirement plan in which benefits are defined by a formula based on the member's compensation, age and/or years of service.
Defined Contribution Plan:	A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.
Employer Normal Cost:	The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.
Experience Study:	A periodic review and analysis of the actual experience of the Plan that may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified based on recommendations from the Actuary.
Funded Ratio:	The ratio of the Actuarial Value of Assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the Market Value of Assets (MVA), rather than the AVA.
Investment Return:	The rate of earnings of the Plan from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next.

Section 3: Supplemental Information

Normal Cost:	That portion of the Actuarial Present Value of pension plan benefits and expenses allocated to a valuation year by the Actuarial Cost Method. Any payment in respect of an Unfunded Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits that are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated.
Open Amortization Period:	An open amortization period is one which is used to determine the Amortization Payment but which does not change over time. If the initial period is set as 30 years, the same 30-year period is used in each future year in determining the Amortization Period.
Unfunded Actuarial Accrued Liability:	The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative, in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.
Valuation Date or Actuarial Valuation Date:	The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Benefits is determined. The expected benefits to be paid in the future are discounted to this date.

Section 4: Actuarial Valuation Basis

Exhibit 1: Actuarial Assumptions and Methods

Rationale for Assumptions:	The information and analysis used in selecting each assumption that has a significant effect on this actuarial valuation is shown in the July 1, 2018 through June 30, 2021 Actuarial Experience Study dated May 20, 2022. Unless otherwise noted, all actuarial assumptions and methods shown below apply to both Tier 1 and Tier 2 members.
<u>Economic Assumptions</u>	
Net Investment Return:	6.50%; net of investment expenses. Based on the Actuarial Experience Study referenced above, expected investment expenses represent about 0.40% of the average Market Value of Assets.
Employee Contribution, Additional Annuity and Matching Account Crediting Rate:	7.00%, based on Plan provisions.
Consumer Price Index (CPI):	CPI Increase of 2.50% per year.
Cost of Living Adjustments (COLA):	Retiree COLA increases of 2.75% per year for Tier 1 and 2.00% per year for Tier 2. For members that have COLA banks, they are reflected in projected future COLAs.
Administration Expenses:	Offset by additional employer contributions.
Increase in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Increase of 2.50% per year from the valuation date.

Section 4: Actuarial Valuation Basis

Salary Increases:

The annual rate of compensation increase includes: inflation at 2.50%, plus “across the board” salary increases of 0.50% per year, plus the following merit and promotion increases:

Rate (%)	
Years of Service	Rate (%)
Less than 1	7.00
1 – 2	7.00
2 – 3	6.50
3 – 4	5.00
4 – 5	3.75
5 – 6	2.75
6 – 7	2.25
7 – 8	2.00
8 – 9	1.90
9 – 10	1.80
10 – 11	1.70
11 – 12	1.45
12 – 13	1.40
13 – 14	1.35
14 – 15	1.30
15 – 16	1.30
16 – 17	1.30
17 & Over	1.25

Section 4: Actuarial Valuation Basis

Demographic Assumptions

Post-Retirement Mortality Rates:

Service Retirement, Disability Retirement, and Beneficiaries not Currently in Pay Status

- Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females) increased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2021.

Beneficiaries in Pay Status

- Pub-2010 Contingent Survivor Amount-Weighted Above-Median Mortality Table (separate tables for males and females) increased by 5% for females, projected generationally with the two-dimensional mortality improvement scale MP-2021.

Optional Form of Payment Amounts at Retirement and Conversion of Contribution Balance to Annuities at Retirement

- *Members:* Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table increased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2018 associated with a retirement year of 2022, weighted 75% male and 25% female.
- *Beneficiaries:* Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table, projected generationally with the two-dimensional mortality improvement scale MP-2018 associated with a retirement year of 2022, weighted 25% male and 75% female.

The Pub-2010 mortality tables and adjustments as shown above reasonably reflect the mortality experience as of the measurement date. These mortality tables were adjusted to future years using the generational projection to reflect future mortality improvement between the measurement date and those years.

