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July 2018

Safety Plan of the City of Pasadena (CalPERS ID: 6556986602)
Annual Valuation Report as of June 30, 2017

Dear Employer,

As an attachment to this letter, you will find a copy of the June 30, 2017 actuarial valuation report of your pension plan. Your 2017 actuarial valuation report contains important actuarial information about your pension plan at CalPERS. Your CalPERS staff actuary, whose signature appears in the "Actuarial Certification" section on page 1, is available to discuss the report with you after August 1, 2018.

Required Contributions

The exhibit below displays the minimum required employer contributions and the Employee PEPRA Rate for Fiscal Year 2019-20 along with an estimate of the required contribution for Fiscal Year 2020-21. Member contributions other than cost sharing (whether paid by the employer or the employee) are in addition to the results shown below. **The required employer contributions in this report do not reflect any cost sharing arrangement you may have with your employees.**

Fiscal Year	Employer Normal Cost Rate	Employer Amortization of Unfunded Accrued Liability	Employee PEPRA Rate
2019-20	18.907%	$12,900,362	11.75%
Projected Results			
2020-21	*20.2%*	*$14,386,000*	*TBD*

The actual investment return for Fiscal Year 2017-18 was not known at the time this report was prepared. The projections above assume the investment return for that year would be 7.25 percent. ***If the actual investment return for Fiscal Year 2017-18 differs from 7.25 percent, the actual contribution requirements for the projected years will differ from those shown above.***

Moreover, the projected results for Fiscal Year 2020-21 assume that there are no future Plan changes, no further changes in assumptions other than those recently approved and no liability gains or losses. Such changes can have a significant impact on required contributions. Since they cannot be predicted in advance, the projected employer results shown above are estimates. The actual required employer contributions for Fiscal Year 2020-21 will be provided in next year's report.

For additional details regarding the assumptions and methods used for these projections please refer to the "Projected Employer Contributions" in the "Highlights and Executive Summary" section.

The required contributions shown above include a Normal Cost component expressed as a percentage of payroll and a payment toward Unfunded Accrued Liability expressed as a dollar amount. For illustrative total contribution requirements expressed as percentages of payroll, please see pages 4 and 5 of the report.

The "Risk Analysis" section of the valuation report starting on page 22 also contains estimated employer contributions in future years under a variety of investment return scenarios.

Changes since the Prior Year's Valuation

At its December 2016 meeting, the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three-year phase-in beginning with the June 30, 2016 actuarial valuation. The minimum employer contributions for Fiscal Year 2019-20 determined in this valuation were calculated using a discount rate of 7.25 percent. The projected employer contributions on Page 5 are calculated under the assumption that the discount rate will be lowered to 7.00 percent next year, as adopted by the Board.

On December 19, 2017, the CalPERS Board of Administration adopted new actuarial assumptions based on the recommendations in the December 2017 CalPERS Experience Study and Review of Actuarial Assumptions. This study reviewed the retirement rates, termination rates, mortality rates, rates of salary increases and inflation assumption for Public Agencies. These new assumptions are incorporated in your actuarial valuations and will impact the required contribution for FY 2019-20. In addition, the Board adopted a new asset portfolio as part of its Asset Liability Management. The new asset mix supports a 7.00 percent discount rate. The reduction of the inflation assumption will be implemented in two steps in conjunction with the decreases in the discount rate. For the June 30, 2017 valuation an inflation rate of 2.625 percent will be used and a rate of 2.50 percent will be used in the following valuation.

The CalPERS Board of Administration has adopted a new amortization policy effective with the June 30, 2019 actuarial valuation. The new policy shortens the period over which actuarial gains and losses are amortized from 30 years to 20 years with the payments computed using a level dollar amount. In addition, the new policy removes the 5-year ramp-up and ramp-down on UAL bases attributable to assumption changes and non-investment gains/losses. The new policy removes the 5-year ramp-down on investment gains/losses. These changes will apply only to new UAL bases established on or after June 30, 2019.

For inactive employers the new amortization policy imposes a maximum amortization period of 15 years for all unfunded accrued liabilities effective June 30, 2017. Furthermore, the plan actuary has the ability to shorten the amortization period on any valuation date based on the life expectancy of plan members and projected cash flow needs to the plan. The impact of this has been reflected in the current valuation results.

Beginning with Fiscal Year 2017-18 CalPERS began collecting employer contributions toward the plan's unfunded liability as dollar amounts instead of the prior method of a contribution rate. This change addressed potential funding issues that could arise from a declining payroll or reduction in the number of active members in the plan. Funding the unfunded liability as a percentage of payroll could lead to the underfunding of the plans. Due to stakeholder feedback regarding internal needs for total contributions expressed as a percentage of payroll, the reports include such results in the contribution projection on page 5. These results are provided for information purposes only. Contributions toward the unfunded liability will continue to be collected as dollar amounts.

The CalPERS Board of Administration adopted a Risk Mitigation Policy which is designed to reduce funding risk over time. This Policy has been temporarily suspended during the period over which the discount rate is being lowered. More details on the Risk Mitigation Policy can be found on our website.

Besides the above noted changes, there may also be changes specific to the plan such as contract amendments and funding changes.

Further descriptions of general changes are included in the "Highlights and Executive Summary" section and in Appendix A, "Actuarial Methods and Assumptions." The effects of the changes on the required contributions are included in the "Reconciliation of Required Employer Contributions" section.

We understand that you might have some questions about these results. While we are very interested in discussing these results with your agency, in the interest of allowing us to give every public agency their results, we ask that you wait until after August 1, 2018 to contact us with actuarial questions. If you have other questions, you may call the Customer Contact Center at (888)-CalPERS or (**888-225-7377**).

Sincerely,

SCOTT TERANDO
Chief Actuary

Actuarial Valuation
as of June 30, 2017

for the
Safety Plan
of the
City of Pasadena

(CalPERS ID: 6556986602)
(Rate Plan ID: 75)

Required Contributions
for Fiscal Year
July 1, 2019 – June 30, 2020

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Actuarial Certification

To the best of our knowledge, this report is complete and accurate and contains sufficient information to disclose, fully and fairly, the funded condition of the Safety Plan of the City of Pasadena. This valuation is based on the member and financial data as of June 30, 2017 provided by the various CalPERS databases and the benefits under this plan with CalPERS as of the date this report was produced. It is our opinion that the valuation has been performed in accordance with generally accepted actuarial principles, in accordance with standards of practice prescribed by the Actuarial Standards Board, and that the assumptions and methods are internally consistent and reasonable for this plan, as prescribed by the CalPERS Board of Administration according to provisions set forth in the California Public Employees' Retirement Law.

The undersigned is an actuary for CalPERS, a member of the American Academy of Actuaries and the Society of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

STUART BENNETT, ASA, MAAA
Senior Pension Actuary, CalPERS

Highlights and Executive Summary

- **Introduction**
- **Purpose of the Report**
- **Required Contributions**
- **Plan's Funded Status**
- **Projected Employer Contributions**
- **Cost**
- **Changes Since the Prior Year's Valuation**
- **Subsequent Events**

Introduction

This report presents the results of the June 30, 2017 actuarial valuation of the Safety Plan of the City of Pasadena of the California Public Employees' Retirement System (CalPERS). This actuarial valuation sets the minimum required employer contributions for Fiscal Year 2019-20.

Purpose of the Report

The actuarial valuation was prepared by the CalPERS Actuarial Office using data as of June 30, 2017. The purpose of the report is to:

- Set forth the assets and accrued liabilities of this plan as of June 30, 2017;
- Determine the minimum required employer contributions for the fiscal year July 1, 2019 through June 30, 2020;
- Provide actuarial information as of June 30, 2017 to the CalPERS Board of Administration and other interested parties.

The pension funding information presented in this report should not be used in financial reports subject to Governmental Accounting Standards Board (GASB) Statement No. 68 for an Agent Employer Defined Benefit Pension Plan. A separate accounting valuation report for such purposes is available from CalPERS and details for ordering are available on our website.

The measurements shown in this actuarial valuation may not be applicable for other purposes. The employer should contact their actuary before disseminating any portion of this report for any reason that is not explicitly described above.

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; changes in actuarial policies; and changes in plan provisions or applicable law.

California Actuarial Advisory Panel Recommendations

This report includes all the basic disclosure elements as described in the *Model Disclosure Elements for Actuarial Valuation Reports* recommended in 2011 by the California Actuarial Advisory Panel (CAAP), with the exception of including the original base amounts of the various components of the unfunded liability in the Schedule of Amortization Bases shown on page 16.

Additionally, this report includes the following "Enhanced Risk Disclosures" also recommended by the CAAP in the Model Disclosure Elements document:

- A "Deterministic Stress Test," projecting future results under different investment income scenarios
- A "Sensitivity Analysis," showing the impact on current valuation results using alternative discount rates of 6.0 percent, 7.0 percent and 8.0 percent.

Required Contributions

		Fiscal Year
Required Employer Contribution		**2019-20**
Employer Normal Cost Rate		**18.907%**
Plus, Either		
1) Monthly Employer Dollar UAL Payment	**$**	**1,075,030**
Or		
2) Annual UAL Prepayment Option	**$**	**12,456,707**
Required PEPRA Member Contribution Rate		**11.75%**

*The total minimum required employer contribution is the **sum** of the Plan's Employer Normal Cost Rate (expressed as a percentage of payroll) **plus** the Employer Unfunded Accrued Liability (UAL) Contribution Amount (billed monthly in dollars).*

*Only the UAL portion of the employer contribution can be prepaid **(which must be received in full no later than July 31)**. Plan Normal Cost contributions will be made as part of the payroll reporting process. If there is contractual cost sharing or other change, this amount will change.*

In accordance with Sections 20537 and 20572 of the Public Employees' Retirement Law, if a contracting agency fails to remit the required contributions when due, interest and penalties may apply.

For additional detail regarding the determination of the required contribution for PEPRA members, see Appendix D. Required member contributions for Classic members can be found in Appendix B.

		Fiscal Year 2018-19		Fiscal Year 2019-20
Normal Cost Contribution as a Percentage of Payroll				
Total Normal Cost		27.179%		28.304%
Employee Contribution[1]		9.239%		9.397%
Employer Normal Cost[2]		17.940%		18.907%
Projected Annual Payroll for Contribution Year	$	45,553,453	$	47,366,075
Estimated Employer Contributions Based On Projected Payroll				
Total Normal Cost	$	12,380,973	$	13,406,494
Employee Contribution[1]		4,208,684		4,450,990
Employer Normal Cost[2]		8,172,289		8,955,504
Unfunded Liability Contribution		10,953,259		12,900,362
% of Projected Payroll (illustrative only)		24.045%		27.235%
Estimated Total Employer Contribution	$	19,125,548	$	21,855,866
% of Projected Payroll (illustrative only)		41.985%		46.142%

[1] For classic members, this is the percentage specified in the Public Employees Retirement Law, net of any reduction from the use of a modified formula or other factors. For PEPRA members, the member contribution rate is based on 50 percent of the normal cost. A development of PEPRA member contribution rates can be found in Appendix D. Employee cost sharing is not shown in this report.

[2] The Employer Normal Cost is a blended rate for all benefit groups in the plan. A breakout of normal cost by benefit group is shown in Appendix D.

Plan's Funded Status

		June 30, 2016		June 30, 2017
1. Present Value of Projected Benefits	$	663,935,876	$	714,151,399
2. Entry Age Normal Accrued Liability		561,743,295		604,467,787
3. Market Value of Assets (MVA)	$	398,311,673	$	438,683,394
4. Unfunded Accrued Liability (UAL) [(2) – (3)]	$	163,431,622	$	165,784,393
5. Funded Ratio [(3) / (2)]		70.9%		72.6%

This measure of funded status is an assessment of the need for future employer contributions based on the selected actuarial cost method used to fund the plan. The UAL is the present value of future employer contributions for service that has already been earned and is in addition to future normal cost contributions for active members. For a measure of funded status that is appropriate for assessing the sufficiency of plan assets to cover estimated termination liabilities, please see "Hypothetical Termination Liability" in the "Risk Analysis" section.