Section 4: Actuarial Valuation Basis

Pre-Retirement Mortality Rates:

Pub-2010 General Employee Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2021.

Age	Rate (%)	
	Male	Female
25	0.024	0.008
30	0.031	0.013
35	0.041	0.021
40	0.057	0.033
45	0.085	0.051
50	0.129	0.076
55	0.190	0.112
60	0.276	0.169
65	0.405	0.270
70	0.609	0.445

5% of pre-retirement deaths are assumed to be duty related, with the remaining being non-duty related. Note that generational projections beyond the base year (2010) are not reflected in the above mortality rates.

Disability Incidence Rates:

Age	Disability Incidence Rate (%)	
	Male	Female
25	0.006	0.000
30	0.012	0.006
35	0.012	0.036
40	0.018	0.072
45	0.030	0.102
50	0.054	0.138
55	0.126	0.168
60	0.240	0.202

Section 4: Actuarial Valuation Basis

Termination Rates

Total Termination	
Years of Service	Rate (%)
Less than 1	9.25
1 – 2	4.25
2 – 3	3.25
3 – 4	3.25
4 – 5	2.25
5 – 6	1.75
6 – 7	1.50
7 – 8	1.50
8 – 9	1.50
9 – 10	1.25
10 – 15	0.75
15 – 20	0.70
20 & over	0.50

Tier 1 Allocation of Termination Rates (%) between Ordinary Withdrawals and Vested Terminations

Years of Service	Ordinary Withdrawals	Vested Terminations
Less than 1	100	0
1 – 10	30	70
10 & Over	15	85

Tier 2 Allocation of Termination Rates (%) between Ordinary Withdrawals and Vested Terminations

Years of Service	Ordinary Withdrawals	Vested Terminations
Less than 5	80	20
5 – 10	25	75
10 & Over	15	85

Ordinary withdrawals are assumed to receive their account balance at termination. Vested terminations are assumed to receive a deferred retirement benefit. No termination is assumed after a member is first eligible to retire.

Section 4: Actuarial Valuation Basis

Retirement Rates:

Age	Retirement Rates (%)			
	Tier 1		Tier 2	
	Under 30 Years of Service	30 or More Years of Service	Under 30 Years of Service	30 or More Years of Service
50	0.00	1.50	0.00	0.00
51	0.00	1.00	0.00	0.00
52	0.00	0.00	0.00	0.00
53	0.00	0.00	0.00	0.00
54	0.00	0.00	0.00	0.00
55	4.50	30.00	0.00	26.00
56	2.50	20.00	0.00	14.00
57	3.00	18.00	0.00	13.50
58	3.50	18.00	0.00	13.50
59	3.50	18.00	0.00	13.50
60	5.25	22.00	5.25	17.50
61	6.75	22.00	3.75	12.00
62	7.00	24.00	2.75	12.00
63	8.50	25.00	20.00	25.00
64	9.50	27.00	11.00	25.00
65	11.50	28.00	11.00	27.00
66	13.50	28.00	12.00	27.00
67	13.50	28.00	12.50	27.00
68	13.50	28.00	12.50	27.00
69	19.00	30.00	16.50	28.00
70	22.00	30.00	40.00	40.00
71	22.00	30.00	40.00	40.00
72	22.00	30.00	40.00	40.00
73	22.00	30.00	40.00	40.00
74	22.00	30.00	40.00	40.00
75 & Over	100.00	100.00	100.00	100.00

Retirement Age and Benefit for Inactive Vested Members:

For Tier 1, inactive vested members are assumed to retire at age 60 with a Money Purchase Annuity. For Tier 2, inactive vested members are assumed to retire at age 63. Tier 1 and Tier 2 members receiving Permanent Total Disability benefits are assumed to retire at the earlier of age 65 or age 55 with 30 years of service.