Projected Employer Contributions

The table below shows the required and projected employer contributions (before cost sharing) for the next six fiscal years. Projected results reflect the adopted changes to the discount rate described in Appendix A, "Actuarial Methods and Assumptions." The projections also assume that all actuarial assumptions will be realized and that no further changes to assumptions, contributions, benefits, or funding will occur during the projection period. The projected normal cost percentages in the projections below do not reflect that the normal cost will decline over time as new employees are hired into PEPRA or other lower cost benefit tiers.

	Required Contribution	**Projected Future Employer Contributions (Assumes 7.25% Return for Fiscal Year 2017-18)**				
Fiscal Year	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**
Normal Cost %	18.907%	20.2%	20.2%	20.2%	20.2%	20.2%
UAL Payment	12,900,362	14,386,000	16,229,000	17,425,000	18,447,000	14,973,000
*Total as a % of Payroll**	*46.1%*	*49.8%*	*52.7%*	*54.2%*	*55.2%*	*47.9%*
Projected Payroll	*47,366,075*	*48,550,443*	*49,885,580*	*51,257,433*	*52,667,013*	*54,115,356*

*Illustrative only and based on the projected payroll shown.

Changes in the UAL due to actuarial gains or losses as well as changes in actuarial assumptions or methods are amortized using a 5-year ramp up. For more information, please see "Amortization of the Unfunded Actuarial Accrued Liability" under "Actuarial Methods" in Appendix A. This method phases in the impact of changes in UAL over a 5-year period and attempts to minimize employer cost volatility from year to year. As a result of this methodology, dramatic changes in the required employer contributions in any one year are less likely. However, required contributions can change gradually and significantly over the next five years. In years where there is a large increase in UAL the relatively small amortization payments during the ramp up period could result in a funded ratio that is projected to decrease initially while the contribution impact of the increase in the UAL is phased in.

Due to the adopted change in the discount rate for the next valuation in combination with the 5-year phase-in ramp, the increases in the required contributions are expected to continue for six years from Fiscal Year 2019-20 through Fiscal Year 2024-25.

For projected contributions under alternate investment return scenarios, please see the "Analysis of Future Investment Return Scenarios" in the "Risk Analysis" section.

Cost

Actuarial Cost Estimates in General

What is the cost of the pension plan?

Contributions to fund the pension plan are comprised of two components:

- The Normal Cost, expressed as a percentage of total active payroll.
- The Amortization of the Unfunded Accrued Liability (UAL), expressed as a dollar amount.

For fiscal years prior to FY 2017-18, the Amortizations of UAL component was expressed as percentage of total active payroll. Starting with FY 2017-18, the Amortization of UAL component was expressed as a dollar amount and invoiced on a monthly basis. There continues to be an option to prepay this amount during July of each fiscal year.

The Normal Cost component will continue to be expressed as a percentage of active payroll with employer and employee contributions payable as part of the regular payroll reporting process.

The determination of both components requires complex actuarial calculations. The calculations are based on a set of actuarial assumptions which can be divided into two categories:

- Demographic assumptions (which includes mortality rates, retirement rates, employment termination rates and disability rates)
- Economic assumptions (which includes future investment earnings, inflation, salary growth rates)

These assumptions reflect CalPERS best estimate of the future experience of the plan and are long term in nature. We recognize that all the assumptions will not be realized in any given year. For example, the investment earnings at CalPERS have averaged 6.6 percent over the 20 years ending June 30, 2017, yet individual fiscal year returns have ranged from -24.0 percent to +21.7 percent. In addition, CalPERS reviews all the actuarial assumptions on an ongoing basis by conducting in-depth experience studies every four years, with the most recent experience study completed in 2017.

Changes since the Prior Year's Valuation

Benefits

The standard actuarial practice at CalPERS is to recognize mandated legislative benefit changes in the first annual valuation following the effective date of the legislation. Voluntary benefit changes by plan amendment are generally included in the first valuation that is prepared after the amendment becomes effective, even if the valuation date is prior to the effective date of the amendment.

This valuation generally reflects plan changes by amendments effective before the date of the report. Please refer to the "Plan's Major Benefit Options" and Appendix B for a summary of the plan provisions used in this valuation. The effect of any mandated benefit changes or plan amendments on the unfunded liability is shown in the "(Gain)/Loss Analysis" and the effect on the employer contribution is shown in the "Reconciliation of Required Employer Contributions." It should be noted that no change in liability or contribution is shown for any plan changes which were already included in the prior year's valuation.

Actuarial Methods and Assumptions

On December 21, 2016, the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three-year phase-in beginning with the June 30, 2016 actuarial valuation. The minimum employer contribution for Fiscal Year 2019-20 determined in this valuation was calculated using a discount rate of 7.25 percent. The projected employer contributions on Page 5 are calculated assuming that the discount rate will be lowered to 7.00 percent next year as adopted by the Board. The decision to reduce the discount rate was primarily based on reduced capital market assumptions provided by external investment consultants and CalPERS investment staff. The specific decision adopted by the Board reflected recommendations from CalPERS staff and additional input from employer and employee stakeholder groups. Based on the investment allocation adopted by the Board and capital market assumptions, the reduced discount rate assumption provides a more realistic assumption for the long-term investment return of the fund.

On December 19, 2017, the CalPERS Board of Administration adopted new actuarial assumptions based on the recommendations in the December 2017 CalPERS Experience Study and Review of Actuarial Assumptions. This study reviewed the retirement rates, termination rates, mortality rates, rates of salary increases and inflation assumption for Public Agencies. These new assumptions are incorporated in this actuarial valuation and will impact the required contribution for FY 2019-20. In addition, the Board adopted a new asset portfolio as part of its Asset Liability Management. The new asset mix supports a 7.00 percent discount rate. The reduction of the inflation assumption will be implemented in two steps in conjunction with the decreases in the discount rate. For the June 30, 2017 valuation an inflation rate of 2.625 percent will be used and a rate of 2.50 percent will be used in the following valuation.

Notwithstanding the Board's decision to phase into a 7.0 percent discount rate, subsequent analysis of the expected investment return of CalPERS assets or changes to the investment allocation may result in a change to this discount rate schedule.

Subsequent Events

The CalPERS Board of Administration has adopted a new amortization policy effective with the June 30, 2019 actuarial valuation. The new policy shortens the period over which actuarial gains and losses are amortized from 30 years to 20 years with the payments computed using a level dollar amount. In addition, the new policy removes the 5-year ramp-up and ramp-down on UAL bases attributable to assumption changes and non-investment gains/losses. The new policy removes the 5-year ramp-down on investment gains/losses. These changes will apply only to new UAL bases established on or after June 30, 2019.

For inactive employers the new amortization policy imposes a maximum amortization period of 15 years for all unfunded accrued liabilities effective June 30, 2017. Furthermore, the plan actuary has the ability to shorten the amortization period on any valuation date based on the life expectancy of plan members and projected cash flow needs to the plan. The impact of this has been reflected in the current valuation results.

The contribution requirements determined in this actuarial valuation report are based on demographic and financial information as of June 30, 2017. Changes in the value of assets subsequent to that date are not reflected. Investment returns below the assumed rate of return will increase the retired contribution, while investment returns above the assumed rate of return will decrease the retired contribution.

This actuarial valuation report reflects statutory changes, regulatory changes and CalPERS Board actions through January 2018. Any subsequent changes or actions are not reflected.

Assets

- **Reconciliation of the Market Value of Assets**
- **Asset Allocation**
- **CalPERS History of Investment Returns**

Reconciliation of the Market Value of Assets

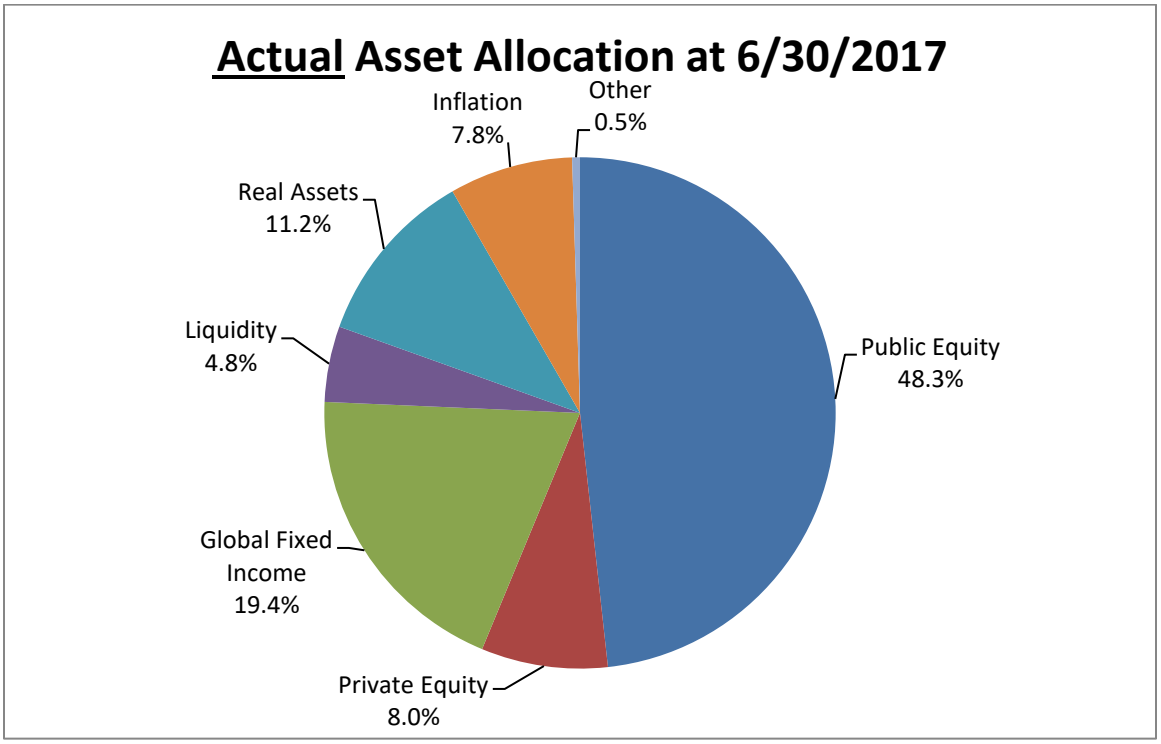
1.	Market Value of Assets as of 6/30/16 including Receivables	$	398,311,673
2.	Change in Receivables for Service Buybacks		(50,799)
3.	Employer Contributions		15,279,239
4.	Employee Contributions		4,037,744
5.	Benefit Payments to Retirees and Beneficiaries		(22,653,492)
6.	Refunds		(51)
7.	Lump Sum Payments		0
8.	Transfers and Miscellaneous Adjustments		69,317
9.	Net Investment Return		43,689,763
10.	Market Value of Assets as of 6/30/17 including Receivables	$	438,683,394

Asset Allocation

CalPERS adheres to an Asset Allocation Strategy which establishes asset class allocation policy targets and ranges, and manages those asset class allocations within their policy ranges. CalPERS Investment Belief No. 6 recognizes that strategic asset allocation is the dominant determinant of portfolio risk and return. On December 19, 2017, the CalPERS Board of Administration adopted changes to the current asset allocation as shown in the Policy Target Allocation below expressed as a percentage of total assets.

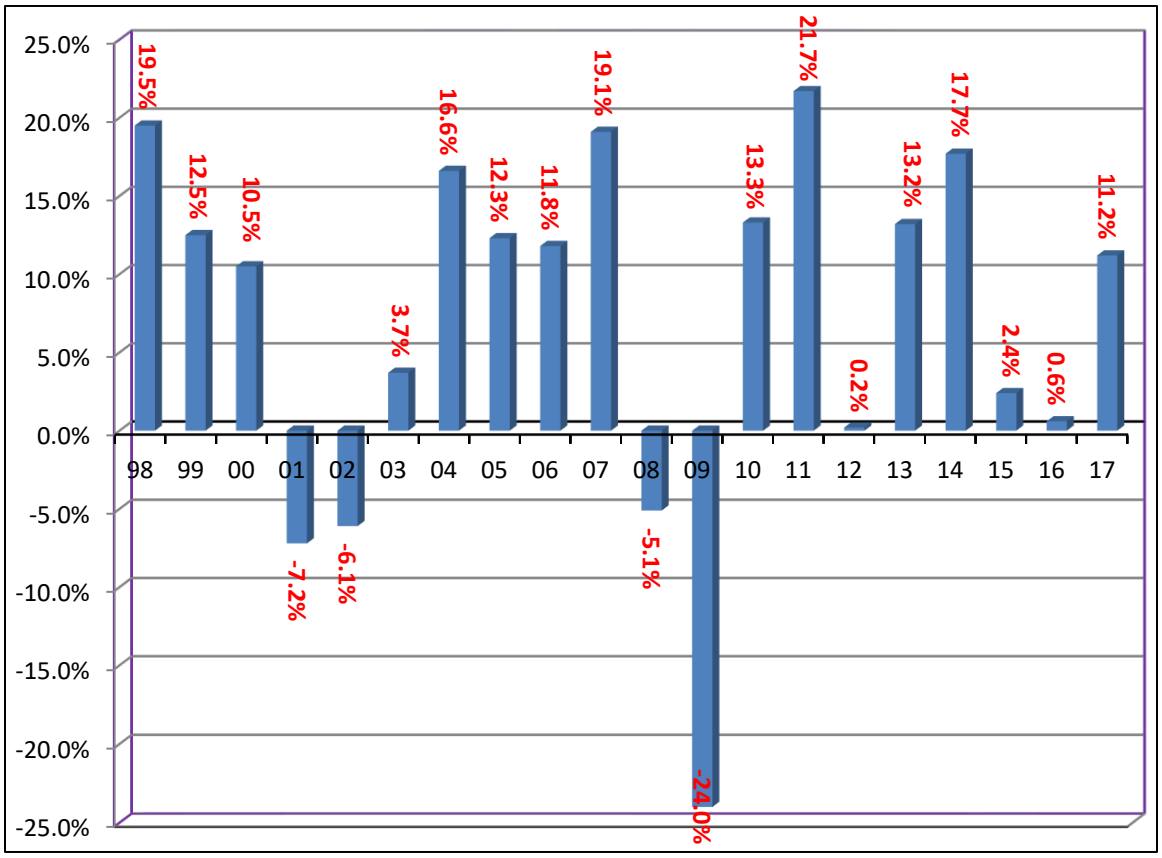
The asset allocation and market value of assets shown below reflect the values of the Public Employees' Retirement Fund (PERF) in its entirety as of June 30, 2017. The assets for City of Pasadena Safety Plan are part of the PERF and are invested accordingly.

(A) Asset Class	(B) Market Value ($ Billion)	(C) Policy Target Allocation
Public Equity	156.2	50.0%
Private Equity	25.9	8.0%
Global Fixed Income	62.9	28.0%
Liquidity	15.5	1.0%
Real Assets	36.3	13.0%
Inflation Sensitive Assets	25.3	0.0%
Other	1.6	0.0%
Total Fund	**$323.7**	**100.0%**



CalPERS History of Investment Returns

The following is a chart with the 20-year historical annual returns of the Public Employees Retirement Fund for each fiscal year ending on June 30. Beginning in 2002, the figures are reported as gross of fees.



The table below shows historical geometric mean annual returns of the Public Employees Retirement Fund for various time periods ending on June 30, 2017 (figures are reported as gross of fees). The geometric mean rate of return is the average rate per period compounded over multiple periods. It should be recognized that in any given year the rate of return is volatile. The portfolio has an expected volatility of 11.4 percent per year based on the most recent Asset Liability Modelling study. The volatility is a measure of the risk of the portfolio expressed in the standard deviation of the fund's total return distribution, expressed as a percentage. Consequently, when looking at investment returns, it is more instructive to look at returns over longer time horizons.

History of CalPERS Geometric Mean Rates of Return and Volatilities					
	1 year	**5 year**	**10 year**	**20 year**	**30 year**
Geometric Return	11.2%	8.8%	4.3%	6.6%	8.2%
Volatility	–	7.3%	13.4%	11.5%	10.1%

Liabilities and Contributions

- **Development of Accrued and Unfunded Liabilities**
- **(Gain) / Loss Analysis 06/30/16 - 06/30/17**
- **Schedule of Amortization Bases**
- **Amortization Schedule and Alternatives**
- **Reconciliation of Required Employer Contributions**
- **Employer Contribution History**
- **Funding History**

Development of Accrued and Unfunded Liabilities

		June 30, 2016	June 30, 2017
1. Present Value of Projected Benefits			
a) Active Members	$	329,398,514	348,568,686
b) Transferred Members		13,972,473	13,145,420
c) Terminated Members		3,046,948	3,893,239
d) Members and Beneficiaries Receiving Payments		317,517,941	348,544,054
e) Total	$	663,935,876	714,151,399
2. Present Value of Future Employer Normal Costs	$	66,018,745	71,068,918
3. Present Value of Future Employee Contributions	$	36,173,836	38,614,694
4. Entry Age Normal Accrued Liability			
a) Active Members [(1a) - (2) - (3)]	$	227,205,933	238,885,074
b) Transferred Members (1b)		13,972,473	13,145,420
c) Terminated Members (1c)		3,046,948	3,893,239
d) Members and Beneficiaries Receiving Payments (1d)		317,517,941	348,544,054
e) Total	$	561,743,295	604,467,787
5. Market Value of Assets (MVA)	$	398,311,673	438,683,394
6. Unfunded Accrued Liability (UAL) [(4e) - (5)]	$	163,431,622	165,784,393
7. Funded Ratio [(5) / (4e)]		70.9%	72.6%

(Gain)/Loss Analysis 6/30/16 – 6/30/17

To calculate the cost requirements of the plan, 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 compared to the expected experience based on the actuarial assumptions. This results in actuarial gains or losses, as shown below.

1. Total (Gain)/Loss for the Year		
a) Unfunded Accrued Liability (UAL) as of 6/30/16	$	163,431,622
b) Expected Payment on the UAL during 2016-17		7,285,375
c) Interest through 6/30/17 [.07375 x (1a) - ((1.07375)$^{1/2}$ - 1) x (1b)]		11,789,212
d) Expected UAL before all other changes [(1a) - (1b) + (1c)]		167,935,459
e) Change due to plan changes		0
f) Change due to assumption change		12,721,348
g) Expected UAL after all other changes [(1d) + (1e) + (1f)]		180,656,807
h) Actual UAL as of 6/30/17		165,784,393
i) Total (Gain)/Loss for 2016-17 [(1h) - (1g)]	$	(14,872,414)
2. Contribution (Gain)/Loss for the Year		
a) Expected Contribution (Employer and Employee)	$	19,032,490
b) Interest on Expected Contributions		689,339
c) Actual Contributions		19,316,983
d) Interest on Actual Contributions		699,644
e) Expected Contributions with Interest [(2a) + (2b)]		19,721,829
f) Actual Contributions with Interest [(2c) + (2d)]		20,016,627
g) Contribution (Gain)/Loss [(2e) - (2f)]	$	(294,798)
3. Asset (Gain)/Loss for the Year		
a) Market Value of Assets as of 6/30/16	$	398,311,673
b) Prior Fiscal Year Receivables		(319,593)
c) Current Fiscal Year Receivables		268,794
d) Contributions Received		19,316,983
e) Benefits and Refunds Paid		(22,653,543)
f) Transfers and Miscellaneous Adjustments		69,317
g) Expected Int. [.07375 x (3a + 3b) + ((1.07375)$^{1/2}$ - 1) x ((3d) + (3e) + (3f))]		29,233,579
h) Expected Assets as of 6/30/17 [(3a) + (3b) + (3c) + (3d) + (3e) + (3f) + (3g)]		424,227,210
i) Market Value of Assets as of 6/30/17		438,683,394
j) Asset (Gain)/Loss [(3h) **-** (3i)]	$	(14,456,184)
4. Liability (Gain)/Loss for the Year		
a) Total (Gain)/Loss (1i)	$	(14,872,414)
b) Contribution (Gain)/Loss (2g)		(294,798)
c) Asset (Gain)/Loss (3j)		(14,456,184)
d) Liability (Gain)/Loss [(4a) - (4b) - (4c)]	$	(121,432)

Schedule of Amortization Bases

There is a two-year lag between the valuation date and the start of the contribution fiscal year.

- The assets, liabilities, and funded status of the plan are measured as of the valuation date: June 30, 2017.
- The required employer contributions determined by the valuation are for the fiscal year beginning two years after the valuation date: Fiscal Year 2019-20.

This two-year lag is necessary due to the amount of time needed to extract and test the membership and financial data, and the need to provide public agencies with their required employer contribution well in advance of the start of the fiscal year.

The Unfunded Accrued Liability (UAL) is used to determine the employer contribution and therefore must be rolled forward two years from the valuation date to the first day of the fiscal year for which the contribution is being determined. The UAL is rolled forward each year by subtracting the expected payment on the UAL for the fiscal year and adjusting for interest. The expected payment on the UAL for a fiscal year is equal to the Expected Employer Contribution for the fiscal year minus the Expected Normal Cost for the year. The Employer Contribution for the first fiscal year is determined by the actuarial valuation two years ago and the contribution for the second year is from the actuarial valuation one year ago. Additional discretionary payments are reflected in the Expected Payments column in the fiscal year they were made by the agency.