Section 4: Actuarial Valuation Basis

Definition of Active Members:	First day of biweekly payroll following employment.
Form of Payment:	All active and inactive members are assumed to elect the unmodified option at retirement.
Unknown Data for Members:	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
Data Adjustments:	Data as of March 31 has been adjusted to June 30 by adding three months of age and, for active employees, three months of service. Contribution account balances were also increased by three months of interest. For members in pay status, we have increased their benefits by the assumed July 1 COLA.
Percent Married/Domestic Partner:	80% of male members and 55% of female members are assumed to have an eligible spouse or domestic partner at pre-retirement death or retirement. The assumption is also applied for current retirees retired before April 1, 2012 with Options Full, A, B, or C since they are missing this data. Spousal gender is assumed to be opposite that of the member.
Age of Spouse:	Male retirees are assumed to be 3 years older than their spouses, and female retirees are assumed to be 2 years younger than their spouses.
Future Benefit Accruals:	1.0 year of service per year.
Additional Service Accrual:	Tier 1 members are assumed to purchase an additional 0.04 years of service per year. Tier 2 members are assumed to purchase an additional 0.02 years of service per year. These service purchases exclude those priced at full actuarial cost. The valuation reflects expected future member contributions that are associated with these assumed service purchases.
<u>Actuarial Funding Policy:</u>	
Actuarial Value of Assets:	The market value of assets less unrecognized returns in each of the last five years. Unrecognized return is equal to the difference between the actual and expected returns on a market value basis and is recognized over a five-year period. Based on the funding policy most recently adopted by the Retirement Board, effective with the July 1, 2020 valuation, the Actuarial Value of Assets is not reduced by 1% of the market value of assets as a non-valuation reserve.
Actuarial Cost Method:	Entry Age Actuarial Cost Method. Entry Age equals attained age less years of service. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis and are based on costs allocated as a level percent of salary, with Normal Cost determined as if the current benefit accrual rate had always been in effect (“replacement life within each tier”).

Section 4: Actuarial Valuation Basis

Amortization Policy:	The July 1, 2004 Unfunded Actuarial Liability is amortized over a fifteen-year period commencing July 1, 2004 (fully amortized as of July 1, 2019). Any subsequent change in Surplus or Unfunded Actuarial Accrued Liability are amortized over separate fifteen-year periods. All amortization amounts are determined in equal dollar amounts over the amortization period. The Board may, by resolution, adopt a separate period of not more than thirty years to amortize the change in Surplus or Unfunded Actuarial Accrued Liability resulting from an unusual event, plan amendment or change in assumptions or methods.
Projected Compensation:	Projected compensation for the year following the valuation date is calculated by annualizing the bi-weekly pay rate increased by the assumed rate of salary increase. For members with less than one year of service as of the valuation date, no salary increase assumption is applied to their annualized compensation.
<u>Other Actuarial Methods</u>	
Internal Revenue Code Section 415:	<p>Section 415 of the Internal Revenue Code (IRC) specifies the maximum benefits that may be paid to an individual from a defined benefit plan and the maximum amounts that may be allocated each year to an individual's account in a defined contribution plan.</p> <p>A qualified pension plan may not pay benefits in excess of the Section 415 limits. The ultimate penalty for non-compliance is disqualification: active participants could be taxed on their vested benefits and the IRS may seek to tax the income earned on the plan's assets.</p> <p>In particular, Section 415(b) of the IRC limits the maximum annual benefit payable at the Normal Retirement Age to a dollar limit of \$160,000 indexed for inflation. That limit is \$245,000 for 2022. Normal Retirement Age for these purposes is age 62. These are the limits in simplified terms. They must be adjusted based on each participant's circumstances, for such things as age at retirement, form of benefits chosen and after tax contributions.</p> <p>Benefits in excess of the limits may be paid through a qualified governmental excess plan that meets the requirements of Section 415(m).</p> <p>Legal Counsel's review and interpretation of the law and regulations should be sought on any questions in this regard.</p> <p>Contribution rates determined in this valuation have not been reduced for the Section 415 limitations. Actual limitations will result in gains as they occur.</p>
Changed Actuarial Assumptions:	The following assumptions have been changed since the prior valuation. Rationale for these changes are presented in the July 1, 2018 through June 30, 2021 Actuarial Experience Study:
<i>Net Investment Return:</i>	7.00%; net of investment expenses. Expected investment expenses represent about 0.35% of the average Market Value of Assets.
<i>Consumer Price Index (CPI):</i>	Increase of 2.75% per year.
<i>Increase in Internal Revenue Code Section 401(a)(17) Compensation Limit:</i>	Increase of 2.75% per year from the valuation date.