Reason for Base	Date Established	Ramp Up/Down 2019-20	Amortization Period	Balance 6/30/17	Expected Payment 2017-18	Balance 6/30/18	Expected Payment 2018-19	Balance 6/30/19	Scheduled Payment for 2019-20
BENEFIT CHANGE	06/30/99	No Ramp	2	$40,600	$11,223	$31,921	$11,503	$22,323	$11,800
BENEFIT CHANGE	06/30/00	No Ramp	3	$1,416,330	$319,750	$1,187,875	$327,618	$934,710	$336,195
BENEFIT CHANGE	06/30/01	No Ramp	4	$(437,302)	$(83,977)	$(382,038)	$(86,007)	$(320,666)	$(88,278)
BENEFIT CHANGE	06/30/02	No Ramp	5	$6,208,287	$1,042,924	$5,578,319	$1,067,648	$4,877,074	$1,095,998
BENEFIT CHANGE	06/30/02	No Ramp	5	$6,124,146	$1,028,789	$5,502,717	$1,053,178	$4,810,976	$1,081,144
BENEFIT CHANGE	06/30/02	No Ramp	4	$338,057	$64,918	$295,336	$66,488	$247,892	$68,244
BENEFIT CHANGE	06/30/03	No Ramp	5	$9,831,758	$1,651,627	$8,834,109	$1,690,781	$7,723,583	$1,735,679
ASSUMPTION CHANGE	06/30/07	No Ramp	6	$(9,195,322)	$(1,379,245)	$(8,433,615)	$(1,411,276)	$(7,583,512)	$(1,448,900)
ARNETT CASE	06/30/07	No Ramp	6	$14,246	$2,137	$13,066	$2,186	$11,749	$2,245
ASSETS CHANGE	06/30/07	No Ramp	6	$(97,776)	$(14,666)	$(89,677)	$(15,006)	$(80,638)	$(15,407)
METHOD CHANGE	06/30/07	No Ramp	7	$(736,562)	$(100,196)	$(686,198)	$(102,474)	$(629,823)	$(105,215)
BENEFIT CHANGE	06/30/08	No Ramp	10	$403,864	$43,723	$387,864	$44,653	$369,741	$45,855
ASSUMPTION CHANGE	06/30/09	No Ramp	12	$7,475,634	$721,164	$7,270,769	$735,815	$7,035,878	$755,679
SPECIAL (GAIN)/LOSS	06/30/09	No Ramp	22	$9,246,378	$626,173	$9,268,266	$636,154	$9,281,404	$653,510
SPECIAL (GAIN)/LOSS	06/30/10	No Ramp	23	$(4,882,765)	$(323,112)	$(4,902,146)	$(328,134)	$(4,917,731)	$(337,093)
ASSUMPTION CHANGE	06/30/11	No Ramp	14	$9,128,588	$800,562	$8,961,336	$816,080	$8,765,887	$838,169
SPECIAL (GAIN)/LOSS	06/30/11	No Ramp	24	$(3,685,520)	$(238,662)	$(3,705,558)	$(242,278)	$(3,723,304)	$(248,898)
PAYMENT (GAIN)/LOSS	06/30/12	No Ramp	25	$(4,978,664)	$(315,918)	$(5,012,447)	$(320,583)	$(5,043,849)	$(329,351)
(GAIN)/LOSS	06/30/12	No Ramp	25	$47,356,817	$3,004,997	$47,678,164	$3,049,375	$47,976,850	$3,132,767
(GAIN)/LOSS	06/30/13	100% →	26	$56,191,154	$2,268,976	$57,915,226	$3,070,868	$58,933,840	$3,943,640
ASSUMPTION CHANGE	06/30/14	80% ↗	17	$28,999,636	$1,079,584	$29,984,075	$1,649,555	$30,449,616	$2,259,241
(GAIN)/LOSS	06/30/14	80% ↗	27	$(48,575,220)	$(1,328,785)	$(50,720,812)	$(2,021,909)	$(52,304,151)	$(2,769,814)
(GAIN)/LOSS	06/30/15	60% ↗	28	$24,775,948	$348,877	$26,210,902	$707,267	$27,378,736	$1,090,061
ASSUMPTION CHANGE	06/30/16	40% ↗	19	$10,090,896	$(357,351)	$11,192,564	$211,207	$11,785,296	$433,981
(GAIN)/LOSS	06/30/16	40% ↗	29	$22,882,251	$0	$24,541,214	$340,550	$25,967,773	$699,868
ASSUMPTION CHANGE	06/30/17	20% ↗	20	$12,721,348	$(502,158)	$14,163,688	$(516,595)	$15,725,549	$296,359
(GAIN)/LOSS	06/30/17	20% ↗	30	$(14,872,415)	$0	$(15,950,665)	$0	$(17,107,088)	$(237,117)
TOTAL				**$165,784,393**	**$8,371,354**	**$169,134,255**	**$10,436,664**	**$170,588,115**	**$12,900,362**

Amortization Schedule and Alternatives

The amortization schedule on the previous page shows the minimum contributions required according to CalPERS amortization policy. There has been considerable interest from many agencies in paying off these unfunded accrued liabilities sooner and the possible savings in doing so. As a result, we have provided alternate amortization schedules to help analyze the current amortization schedule and illustrate the advantages of accelerating unfunded liability payments.

Shown on the following page are future year amortization payments based on 1) the current amortization schedule reflecting the individual bases and remaining periods shown on the previous page, and 2) alternate "fresh start" amortization schedules using two sample periods that would both result in interest savings relative to the current amortization schedule. Note that the payments under each alternate scenario increase by 2.875 percent per year. **The schedules do not reflect the impact of adopted discount rate changes that will become effective beyond June 30, 2017. Therefore, future amortization payments displayed in the Current Amortization Schedule on the following page will not match projected amortization payments shown in connection with Projected Employer Contributions provided elsewhere in this report.**

The Current Amortization Schedule typically contains individual bases that are both positive and negative. Positive bases result from plan changes, assumption changes or plan experience that result in increases to unfunded liability. Negative bases result from plan changes, assumption changes or plan experience that result in decreases to unfunded liability. The combination of positive and negative bases within an amortization schedule can result in unusual or problematic circumstances in future years such as:

- A positive total unfunded liability with a negative total payment,
- A negative total unfunded liability with a positive total payment, or
- Total payments that completely amortize the unfunded liability over a very short period of time

In any year where one of the above scenarios occurs, the actuary will consider corrective action such as replacing the existing unfunded liability bases with a single "fresh start" base and amortizing it over a reasonable period.

The Current Amortization Schedule on the following page may appear to show that, based on the current amortization bases, one of the above scenarios will occur at some point in the future. It is impossible to know today whether such a scenario will in fact arise since there will be additional bases added to the amortization schedule in each future year. Should such a scenario arise in any future year, the actuary will take appropriate action based on guidelines in the CalPERS amortization policy.

Amortization Schedule and Alternatives

	Current Amortization Schedule*		Alternate Schedules			
			20 Year Amortization		15 Year Amortization	
Date	**Balance**	**Payment**	**Balance**	**Payment**	**Balance**	**Payment**
6/30/2019	170,588,115	12,900,362	170,588,115	12,749,594	170,588,115	15,511,733
6/30/2020	169,595,936	14,157,902	169,752,073	13,116,144	166,891,558	15,957,695
6/30/2021	167,229,496	15,599,693	168,475,813	13,493,234	162,465,156	16,416,479
6/30/2022	163,198,345	16,363,893	166,716,504	13,881,164	157,242,715	16,888,453
6/30/2023	158,083,520	16,923,148	164,427,898	14,280,247	151,152,865	17,373,996
6/30/2024	152,018,695	12,901,110	161,560,072	14,690,805	144,118,664	17,873,498
6/30/2025	149,679,458	15,005,120	158,059,148	15,113,165	136,057,190	18,387,361
6/30/2026	144,991,679	15,564,825	153,867,004	15,547,669	126,879,096	18,915,998
6/30/2027	139,384,400	16,012,316	148,920,951	15,994,664	116,488,125	19,459,833
6/30/2028	132,907,163	16,472,669	143,153,394	16,454,511	104,780,605	20,019,303
6/30/2029	125,483,578	16,885,377	136,491,464	16,927,578	91,644,893	20,594,858
6/30/2030	117,094,375	17,370,835	128,856,629	17,414,246	76,960,788	21,186,960
6/30/2031	107,594,209	16,808,411	120,164,267	17,914,905	60,598,896	21,796,085
6/30/2032	97,987,734	16,475,202	110,323,218	18,429,959	42,419,947	22,422,723
6/30/2033	88,029,865	14,862,503	99,235,295	18,959,820	22,274,068	23,067,376
6/30/2034	79,020,189	14,093,762	86,794,766	19,504,915		
6/30/2035	70,153,431	12,802,122	72,887,789	20,065,681		
6/30/2036	61,981,473	11,424,557	57,391,817	20,642,570		
6/30/2037	54,643,678	10,897,967	40,174,954	21,236,044		
6/30/2038	47,319,238	10,331,653	21,095,256	21,846,580		
6/30/2039	40,050,260	10,106,275				
6/30/2040	32,487,684	10,396,829				
6/30/2041	24,075,921	8,005,108				
6/30/2042	17,531,209	8,697,443				
6/30/2043	9,795,012	8,531,427				
6/30/2044	1,669,870	1,438,130				
6/30/2045	301,585	283,317				
6/30/2046	30,043	31,113				
6/30/2047						
6/30/2048						
Totals	**341,343,069**		**338,263,495**		**285,872,351**	
Interest Paid	**170,754,954**		**167,675,380**		**115,284,236**	
Estimated Savings			**3,079,574**		**55,470,718**	

* This schedule does not reflect the impact of adopted discount rate changes that will become effective beyond June 30, 2017. For Projected Employer Contributions, please see Page 5.

Reconciliation of Required Employer Contributions

Normal Cost (% of Payroll)

1. For Period 7/1/18 – 6/30/19	
a) Employer Normal Cost	17.940%
b) Employee Contribution	9.239%
c) Total Normal Cost	27.179%
2. Changes since the prior year annual valuation	
a) Effect of changes in demographics results	0.003%
b) Effect of plan changes	0.000%
c) Effect of changes in assumptions	1.122%
d) Net effect of the changes above [sum of (a) through (c)]	1.125%
3. For Period 7/1/19 – 6/30/20	
a) Employer Normal Cost	18.907%
b) Employee Contribution	9.397%
c) Total Normal Cost	28.304%
Employer Normal Cost Change [(3a) – (1a)]	0.967%
Employee Contribution Change [(3b) – (1b)]	0.158%

Unfunded Liability Contribution ($)

1. For Period 7/1/18 – 6/30/19	10,953,259
2. Changes since the prior year annual valuation	
a) Effect of (gain)/loss during prior year[1]	(237,117)
b) Effect of plan changes	0
c) Effect of changes in assumptions[2]	296,359
d) Changes to prior year amortization payments[3]	1,887,861
e) Effect of changes due to Fresh Start	0
f) Effect of elimination of amortization base	0
g) Net effect of the changes above [sum of (a) through (f)]	1,947,103
3. For Period 7/1/19 – 6/30/20 [(1) + (2g)]	12,900,362

[1] The unfunded liability contribution for the (gain)/loss during the year prior to the valuation date is 20 percent of the "full" annual requirement due to the 5-year ramp. Increases to this amount that occur during the ramp period will be included in line d) in future years.

[2] The unfunded liability contribution for the change in assumptions is 20 percent of the "full" annual requirement due to the 5-year ramp. Increases to this amount that occur during the ramp period will be included in line d) in future years.

[3] Includes changes due to 5-year ramp, payroll growth assumption, and re-amortization under new discount rate.

The amounts shown for the period 7/1/18 – 6/30/19 may be different if a prepayment of unfunded actuarial liability is made or a plan change became effective after the prior year's actuarial valuation was performed.

Employer Contribution History

The table below provides a recent history of the required employer contributions for the plan, as determined by the annual actuarial valuation. It does not account for prepayments or benefit changes made during a fiscal year.

Fiscal Year	Employer Normal Cost	Unfunded Rate	Unfunded Liability Payment ($)
2013 - 14	16.136%	11.090%	N/A
2014 - 15	16.114%	13.207%	N/A
2015 - 16	16.187%	15.584%	N/A
2016 - 17	17.213%	17.873%	N/A
2017 - 18	17.141%	N/A	9,230,863
2018 - 19	17.940%	N/A	10,953,259
2019 - 20	18.907%	N/A	12,900,362

Funding History

The table below shows the recent history of the actuarial accrued liability, the market value of assets, the funded ratio and the annual covered payroll.

Valuation Date	Accrued Liability	Market Value of Assets (MVA)	Unfunded Liability	Funded Ratio	Annual Covered Payroll
06/30/11	$ 403,625,610	$ 296,949,510	$ 106,676,100	73.6%	$ 44,057,632
06/30/12	429,717,919	298,720,798	130,997,121	69.5%	42,612,407
06/30/13	457,270,676	338,082,068	119,188,608	73.9%	41,383,174
06/30/14	501,785,456	395,728,921	106,056,535	78.9%	41,013,701
06/30/15	530,413,907	400,797,210	129,616,697	75.6%	40,318,379
06/30/16	561,743,295	398,311,673	163,431,622	70.9%	41,687,863
06/30/17	604,467,787	438,683,394	165,784,393	72.6%	43,504,868

Risk Analysis

- **Analysis of Future Investment Return Scenarios**
- **Analysis of Discount Rate Sensitivity**
- **Volatility Ratios**
- **Hypothetical Termination Liability**

Analysis of Future Investment Return Scenarios

Analysis was performed to determine the effects of various future investment returns on required employer contributions. The projections below provide a range of results based on five investment return scenarios assumed to occur during the next four fiscal years (2017-18, 2018-19, 2019-20 and 2020-21). The projections also assume that all other actuarial assumptions will be realized and that no further changes to assumptions, contributions, benefits, or funding will occur.