Section 4: Actuarial Valuation Basis

Changed Actuarial Assumptions (continued):

The following assumptions have been changed since the prior valuation. Rationale for these changes are presented in the July 1, 2018 through June 30, 2021 Actuarial Experience Study:

Salary Increases:

The annual rate of compensation increase includes: inflation at 2.75%, plus “across the board” salary increases of 0.50% per year, plus the following merit and promotion increases:

Rate (%)	
Years of Service	Rate (%)
Less than 1	7.00
1 – 2	7.00
2 – 3	6.50
3 – 4	5.25
4 – 5	3.75
5 – 6	2.75
6 – 7	2.25
7 – 8	2.00
8 – 9	1.70
9 – 10	1.60
10 – 11	1.50
11 – 12	1.45
12 – 13	1.40
13 – 14	1.35
14 – 15	1.30
15 & Over	1.25

Section 4: Actuarial Valuation Basis

Changed Actuarial Assumptions (continued):

The following assumptions have been changed since the prior valuation. Rationale for these changes are presented in the July 1, 2018 through June 30, 2021 Actuarial Experience Study:

Post-Retirement Mortality Rates:

Service Retirement and Disability Retirement

- Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females) increased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2018.

Beneficiaries

- Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2018.

The Pub-2010 mortality tables and adjustments as shown above reasonably reflect the mortality experience as of the measurement date. These mortality tables were adjusted to future years using the generational projection to reflect future mortality improvement between the measurement date and those years.

Section 4: Actuarial Valuation Basis

Changed Actuarial Assumptions (continued):

The following assumptions have been changed since the prior valuation. Rationale for these changes are presented in the July 1, 2018 through June 30, 2021 Actuarial Experience Study:

Pre-Retirement Mortality Rates:

Pub-2010 General Employee Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2018.

Age	Rate (%)	
	Male	Female
25	0.024	0.008
30	0.031	0.013
35	0.041	0.021
40	0.057	0.033
45	0.085	0.051
50	0.129	0.076
55	0.190	0.112
60	0.276	0.169
65	0.405	0.270
70	0.609	0.445

5% of pre-retirement deaths are assumed to be duty related, with the remaining being non-duty related. Note that generational projections beyond the base year (2010) are not reflected in the above mortality rates.

Disability Incidence Rates:

Age	Disability Incidence Rate (%)	
	Male	Female
25	0.006	0.000
30	0.012	0.006
35	0.012	0.036
40	0.018	0.072
45	0.030	0.102
50	0.054	0.138
55	0.126	0.168
60	0.240	0.000

Section 4: Actuarial Valuation Basis

Changed Actuarial Assumptions (continued):

The following assumptions have been changed since the prior valuation. Rationale for these changes are presented in the July 1, 2018 through June 30, 2021 Actuarial Experience Study:

Termination Rates:

Total Termination	
Years of Service	Rate (%)
Less than 1	10.00
1 – 2	5.25
2 – 3	3.75
3 – 4	3.50
4 – 5	2.50
5 – 6	2.00
6 – 7	1.50
7 – 8	1.50
8 – 9	1.50
9 – 10	1.00
10 – 20	0.75
20 & over	0.50

Tier 1 Allocation of Termination Rates (%) between Ordinary Withdrawals and Vested Terminations

Years of Service	Ordinary Withdrawals	Vested Terminations
Less than 1	100	0
1 – 10	30	70
10 & Over	15	85

Tier 2 Allocation of Termination Rates (%) between Ordinary Withdrawals and Vested Terminations

Years of Service	Ordinary Withdrawals	Vested Terminations
Less than 5	100	0
5 & Over	15	85

Ordinary withdrawals are assumed to receive their account balance at termination. Vested terminations are assumed to receive a deferred retirement benefit. No termination is assumed after a member is first eligible to retire.

Section 4: Actuarial Valuation Basis

Changed Actuarial Assumptions (continued):

The following assumptions have been changed since the prior valuation. Rationale for these changes are presented in the July 1, 2018 through June 30, 2021 Actuarial Experience Study:

Retirement Rates:

Age	Retirement Rates (%)			
	Tier 1		Tier 2	
	Under 30 Years of Service	30 or More Years of Service	Under 30 Years of Service	30 or More Years of Service
50	0.00	1.00	0.00	0.00
51	0.00	0.00	0.00	0.00
52	0.00	0.00	0.00	0.00
53	0.00	0.00	0.00	0.00
54	0.00	0.00	0.00	0.00
55	4.25	27.00	0.00	25.00
56	2.00	20.00	0.00	14.00
57	2.50	17.50	0.00	13.00
58	3.50	17.50	0.00	13.00
59	3.50	17.50	0.00	13.00
60	5.50	22.00	5.50	17.50
61	6.50	22.00	3.50	10.00
62	7.00	22.00	2.50	10.00
63	8.00	25.00	20.00	25.00
64	8.50	27.00	12.00	25.00
65	11.50	30.00	11.00	28.00
66	12.00	30.00	11.00	28.00
67	12.50	30.00	12.00	28.00
68	13.00	30.00	12.50	28.00
69	17.00	30.00	15.00	28.00
70	22.00	25.00	50.00	50.00
71	22.00	25.00	50.00	50.00
72	22.00	25.00	50.00	50.00
73	22.00	25.00	50.00	50.00
74	22.00	25.00	50.00	50.00
75 & Over	100.00	100.00	100.00	100.00

Section 4: Actuarial Valuation Basis

Changed Actuarial Assumptions (continued):

The following assumptions have been changed since the prior valuation. Rationale for these changes are presented in the July 1, 2018 through June 30, 2021 Actuarial Experience Study:

Percent Married/Domestic Partner:

85% of male members and 60% of female members are assumed to have an eligible spouse or domestic partner at pre-retirement death or retirement. The assumption is also applied for current retirees retired before April 1, 2012 with Options Full, A, B, or C since they are missing this data. Spousal gender is assumed to be opposite that of the member.

Additional Service Accrual:

Tier 1 members are assumed to purchase an additional 0.07 years of service per year. Tier 2 members are assumed to purchase an additional 0.02 years of service per year. These service purchases exclude those priced at full actuarial cost. The valuation reflects expected future member contributions that are associated with these assumed service purchases.

Section 4: Actuarial Valuation Basis

Exhibit 2: Summary of Plan Provisions

This exhibit summarizes the major provisions of the Retirement Plan included in the valuation. It is not intended to be, nor should it be interpreted as, a complete statement of all plan provisions.

Plan Year:	July 1 through June 30
Census Date:	March 31
Membership Eligibility:	
<i><u>Tier 1</u></i>	All members hired before January 1, 2014. Utility Pre-Craft Trainee, Construction Electrical Helper, or Construction Electrical Mechanic hired before January 1, 2014 and continuously employed until eligible for membership become Tier 1 members upon membership.
<i><u>Tier 2</u></i>	All members hired on or after January 1, 2014.
Formula Retirement Benefit:	
<i><u>Tier 1</u></i>	
<i>Age & Service Requirement</i>	Age 60 with 5 years of Department service; or Age 55 with 10 years of Department service in the last 12 years; or Any age with 30 years of Department service; or Receiving permanent total disability benefits from the Plan Note: To be eligible, the employee must have worked or been paid disability four of the last five years immediately preceding eligibility to retire, or while eligible to retire.
<i>Monthly Amount</i>	The greater of 2.1% of the Monthly Salary Base or \$9.50 per year of service. For those age 55 or older with 30 or more years of service the factor is 2.3% of the Monthly Salary Base. Benefits are limited to 100% of Monthly Salary Base.
<i>Monthly Salary Base</i>	Equivalent of monthly average salary of highest successive 26 biweekly payroll periods (one year).
<i>Cost of Living Benefit</i>	Based on CPI subject to a maximum of 3% per year, excess "banked".