Each of the five investment return scenarios assumes a return of 7.25 percent for fiscal year 2017-18. For fiscal years 2018-19, 2019-20, and 2020-21 each scenario assumes an alternate fixed annual return. The fixed return assumptions for the five scenarios are 1.0 percent, 4.0 percent, 7.0 percent, 9.0 percent and 12.0 percent.

The alternate investment returns were chosen based on stochastic analysis of possible future investment returns over the four-year period ending June 30, 2021. Using the expected returns and volatility of the asset classes in which the funds are invested, we produced five thousand stochastic outcomes for this period based on the recently completed Asset Liability Management process. We then selected annual returns that approximate the 5th, 25th, 50th, 75th, and 95th percentiles for these outcomes. For example, of all the 4-year outcomes generated in the stochastic analysis, approximately 25 percent of them had an average annual return of 4.0 percent or less.

Required contributions outside of this range are also possible. In particular, whereas it is unlikely that investment returns will average less than 1.0 percent or greater than 12.0 percent over this four-year period, the possibility of a single investment return less than 1.0 percent or greater than 12.0 percent in any given year is much greater.

Assumed Annual Return From 2018-19 through 2020-21	Projected Employer Contributions			
	2020-21	2021-22	2022-23	2023-24
1.0%				
Normal Cost	20.2%	20.2%	20.2%	20.2%
UAL Contribution	$14,386,000	$16,668,000	$18,772,000	$21,202,000
4.0%				
Normal Cost	20.2%	20.2%	20.2%	20.2%
UAL Contribution	$14,386,000	$16,449,000	$18,105,000	$19,851,000
7.0%				
Normal Cost	20.2%	20.2%	20.2%	20.2%
UAL Contribution	$14,386,000	$16,229,000	$17,425,000	$18,447,000
9.0%				
Normal Cost	20.2%	20.6%	21.0%	21.4%
UAL Contribution	$14,386,000	$16,091,000	$17,053,000	$17,726,000
12.0%				
Normal Cost	20.2%	20.6%	21.0%	21.4%
UAL Contribution	$14,386,000	$15,873,000	$16,360,000	$16,258,000

Given the temporary suspension of the Risk Mitigation Policy during the period over which the discount rate assumption is being phased down to 7.0 percent, the projections above were performed without reflection of any possible impact of this Policy for Fiscal Year 2020-21.

The projected normal cost percentages do not reflect that the normal cost will decline over time as new employees are hired into PEPRA or other lower cost benefit tiers. In addition, the projections above do not reflect the recent changes to the amortization policy effective with the June 30, 2019 valuation but the impact on the results above is expected to be minimal.

Analysis of Discount Rate Sensitivity

Shown below are various valuation results as of June 30, 2017 assuming alternate discount rates. Results are shown using the current discount rate of 7.25 percent as well as alternate discount rates of 6.0 percent, 7.0 percent, and 8.0 percent. The alternate rate of 7.0 percent was selected since the Board has adopted this rate as the final discount rate at the end of the three-year phase-in of the reduction in this assumption. The rates of 6.0 percent and 8.0 percent were selected since they illustrate the impact of a 1 percent increase or decrease to the 7.0 percent assumption. This analysis shows the potential plan impacts if the PERF were to realize investment returns of 6.0 percent, 7.0 percent, or 8.0 percent over the long-term.

This type of analysis gives the reader a sense of the long-term risk to required contributions. For a measure of funded status that is appropriate for assessing the sufficiency of plan assets to cover estimated termination liabilities, please see "Hypothetical Termination Liability" at the end of this section.

Sensitivity Analysis				
As of June 30, 2017	**Plan's Normal Cost**	**Accrued Liability**	**Unfunded Accrued Liability**	**Funded Status**
7.25% (current discount rate)	28.304%	$604,467,787	$165,784,393	72.6%
6.0%	37.896%	$713,473,232	$274,789,838	61.5%
7.0%	29.588%	$622,578,962	$183,895,568	70.5%
8.0%	23.355%	$548,532,953	$109,849,559	80.0%

Volatility Ratios

The actuarial calculations supplied in this communication are based on various assumptions about long-term demographic and economic behavior. Unless these assumptions (terminations, deaths, disabilities, retirements, salary growth, and investment return) are exactly realized each year, there will be differences on a year-to-year basis. The year-to-year differences between actual experience and the assumptions are called actuarial gains and losses and serve to lower or raise required employer contributions from one year to the next. Therefore, employer contributions will inevitably fluctuate, especially due to the ups and downs of investment returns.

Asset Volatility Ratio (AVR)

Plans that have higher asset-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return. For example, a plan with an asset-to-payroll ratio of 8 may experience twice the contribution volatility due to investment return volatility than a plan with an asset-to-payroll ratio of 4. Shown below is the asset volatility ratio, a measure of the plan's current volatility. It should be noted that this ratio is a measure of the current situation. It increases over time but generally tends to stabilize as the plan matures.

Liability Volatility Ratio (LVR)

Plans that have higher liability-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return and changes in liability. For example, a plan with a liability-to-payroll ratio of 8 is expected to have twice the contribution volatility of a plan with a liability-to-payroll ratio of 4. The liability volatility ratio is also included in the table below. It should be noted that this ratio indicates a longer-term potential for contribution volatility. The asset volatility ratio, described above, will tend to move closer to the liability volatility ratio as the plan matures. Since the liability volatility ratio is a long-term measure, it is shown below at the current discount rate (7.25 percent) as well as the discount rate the Board has adopted to determine the contribution requirement in the June 30, 2018 actuarial valuation (7.00 percent).

Contribution Volatility		**As of June 30, 2017**
1. Market Value of Assets without Receivables	$	438,414,600
2. Payroll		43,504,868
3. Asset Volatility Ratio (AVR) [(1) / (2)]		10.1
4. Accrued Liability (7.25% discount rate)	$	604,467,787
5. Liability Volatility Ratio (LVR) [(4) / (2)]		13.9
6. Accrued Liability (7.00% discount rate)		622,578,962
7. Projected Liability Volatility Ratio [(6) / (2)]		14.3

Hypothetical Termination Liability

The hypothetical termination liability is an estimate of the financial position of the plan had the contract with CalPERS been terminated as of June 30, 2017. The plan liability on a termination basis is calculated differently from the plan's ongoing funding liability. For this hypothetical termination liability calculation, both compensation and service are frozen as of the valuation date and no future pay increases or service accruals are assumed. This measure of funded status is not appropriate for assessing the need for future employer contributions in the case of an ongoing plan, that is, for an employer that continues to provide CalPERS retirement benefits to active employees.

A more conservative investment policy and asset allocation strategy was adopted by the CalPERS Board for the Terminated Agency Pool. The Terminated Agency Pool has limited funding sources since no future employer contributions will be made. Therefore, expected benefit payments are secured by risk-free assets and benefit security for members is increased while limiting the funding risk. However, this asset allocation has a lower expected rate of return than the PERF and consequently, a lower discount rate assumption. The lower discount rate for the Terminated Agency Pool results in higher liabilities for terminated plans.

The effective termination discount rate will depend on actual market rates of return for risk-free securities on the date of termination. As market discount rates are variable the table below shows a range for the hypothetical termination liability based on the lowest and highest interest rates observed during an approximate 2-year period centered around the valuation date.

Market Value of Assets (MVA)	Hypothetical Termination Liability[1,2] @ 1.75%	Funded Status	Unfunded Termination Liability @ 1.75%	Hypothetical Termination Liability[1,2] @ 3.00%	Funded Status	Unfunded Termination Liability @ 3.00%
$438,683,394	$1,247,998,451	35.2%	$809,315,057	$1,105,269,638	39.7%	$666,586,244

[1] The hypothetical liabilities calculated above include a 5 percent contingency load in accordance with Board policy. Other actuarial assumptions can be found in Appendix A.

[2] The current discount rate assumption used for termination valuations is a weighted average of the 10-year and 30-year U.S. Treasury yields where the weights are based on matching asset and liability durations as of the termination date. The discount rates used in the table are based on 20-year Treasury bonds, rounded to the nearest quarter percentage point, which is a good proxy for most plans. The 20-year Treasury yield was 2.61 percent on June 30, 2017, and was 2.83 percent on January 31, 2018.

In order to terminate the plan, you must first contact our Retirement Services Contract Unit to initiate a Resolution of Intent to Terminate. The completed Resolution will allow the plan actuary to give you a preliminary termination valuation with a more up-to-date estimate of the plan liabilities. CalPERS advises you to consult with the plan actuary before beginning this process.

Plan’s Major Benefit Provisions

Plan's Major Benefit Options

Shown below is a summary of the major optional benefits for which your agency has contracted for this plan. A description of principal standard and optional plan provisions is in Appendix B of this report.

	Contract Package						
Benefit Provision	Active Fire	Active Police	Active Police	Active Fire	Active Fire	Active Police	Receiving Fire
Benefit Formula	3.0% @ 55	3.0% @ 55	3.0% @ 55	3.0% @ 55	2.7% @ 57	2.7% @ 57	
Social Security Coverage	No	No	No	No	No	No	
Full/Modified	Full	Full	Full	Full	Full	Full	
Employee Contribution Rate	9.00%	9.00%	9.00%	9.00%	11.75%	11.75%	
Final Average Compensation Period	One Year	One Year	One Year	One Year	Three Year	Three Year	
Sick Leave Credit	Yes	Yes	Yes	Yes	Yes	Yes	
Non-Industrial Disability	Standard	Standard	Standard	Standard	Standard	Standard	
Industrial Disability	Yes	Yes	Yes	Yes	Yes	Yes	
Pre-Retirement Death Benefits							
Optional Settlement 2	Yes	Yes	Yes	Yes	Yes	Yes	
1959 Survivor Benefit Level	Level 4	Level 4	Level 4	Level 4	Level 4	Level 4	
Special	Yes	Yes	Yes	Yes	Yes	Yes	
Alternate (firefighters)	No	No	No	No	No	No	
Post-Retirement Death Benefits							
Lump Sum	$500	$500	$500	$500	$500	$500	$500
Survivor Allowance (PRSA)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
COLA	2%	2%	2%	2%	2%	2%	2%

Plan's Major Benefit Options

Shown below is a summary of the major optional benefits for which your agency has contracted. A description of principal standard and optional plan provisions is in the following section of this Appendix.

	Contract Package	
Benefit Provision	Receiving Police	
Benefit Formula		
Social Security Coverage		
Full/Modified		
Employee Contribution Rate		
Final Average Compensation Period		
Sick Leave Credit		
Non-Industrial Disability		
Industrial Disability		
Pre-Retirement Death Benefits		
Optional Settlement 2		
1959 Survivor Benefit Level		
Special		
Alternate (firefighters)		
Post-Retirement Death Benefits		
Lump Sum	$500	
Survivor Allowance (PRSA)	Yes	
COLA	2%	

Appendices

- **Appendix A – Actuarial Methods and Assumptions**
- **Appendix B – Principal Plan Provisions**
- **Appendix C – Participant Data**
- **Appendix D – Normal Cost by Benefit Group and PEPRA Member Contribution Rates**
- **Appendix E – Glossary of Actuarial Terms**

Appendix A

Actuarial Methods and Assumptions

- **Actuarial Data**
- **Actuarial Methods**
- **Actuarial Assumptions**
- **Miscellaneous**

Actuarial Data

As stated in the Actuarial Certification, the data which serves as the basis of this valuation has been obtained from the various CalPERS databases. We have reviewed the valuation data and believe that it is reasonable and appropriate in aggregate. We are unaware of any potential data issues that would have a material effect on the results of this valuation, except that data does not always contain the latest salary information for former members now in reciprocal systems and does not recognize the potential for unusually large salary deviation in certain cases such as elected officials. Therefore, salary information in these cases may not be accurate. These situations are relatively infrequent, however, and when they do occur, they generally do not have a material impact on the required employer contributions.