Section 4: Actuarial Valuation Basis

Formula Retirement Benefit (continued):

Tier 2

<i>Age & Service Requirement</i>	Age 60 with 5 years of continuous Department Service with the Plan immediately prior to reaching eligibility; or Age 60 with 10 years of Qualifying Service; or Any age with 30 years of Qualifying Service; or Receiving permanent total disability benefits from the Plan.
<i>Monthly Amount</i>	1.5% x Monthly Salary Base x service credit at age 60 with 5 years of continuous Department Service (or 10 years of Qualifying Service). 2.0% x Monthly Salary Base x service credit at age 60 with 30 years of Qualifying Service; or 2.0% x Monthly Salary Base x service credit at age 55 with 30 years of Service Credit (Service Credit with the Department and with LACERS is combined for satisfying this requirement); or 2.0% x Monthly Salary Base x service credit at age 63 with 5 years of continuous Department Service (or 10 years of Qualifying Service); or 2.1% x Monthly Salary Base x service credit at age 63 with 30 years of Qualifying Service. Benefits are limited to 80% of Monthly Salary Base.
<i>Monthly Salary Base</i>	Equivalent of monthly average salary of highest successive 78 biweekly payroll periods (three years).
<i>Cost of Living Benefit</i>	Based on CPI subject to a maximum of 2% per year.

Money Purchase Annuity:

Tier 1

A monthly lifetime benefit equal in value to the employee normal contribution account plus Department matching contribution (current service contribution) account at retirement date.

Tier 2

Same as Tier 1 (except no Department matching contribution).

Minimum Benefit:

If the money purchase annuity amount exceeds the monthly amount of the formula retirement benefit and the retiree meets the eligibility requirements for the formula retirement benefit, the amount of the money purchase annuity is paid and the cost-of-living and death after retirement continuance features of the formula retirement benefit are also paid.

Section 4: Actuarial Valuation Basis

Early Retirement Reduction Factors:

The early retirement factor is determined by the attained age on the effective date of retirement. Every three months of attained age will affect the factor.

Tier 1

Attained Age at Actual Retirement	Exact Age	+3 Months	+6 Months	+9 Months
48	.7150	.7225	0.7300	0.7375
49	.7450	.7525	0.7600	0.7675
50	.7750	.7825	0.7900	0.7975
51	.8050	.8125	0.8200	0.8275
52	.8350	.8425	0.8500	0.8575
53	.8650	.8725	0.8800	0.8875
54	.8950	.9025	0.9100	0.9175
55	.9250	.92875	0.9325	0.93625
56	.9400	.94375	0.9475	0.95125
57	.9550	.95875	0.9625	0.96625
58	.9700	.97375	0.9775	0.98125
59	.9850	.98875	0.9925	0.99625
60 & Over	1.0000			

The factor is 1.0000 for those retiring at age 55 or later with at least 30 years of service credit.

Tier 2

Same as Tier 1. These are applied to the age 60 benefit for members (with 2.0% formula) who retire before age 60 with less than 30 years of service credit. Service Credit with the Department and with LACERS is combined for satisfying this requirement.

Section 4: Actuarial Valuation Basis

Member Normal Contributions:

Tier 1

If an employee became a plan member after May 31, 1984, the member normal contribution rate is 6% of pay. If an employee became a plan member before June 1, 1984 or transferred from CERS with an entry age contribution rate, sample rates by entry age are as follows:

Entry Age	Rate
20	2.601%
25	3.102%
30	3.611%
35	4.161%
40	4.742%
45	5.381%
50	6.042%
55	6.762%
59	7.332%

Tier 2

Normal contribution rate of 10% of pay.