Actuarial Methods

Actuarial Cost Method

The actuarial cost method used is the Entry Age Normal Cost Method. Under this method, projected benefits are determined for all members and the associated liabilities are spread in a manner that produces level annual cost as a percentage of pay in each year from the member's entry age to their assumed retirement age on the valuation date. The cost allocated to the current fiscal year is called the normal cost.

The actuarial accrued liability for active members is then calculated as the portion of the total cost of the plan allocated to prior years. The actuarial accrued liability for members currently receiving benefits and for members entitled to deferred benefits is equal to the present value of the benefits expected to be paid. No normal costs are applicable for these participants.

Amortization of Unfunded Actuarial Accrued Liability

The excess of the total actuarial accrued liability over the market value of plan assets is called the unfunded actuarial accrued liability (UAL). Funding requirements are determined by adding the normal cost and an amortization payment toward the unfunded liability. The unfunded liability is amortized as a "level percent of pay". Commencing with the June 30, 2013 valuation, all new gains or losses are amortized over a fixed 30-year period with a 5-year ramp up at the beginning and a 5-year ramp down at the end of the amortization period. All changes in liability due to plan amendments (other than golden handshakes) are amortized over a 20-year period with no ramp. Changes in actuarial assumptions or changes in actuarial methodology are amortized over a 20-year period with a 5-year ramp up at the beginning and a 5-year ramp down at the end of the amortization period. Changes in unfunded accrued liability due to a Golden Handshake will be amortized over a period of five years. A summary of the current policy is provided in the table below:

	Source				
	(Gain)/Loss				
Driver	Investment	Non-investment	Assumption/Method Change	Benefit Change	Golden Handshake
Amortization Period	30 Years	30 Years	20 Years	20 Years	5 Years
Escalation Rate - Active Plans - Inactive Plans	2.875% 0%	2.875% 0%	2.875% 0%	2.875% 0%	2.875% 0%
Ramp Up	5	5	5	0	0
Ramp Down	5	5	5	0	0

The 5-year ramp up means that the payments in the first four years of the amortization period are 20 percent, 40 percent, 60 percent and 80 percent of the "full" payment which begins in year five. The 5-year ramp down means that the reverse is true in the final four years of the amortization period.

Exceptions for Inconsistencies:

An exception to the amortization rules above is used whenever their application results in inconsistencies. In these cases, a "fresh start" approach is used. This means that the current unfunded actuarial liability is projected and amortized over a set number of years. For example, a fresh start is needed in the following situations:

- When a positive payment would be required on a negative unfunded actuarial liability (or conversely a negative payment on a positive unfunded actuarial liability); or
- When there are excess assets, rather than an unfunded liability. In this situation, a 30-year fresh start is used.

It should be noted that the actuary may determine that a fresh start is necessary under other circumstances. In all cases of a fresh start, the period is set by the actuary at what is deemed appropriate; however, the period will not be greater than 30 years.

Exceptions for Inactive Plans:

The following exceptions apply to plans classified as Inactive. These plans have no active members and no expectation to have active members in the future.

- Amortization of the unfunded liability is on a "level dollar" basis rather than a "level percent of pay" basis. For amortization layers, which utilize a ramp up and ramp down, the "ultimate" payment is constant.
- Actuarial judgment will be used to shorten amortization periods for Inactive plans with existing periods that are deemed too long given the duration of the liability. The specific demographics of the plan will be used to determine if shorter periods may be more appropriate.

Asset Valuation Method

It is the policy of the CalPERS Board of Administration to use professionally accepted amortization methods to eliminate a surplus or an unfunded accrued liability in a manner that maintains benefit security for the members of the System while minimizing substantial variations in required employer contributions. On April 17, 2013, the CalPERS Board of Administration approved a recommendation to change the CalPERS amortization and rate smoothing policies. Beginning with the June 30, 2013 valuations that set the employer contribution for Fiscal Year 2015-16, CalPERS employs a policy that amortizes all gains and losses over a fixed 30-year period. The increase or decrease in the rate is then spread directly over a 5-year period. This method is referred to as "direct rate smoothing." CalPERS no longer uses an actuarial value of assets and only uses the market value of assets. The direct rate smoothing method is equivalent to a method using a 5-year asset smoothing period with no actuarial value of asset corridor and a 25-year amortization period for gains and losses.

PEPRA Normal Cost Rate Methodology

Per Government Code Section 7522.30(b) the "normal cost rate" shall mean the annual actuarially determined normal cost for the plan of retirement benefits provided to the new member and shall be established based on actuarial assumptions used to determine the liabilities and costs as part of the annual actuarial valuation. The plan of retirement benefits shall include any elements that would impact the actuarial determination of the normal cost, including, but not limited to, the retirement formula, eligibility and vesting criteria, ancillary benefit provisions, and any automatic cost-of-living adjustments as determined by the public retirement system.

Each non-pooled plan is stable with a sufficiently large demographic representation of active employees. It is preferable to determine normal cost using a large active population ongoing so that this rate remains relatively stable. The total PEPRA normal cost will be calculated using all active members within a non-pooled plan until the number of members covered under the PEPRA formula meets either:

1. 50 percent of the active population, or
2. 25 percent of the active population and 100 or more PEPRA members

Once either of the conditions above is met for a non-pooled plan, the total PEPRA normal cost will be based on the active PEPRA population in the plan.

Accordingly, the total normal cost will be funded equally between employer and employee based on the demographics of the employees of that employer.

Actuarial Assumptions

In 2017, CalPERS completed its most recent asset liability management study incorporating actuarial assumptions and strategic asset allocation. In December 2017, the CalPERS Board of Administration adopted relatively modest changes to the asset allocation that reduced the expected volatility of returns. The adopted asset allocation was expected to have a long-term blended return that continued to support a discount rate assumption of 7.00 percent. The Board also approved several changes to the demographic assumptions that more closely aligned with actual experience. These new actuarial assumptions were first used in this, the June 30, 2017 valuation to set the Fiscal Year 2019-20 contribution for public agency employers.

On December 21, 2016, the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three-year phase-in beginning with the June 30, 2016 actuarial valuations. The minimum employer contributions for Fiscal Year 2019-20 determined in this valuation were calculated using a discount rate of 7.25 percent. The projected employer contributions on Page 5 are calculated assuming that the discount rate will be lowered to 7.00 percent next year as adopted by the Board. The decision to reduce the discount rate was primarily based on reduced capital market assumptions provided by external investment consultants and CalPERS investment staff. The specific decision adopted by the Board reflected recommendations from CalPERS staff and additional input from employer and employee stakeholder groups. Based on the investment allocation adopted by the Board and capital market assumptions, the reduced discount rate schedule provides a more realistic assumption for the long-term investment return of the fund.

Notwithstanding the Board's decision to phase into a 7.0 percent discount rate, subsequent analysis of the expected investment return of CalPERS assets or changes to the investment allocation may result in a change to this discount rate schedule.

For more details and additional rationale for the selection of the actuarial assumptions, please refer to the CalPERS Experience Study and Review of Actuarial Assumptions report from December 2017 that can be found on the CalPERS website under: "Forms and Publications". Click on "View All" and search for Experience Study.

All actuarial assumptions (except the discount rates used for the hypothetical termination liability) represent an estimate of future experience rather than observations of the estimates inherent in market data.

Economic Assumptions

Discount Rate

The prescribed discount rate assumption adopted by the Board on December 21, 2016 is 7.25 percent compounded annually (net of investment and administrative expenses) as of 6/30/2017.

The Board also prescribed that the assumed discount rate will reduce to 7.0 percent compounded annually (net of expenses) as of 6/30/2018. This change to the discount rate assumption is not reflected in the determination of required contributions determined in this report for Fiscal Year 2019-20.

Termination Liability Discount Rate

The current discount rate assumption used for termination valuations is a weighted average of the 10-year and 30-year U.S. Treasury yields where the weights are based on matching asset and liability durations as of the termination date.

The hypothetical termination liabilities in this report are calculated using an observed range of market interest rates. This range is based on the lowest and highest 20-year Treasury bond observed during an approximate 2-year period centered around the valuation date. The 20-year Treasury bond has a similar duration to most plan liabilities and serves as a good proxy for the termination discount rate. The 20-year Treasury yield was 2.61 percent on June 30, 2017.

Salary Growth

Annual increases vary by category, entry age, and duration of service. A sample of assumed increases are shown below. Wage inflation assumption in the valuation year (2.875% for 2017) is added to these factors for total salary growth.

Public Agency Miscellaneous

Duration of Service	(Entry Age 20)	(Entry Age 30)	(Entry Age 40)
0	0.0850	0.0775	0.0650
1	0.0690	0.0635	0.0525
2	0.0560	0.0510	0.0410
3	0.0470	0.0425	0.0335
4	0.0400	0.0355	0.0270
5	0.0340	0.0295	0.0215
10	0.0160	0.0135	0.0090
15	0.0120	0.0100	0.0060
20	0.0090	0.0075	0.0045
25	0.0080	0.0065	0.0040
30	0.0080	0.0065	0.0040

Public Agency Fire

Duration of Service	(Entry Age 20)	(Entry Age 30)	(Entry Age 40)
0	0.1700	0.1700	0.1700
1	0.1100	0.1100	0.1100
2	0.0700	0.0700	0.0700
3	0.0580	0.0580	0.0580
4	0.0473	0.0473	0.0473
5	0.0372	0.0372	0.0372
10	0.0165	0.0165	0.0165
15	0.0144	0.0144	0.0144
20	0.0126	0.0126	0.0126
25	0.0111	0.0111	0.0111
30	0.0097	0.0097	0.0097

Public Agency Police

Duration of Service	(Entry Age 20)	(Entry Age 30)	(Entry Age 40)
0	0.1027	0.1027	0.1027
1	0.0803	0.0803	0.0803
2	0.0628	0.0628	0.0628
3	0.0491	0.0491	0.0491
4	0.0384	0.0384	0.0384
5	0.0300	0.0300	0.0300
10	0.0145	0.0145	0.0145
15	0.0150	0.0150	0.0150
20	0.0155	0.0155	0.0155
25	0.0160	0.0160	0.0160
30	0.0165	0.0165	0.0165

Salary Growth (continued)

Public Agency County Peace Officers

Duration of Service	(Entry Age 20)	(Entry Age 30)	(Entry Age 40)
0	0.1320	0.1320	0.1320
1	0.0960	0.0960	0.0960
2	0.0657	0.0657	0.0657
3	0.0525	0.0525	0.0525
4	0.0419	0.0419	0.0419
5	0.0335	0.0335	0.0335
10	0.0170	0.0170	0.0170
15	0.0150	0.0150	0.0150
20	0.0150	0.0150	0.0150
25	0.0175	0.0175	0.0175
30	0.0200	0.0200	0.0200

Schools

Duration of Service	(Entry Age 20)	(Entry Age 30)	(Entry Age 40)
0	0.0428	0.0419	0.0380
1	0.0428	0.0419	0.0380
2	0.0428	0.0419	0.0380
3	0.0354	0.0332	0.0280
4	0.0305	0.0279	0.0224
5	0.0262	0.0234	0.0180
10	0.0171	0.0154	0.0112
15	0.0152	0.0134	0.0098
20	0.0135	0.0117	0.0086
25	0.0120	0.0103	0.0076
30	0.0087	0.0071	0.0048

- The Miscellaneous salary scale is used for Local Prosecutors.
- The Police salary scale is used for Other Safety, Local Sheriff, and School Police.

Overall Payroll Growth

2.875 percent compounded annually (used in projecting the payroll over which the unfunded liability is amortized). This assumption is used for all plans with active members. For the June 30, 2018 valuation the payroll growth assumption will be 2.75 percent.