Department Current Service Contributions:

Tier 1

The Department of Water and Power makes actuarially based contributions that are a minimum of 110% of employee contributions.

Tier 2

Same as Tier 1, except that the minimum contribution equal to 110% of employee contributions is not required.

Disability:

Tier 1

Disability benefits are paid from the Disability Fund. However, if a member is receiving permanent total disability benefits, the member may elect to retire. Other than a nominal amount, no service credit during disability is earned for the Formula benefit; however, credit is earned during disability toward the \$9.50 minimum formula.

Tier 2

Same as Tier 1 (except no \$9.50 minimum formula).

Section 4: Actuarial Valuation Basis

Deferred Retirement Benefit (Vested):

Tier 1

Age & Service Requirement

Age 60 with one year of continuous membership;
or Age 55 with 10 years of contributing membership in the 12 years prior to separation from service.

Amount

Value of employee normal contribution account plus Department matching contribution (called current service contribution) account at retirement date. Does not include cost-of-living and death after retirement continuance features of the formula retirement benefit.

Tier 2

Age & Service Requirement

Age 60 with 5 years of Service Credit with the Plan;
or Age 60 with 15 years of Service Credit (Plan and LACERS Service)

Monthly Amount

1.5% x Monthly Salary Base x service credit at age 60 with 5 years of Service Credit (or 15 years of Service Credit (Plan and LACERS));
or 2.0% x Monthly Salary Base x service credit at age 63 with 5 years of Service Credit (or 15 years of Service Credit (Plan and LACERS)).

Does not include cost-of-living and death after retirement continuance features of the formula retirement benefit.

Death Before Retirement:

Tier 1 and Tier 2

Age & Service Requirement

None

Amount

Refund of member contributions with interest.

Age, Service and Type of Death Requirement

Any death of a member who is eligible for service retirement or attained 25 years of service.

In lieu of the refund of member contributions with interest, the member's spouse or domestic partner may elect an immediate lifetime monthly allowance. The monthly allowance payable to the surviving spouse or domestic partner is the amount the spouse or domestic partner would have received had the member retired and elected a 100% joint and survivor allowance.

Section 4: Actuarial Valuation Basis

Death Before Retirement (continued):	
<i>Age, Service and Type of Death Requirement</i>	Duty death, but prior to service retirement eligibility or attainment of 25 years of service.
<i>Amount</i>	In lieu of the refund of member contributions with interest, the member's spouse or domestic partner may elect either: <ul style="list-style-type: none"> a. A lifetime monthly allowance commencing when the member would have been eligible for a service retirement or attained 25 years of service; or b. A lifetime monthly allowance calculated with up to five years added to the member's age or service. This option is only available if the member has attained age 50 or attained 20 years of service. <p>The monthly allowance payable is the amount the spouse or domestic partner would have received had the member retired and elected a 100% joint and survivor allowance.</p>
Death After Retirement:	
<u><i>Tier 1 and Tier 2</i></u>	50% of retiree's unmodified allowance continued to eligible spouse or domestic partner (reduced if difference in ages is greater than five years).
Withdrawal of Contributions Benefit (Ordinary Withdrawal):	
<u><i>Tier 1 and Tier 2</i></u>	Refund of employee contributions with interest.
Post-retirement Cost-of-Living Benefits:	
<u><i>Tier 1</i></u>	Future changes based on the Consumer Price Index to a maximum of 3% per year, excess "banked."
<u><i>Tier 2</i></u>	Future changes based on the Consumer Price Index to a maximum of 2% per year. Member may purchase additional 1% COLA protection at full actuarial cost.
Changes in Plan Provisions:	There have been no changes in plan provisions since the last valuation.

Note: The summary of major plan provisions is designed to outline principal plan benefits as interpreted for purposes of the actuarial valuation. If the Retirement Office should find the plan summary not in accordance with the actual provisions, the Retirement Office should alert the actuary so they can both be sure the proper provisions are valued.