Inflation

2.625 percent compounded annually. For the June 30, 2018 valuation the inflation assumption will be 2.50 percent.

Non-valued Potential Additional Liabilities

The potential liability loss for a cost-of-living increase exceeding the 2.625 percent inflation assumption, and any potential liability loss from future member service purchases are not reflected in the valuation.

Miscellaneous Loading Factors

Credit for Unused Sick Leave

Total years of service is increased by 1 percent for those plans that have adopted the provision of providing Credit for Unused Sick Leave.

Conversion of Employer Paid Member Contributions (EPMC)

Total years of service is increased by the Employee Contribution Rate for those plans with the provision providing for the Conversion of Employer Paid Member Contributions (EPMC) during the final compensation period.

Norris Decision (Best Factors)

Employees hired prior to July 1, 1982 have projected benefit amounts increased in order to reflect the use of "Best Factors" in the calculation of optional benefit forms. This is due to a 1983 Supreme Court decision, known as the Norris decision, which required males and females to be treated equally in the determination of benefit amounts. Consequently, anyone already employed at that time is given the best possible conversion factor when optional benefits are determined. No loading is necessary for employees hired after July 1, 1982.

Termination Liability

The termination liabilities include a 5 percent contingency load. This load is for unforeseen negative experience.

Demographic Assumptions

Pre-Retirement Mortality

Non-industrial death rates vary by age and gender. Industrial death rates vary by age. See sample rates in table below. The non-industrial death rates are used for all plans. The industrial death rates are used for safety plans (except for Local Prosecutor safety members where the corresponding miscellaneous plan does not have the Industrial Death Benefit).

	Non-Industrial Death (Not Job-Related)		**Industrial Death (Job-Related)**
Age	Male	Female	Male and Female
20	0.00022	0.00007	0.00004
25	0.00029	0.00011	0.00006
30	0.00038	0.00015	0.00007
35	0.00049	0.00027	0.00009
40	0.00064	0.00037	0.00010
45	0.00080	0.00054	0.00012
50	0.00116	0.00079	0.00013
55	0.00172	0.00120	0.00015
60	0.00255	0.00166	0.00016
65	0.00363	0.00233	0.00018
70	0.00623	0.00388	0.00019
75	0.01057	0.00623	0.00021
80	0.01659	0.00939	0.00022

Miscellaneous plans usually have industrial death rates set to zero unless the agency has specifically contracted for industrial death benefits. If so, each non-industrial death rate shown above will be split into two components; 99 percent will become the non-industrial death rate and 1 percent will become the industrial death rate.

Post-Retirement Mortality

Rates vary by age, type of retirement, and gender. See sample rates in table below. These rates are used for all plans.

	Healthy Recipients		Non-Industrially Disabled (Not Job-Related)		Industrially Disabled (Job-Related)	
Age	Male	Female	Male	Female	Male	Female
50	0.00372	0.00346	0.01183	0.01083	0.00372	0.00346
55	0.00437	0.00410	0.01613	0.01178	0.00437	0.00410
60	0.00671	0.00476	0.02166	0.01404	0.00671	0.00476
65	0.00928	0.00637	0.02733	0.01757	0.01113	0.00765
70	0.01339	0.00926	0.03358	0.02183	0.01607	0.01111
75	0.02316	0.01635	0.04277	0.02969	0.02779	0.01962
80	0.03977	0.03007	0.06272	0.04641	0.04773	0.03609
85	0.07122	0.05418	0.09793	0.07847	0.08547	0.06501
90	0.13044	0.10089	0.14616	0.13220	0.14348	0.11098
95	0.21658	0.17698	0.21658	0.21015	0.21658	0.17698
100	0.32222	0.28151	0.32222	0.32226	0.32222	0.28151
105	0.46691	0.43491	0.46691	0.43491	0.46691	0.43491
110	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

The post-retirement mortality rates above include 15 years of projected on-going mortality improvement using 90 percent of Scale MP 2016 published by the Society of Actuaries.

Marital Status

For active members, a percentage who are married upon retirement is assumed according to member category as shown in the following table.

Member Category	Percent Married
Miscellaneous Member	70%
Local Police	85%
Local Fire	90%
Other Local Safety	70%
School Police	85%
Local County Peace Officers	75%

Age of Spouse

It is assumed that female spouses are 3 years younger than male spouses. This assumption is used for all plans.

Terminated Members

It is assumed that terminated members refund immediately if non-vested. Terminated members who are vested are assumed to retire at age 59 for Miscellaneous members and age 54 for safety members.

Termination with Refund

Rates vary by entry age and service for miscellaneous plans. Rates vary by service for safety plans. See sample rates in tables below.

Public Agency Miscellaneous

Duration of Service	Entry Age 20	Entry Age 25	Entry Age 30	Entry Age 35	Entry Age 40	Entry Age 45
0	0.1742	0.1674	0.1606	0.1537	0.1468	0.1400
1	0.1545	0.1477	0.1409	0.1339	0.1271	0.1203
2	0.1348	0.1280	0.1212	0.1142	0.1074	0.1006
3	0.1151	0.1083	0.1015	0.0945	0.0877	0.0809
4	0.0954	0.0886	0.0818	0.0748	0.0680	0.0612
5	0.0212	0.0193	0.0174	0.0155	0.0136	0.0116
10	0.0138	0.0121	0.0104	0.0088	0.0071	0.0055
15	0.0060	0.0051	0.0042	0.0032	0.0023	0.0014
20	0.0037	0.0029	0.0021	0.0013	0.0005	0.0001
25	0.0017	0.0011	0.0005	0.0001	0.0001	0.0001
30	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001
35	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Public Agency Safety

Duration of Service	Fire	Police	County Peace Officer
0	0.1298	0.1013	0.1188
1	0.0674	0.0636	0.0856
2	0.0320	0.0271	0.0617
3	0.0237	0.0258	0.0445
4	0.0087	0.0245	0.0321
5	0.0052	0.0086	0.0121
10	0.0005	0.0053	0.0053
15	0.0004	0.0027	0.0025
20	0.0003	0.0017	0.0012
25	0.0002	0.0012	0.0005
30	0.0002	0.0009	0.0003
35	0.0001	0.0009	0.0002

The police termination and refund rates are also used for Public Agency Local Prosecutors, Other Safety, Local Sheriff, and School Police.

Schools

Duration of Service	Entry Age 20	Entry Age 25	Entry Age 30	Entry Age 35	Entry Age 40	Entry Age 45
0	0.2107	0.2107	0.1827	0.1546	0.1375	0.1203
1	0.1807	0.1807	0.1526	0.1246	0.1105	0.0963
2	0.1526	0.1526	0.1259	0.0992	0.0878	0.0765
3	0.1266	0.1266	0.1023	0.0780	0.0691	0.0603
4	0.1026	0.1026	0.0815	0.0605	0.0537	0.0469
5	0.0808	0.0808	0.0634	0.0461	0.0409	0.0358
10	0.0202	0.0202	0.0157	0.0112	0.0087	0.0063
15	0.0107	0.0107	0.0077	0.0048	0.0034	0.0021
20	0.0056	0.0056	0.0037	0.0017	0.0016	0.0016
25	0.0026	0.0026	0.0018	0.0009	0.0012	0.0015
30	0.0013	0.0013	0.0011	0.0009	0.0012	0.0015
35	0.0008	0.0008	0.0009	0.0009	0.0012	0.0015

Termination with Vested Benefits

Rates vary by entry age and service for miscellaneous plans. Rates vary by service for safety plans. See sample rates in tables below.

Public Agency Miscellaneous

Duration of Service	Entry Age 20	Entry Age 25	Entry Age 30	Entry Age 35	Entry Age 40
5	0.0422	0.0422	0.0393	0.0364	0.0344
10	0.0278	0.0278	0.0271	0.0263	0.0215
15	0.0192	0.0192	0.0174	0.0156	0.0120
20	0.0139	0.0139	0.0109	0.0079	0.0047
25	0.0083	0.0083	0.0048	0.0014	0.0007
30	0.0015	0.0015	0.0007	0.0000	0.0000
35	0.0000	0.0000	0.0000	0.0000	0.0000

Public Agency Safety

Duration of Service	Fire	Police	County Peace Officer
5	0.0094	0.0163	0.0187
10	0.0064	0.0126	0.0134
15	0.0048	0.0082	0.0092
20	0.0038	0.0065	0.0064
25	0.0026	0.0058	0.0042
30	0.0014	0.0056	0.0022
35	0.0000	0.0000	0.0000

- After termination with vested benefits, a miscellaneous member is assumed to retire at age 59 and a safety member at age 54.
- The Police termination with vested benefits rates are also used for Public Agency Local Prosecutors, Other Safety, Local Sheriff, and School Police.

Schools

Duration of Service	Entry Age 20	Entry Age 25	Entry Age 30	Entry Age 35	Entry Age 40
5	0.0405	0.0405	0.0346	0.0288	0.0264
10	0.0324	0.0324	0.0280	0.0235	0.0211
15	0.0202	0.0202	0.0179	0.0155	0.0126
20	0.0144	0.0144	0.0114	0.0083	0.0042
25	0.0091	0.0091	0.0046	0.0000	0.0000
30	0.0015	0.0015	0.0007	0.0000	0.0000
35	0.0000	0.0000	0.0000	0.0000	0.0000

Non-Industrial (Not Job-Related) Disability

Rates vary by age and gender for miscellaneous plans. Rates vary by age and category for safety plans.

	Miscellaneous		Fire	Police	County Peace Officer	Schools	
Age	Male	Female	Male and Female	Male and Female	Male and Female	Male	Female
20	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
25	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
30	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002
35	0.0004	0.0007	0.0001	0.0003	0.0004	0.0005	0.0004
40	0.0010	0.0014	0.0001	0.0004	0.0007	0.0012	0.0008
45	0.0015	0.0019	0.0002	0.0005	0.0013	0.0020	0.0017
50	0.0016	0.0020	0.0005	0.0008	0.0018	0.0026	0.0022
55	0.0016	0.0015	0.0007	0.0013	0.0010	0.0025	0.0018
60	0.0015	0.0011	0.0007	0.0020	0.0006	0.0022	0.0011

- The miscellaneous non-industrial disability rates are used for Local Prosecutors.
- The police non-industrial disability rates are also used for Other Safety, Local Sheriff, and School Police.

Industrial (Job-Related) Disability

Rates vary by age and category.

Age	Fire	Police	County Peace Officer
20	0.0001	0.0000	0.0004
25	0.0002	0.0017	0.0013
30	0.0006	0.0048	0.0025
35	0.0012	0.0079	0.0037
40	0.0023	0.0110	0.0051
45	0.0040	0.0141	0.0067
50	0.0208	0.0185	0.0092
55	0.0307	0.0479	0.0151
60	0.0438	0.0602	0.0174

- The police industrial disability rates are also used for Local Sheriff and Other Safety.
- Fifty percent of the police industrial disability rates are used for School Police.
- One percent of the police industrial disability rates are used for Local Prosecutors.
- Normally, rates are zero for miscellaneous plans unless the agency has specifically contracted for industrial disability benefits. If so, each miscellaneous non-industrial disability rate will be split into two components: 50 percent will become the non-industrial disability rate and 50 percent will become the industrial disability rate.

Service Retirement

Retirement rates vary by age, service, and formula, except for the safety ½ @ 55 and 2% @ 55 formulas, where retirement rates vary by age only.

Service Retirement

Public Agency Miscellaneous 1.5% @ 65

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.008	0.011	0.013	0.015	0.017	0.019
51	0.007	0.010	0.012	0.013	0.015	0.017
52	0.010	0.014	0.017	0.019	0.021	0.024
53	0.008	0.012	0.015	0.017	0.019	0.022
54	0.012	0.016	0.019	0.022	0.025	0.028
55	0.018	0.025	0.031	0.035	0.038	0.043
56	0.015	0.021	0.025	0.029	0.032	0.036
57	0.020	0.028	0.033	0.038	0.043	0.048
58	0.024	0.033	0.040	0.046	0.052	0.058
59	0.028	0.039	0.048	0.054	0.060	0.067
60	0.049	0.069	0.083	0.094	0.105	0.118
61	0.062	0.087	0.106	0.120	0.133	0.150
62	0.104	0.146	0.177	0.200	0.223	0.251
63	0.099	0.139	0.169	0.191	0.213	0.239
64	0.097	0.136	0.165	0.186	0.209	0.233
65	0.140	0.197	0.240	0.271	0.302	0.339
66	0.092	0.130	0.157	0.177	0.198	0.222
67	0.129	0.181	0.220	0.249	0.277	0.311
68	0.092	0.129	0.156	0.177	0.197	0.221
69	0.092	0.130	0.158	0.178	0.199	0.224
70	0.103	0.144	0.175	0.198	0.221	0.248

Public Agency Miscellaneous 2% @ 60

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.020	0.020	0.020	0.020	0.020	0.150
51	0.006	0.019	0.027	0.031	0.035	0.038
52	0.011	0.024	0.031	0.034	0.037	0.040
53	0.010	0.015	0.021	0.027	0.033	0.040
54	0.025	0.025	0.029	0.035	0.041	0.048
55	0.019	0.026	0.033	0.092	0.136	0.146
56	0.030	0.034	0.038	0.060	0.093	0.127
57	0.030	0.046	0.061	0.076	0.090	0.104
58	0.040	0.044	0.059	0.080	0.101	0.122
59	0.024	0.044	0.063	0.083	0.103	0.122
60	0.070	0.074	0.089	0.113	0.137	0.161
61	0.080	0.086	0.093	0.118	0.156	0.195
62	0.100	0.117	0.133	0.190	0.273	0.357
63	0.140	0.157	0.173	0.208	0.255	0.301
64	0.140	0.153	0.165	0.196	0.239	0.283
65	0.140	0.178	0.215	0.264	0.321	0.377
66	0.140	0.178	0.215	0.264	0.321	0.377
67	0.140	0.178	0.215	0.264	0.321	0.377
68	0.112	0.142	0.172	0.211	0.257	0.302
69	0.112	0.142	0.172	0.211	0.257	0.302
70	0.140	0.178	0.215	0.264	0.321	0.377

Service Retirement

Public Agency Miscellaneous 2% @ 55

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.008	0.013	0.018	0.021	0.022	0.033
51	0.009	0.016	0.020	0.023	0.026	0.036
52	0.015	0.018	0.020	0.021	0.025	0.030
53	0.016	0.020	0.024	0.028	0.031	0.035
54	0.018	0.022	0.026	0.030	0.034	0.038
55	0.040	0.040	0.056	0.093	0.109	0.154
56	0.034	0.050	0.066	0.092	0.107	0.138
57	0.042	0.048	0.058	0.082	0.096	0.127
58	0.046	0.054	0.062	0.090	0.106	0.131
59	0.045	0.055	0.066	0.097	0.115	0.144
60	0.058	0.075	0.093	0.126	0.143	0.169
61	0.065	0.088	0.111	0.146	0.163	0.189
62	0.136	0.118	0.148	0.190	0.213	0.247
63	0.130	0.133	0.174	0.212	0.249	0.285
64	0.113	0.129	0.165	0.196	0.223	0.249
65	0.145	0.173	0.201	0.233	0.266	0.289
66	0.170	0.199	0.229	0.258	0.284	0.306
67	0.250	0.204	0.233	0.250	0.257	0.287
68	0.227	0.175	0.193	0.215	0.240	0.262
69	0.200	0.180	0.180	0.198	0.228	0.246
70	0.150	0.171	0.192	0.239	0.304	0.330

Public Agency Miscellaneous 2.5% @ 55

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.008	0.014	0.020	0.026	0.033	0.050
51	0.008	0.015	0.023	0.030	0.037	0.059
52	0.009	0.016	0.023	0.030	0.037	0.061
53	0.014	0.021	0.028	0.035	0.042	0.063
54	0.014	0.022	0.030	0.039	0.047	0.068
55	0.020	0.038	0.055	0.073	0.122	0.192
56	0.025	0.047	0.069	0.091	0.136	0.196
57	0.030	0.048	0.065	0.083	0.123	0.178
58	0.035	0.054	0.073	0.093	0.112	0.153
59	0.035	0.054	0.073	0.092	0.131	0.183
60	0.044	0.072	0.101	0.130	0.158	0.197
61	0.050	0.078	0.105	0.133	0.161	0.223
62	0.055	0.093	0.130	0.168	0.205	0.268
63	0.090	0.124	0.158	0.192	0.226	0.279
64	0.080	0.112	0.144	0.175	0.207	0.268
65	0.120	0.156	0.193	0.229	0.265	0.333
66	0.132	0.172	0.212	0.252	0.292	0.366
67	0.132	0.172	0.212	0.252	0.292	0.366
68	0.120	0.156	0.193	0.229	0.265	0.333
69	0.120	0.156	0.193	0.229	0.265	0.333
70	0.120	0.156	0.193	0.229	0.265	0.333

Service Retirement

Public Agency Miscellaneous 2.7% @ 55

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.003	0.010	0.016	0.034	0.033	0.045
51	0.009	0.016	0.023	0.042	0.038	0.047
52	0.015	0.019	0.024	0.040	0.036	0.046
53	0.012	0.020	0.028	0.047	0.046	0.060
54	0.020	0.027	0.035	0.054	0.056	0.073
55	0.033	0.055	0.078	0.113	0.156	0.234
56	0.039	0.067	0.095	0.135	0.169	0.227
57	0.050	0.067	0.084	0.113	0.142	0.198
58	0.043	0.066	0.089	0.124	0.151	0.201
59	0.050	0.070	0.090	0.122	0.158	0.224
60	0.060	0.086	0.112	0.150	0.182	0.238
61	0.071	0.094	0.117	0.153	0.184	0.241
62	0.091	0.122	0.152	0.194	0.226	0.279
63	0.143	0.161	0.179	0.209	0.222	0.250
64	0.116	0.147	0.178	0.221	0.254	0.308
65	0.140	0.174	0.208	0.254	0.306	0.389
66	0.170	0.209	0.247	0.298	0.310	0.324
67	0.170	0.199	0.228	0.269	0.296	0.342
68	0.150	0.181	0.212	0.255	0.287	0.339
69	0.150	0.181	0.212	0.255	0.287	0.339
70	0.150	0.181	0.212	0.243	0.291	0.350

Public Agency Miscellaneous 3% @ 60

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.013	0.019	0.026	0.042	0.038	0.064
51	0.035	0.037	0.039	0.052	0.047	0.062
52	0.023	0.030	0.038	0.055	0.051	0.056
53	0.025	0.032	0.040	0.057	0.056	0.066
54	0.035	0.042	0.050	0.067	0.066	0.076
55	0.040	0.052	0.064	0.085	0.095	0.120
56	0.043	0.056	0.070	0.094	0.102	0.150
57	0.045	0.060	0.074	0.099	0.109	0.131
58	0.053	0.056	0.059	0.099	0.126	0.185
59	0.050	0.068	0.085	0.113	0.144	0.202
60	0.089	0.106	0.123	0.180	0.226	0.316
61	0.100	0.117	0.133	0.212	0.230	0.298
62	0.130	0.155	0.180	0.248	0.282	0.335
63	0.120	0.163	0.206	0.270	0.268	0.352
64	0.150	0.150	0.150	0.215	0.277	0.300
65	0.200	0.242	0.283	0.330	0.300	0.342
66	0.220	0.264	0.308	0.352	0.379	0.394
67	0.250	0.279	0.309	0.338	0.371	0.406
68	0.170	0.196	0.223	0.249	0.290	0.340
69	0.220	0.261	0.302	0.344	0.378	0.408
70	0.220	0.255	0.291	0.326	0.358	0.388

Service Retirement

Public Agency Miscellaneous 2% @ 62

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.000	0.000	0.000	0.000	0.000	0.000
51	0.000	0.000	0.000	0.000	0.000	0.000
52	0.005	0.008	0.012	0.015	0.019	0.031
53	0.007	0.011	0.014	0.018	0.021	0.032
54	0.007	0.011	0.015	0.019	0.023	0.034
55	0.010	0.019	0.028	0.036	0.061	0.096
56	0.014	0.026	0.038	0.050	0.075	0.108
57	0.018	0.029	0.039	0.050	0.074	0.107
58	0.023	0.035	0.048	0.060	0.073	0.099
59	0.025	0.038	0.051	0.065	0.092	0.128
60	0.031	0.051	0.071	0.091	0.111	0.138
61	0.038	0.058	0.079	0.100	0.121	0.167
62	0.044	0.074	0.104	0.134	0.164	0.214
63	0.077	0.105	0.134	0.163	0.192	0.237
64	0.072	0.101	0.129	0.158	0.187	0.242
65	0.108	0.141	0.173	0.206	0.239	0.300
66	0.132	0.172	0.212	0.252	0.292	0.366
67	0.132	0.172	0.212	0.252	0.292	0.366
68	0.120	0.156	0.193	0.229	0.265	0.333
69	0.120	0.156	0.193	0.229	0.265	0.333
70	0.120	0.156	0.193	0.229	0.265	0.333

Service Retirement

Public Agency Fire ½ @ 55 and 2% @ 55

Age	Rate	Age	Rate
50	0.0159	56	0.1108
51	0.0000	57	0.0000
52	0.0344	58	0.0950
53	0.0199	59	0.0441
54	0.0413	60	1.00000
55	0.0751		

Public Agency Police ½ @ 55 and 2% @ 55

Age	Rate	Age	Rate
50	0.0255	56	0.0692
51	0.0000	57	0.0511
52	0.0164	58	0.0724
53	0.0272	59	0.0704
54	0.0095	60	0.3000
55	0.1667		

Service Retirement

Public Agency Police 2% @ 50

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.050	0.050	0.050	0.050	0.050	0.100
51	0.040	0.040	0.040	0.040	0.058	0.094
52	0.040	0.040	0.040	0.040	0.061	0.087
53	0.040	0.040	0.040	0.040	0.082	0.123
54	0.040	0.040	0.040	0.046	0.098	0.158
55	0.072	0.072	0.072	0.096	0.141	0.255
56	0.066	0.066	0.066	0.088	0.129	0.228
57	0.060	0.060	0.060	0.080	0.118	0.213
58	0.080	0.080	0.080	0.088	0.138	0.228
59	0.080	0.080	0.080	0.092	0.140	0.228
60	0.150	0.150	0.150	0.150	0.150	0.228
61	0.144	0.144	0.144	0.144	0.144	0.170
62	0.150	0.150	0.150	0.150	0.150	0.213
63	0.150	0.150	0.150	0.150	0.150	0.213
64	0.150	0.150	0.150	0.150	0.150	0.319
65	1.000	1.000	1.000	1.000	1.000	1.000

- These rates also apply to County Peace officers, Local Prosecutors, Local Sheriff, School Police, and Other Safety.

Service Retirement

Public Agency Fire 2% @ 50

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.009	0.009	0.009	0.009	0.013	0.020
51	0.013	0.013	0.013	0.013	0.020	0.029
52	0.018	0.018	0.018	0.018	0.028	0.042
53	0.052	0.052	0.052	0.052	0.079	0.119
54	0.067	0.067	0.067	0.067	0.103	0.154
55	0.089	0.089	0.089	0.089	0.136	0.204
56	0.083	0.083	0.083	0.083	0.127	0.190
57	0.082	0.082	0.082	0.082	0.126	0.189
58	0.088	0.088	0.088	0.088	0.136	0.204
59	0.074	0.074	0.074	0.074	0.113	0.170
60	0.100	0.100	0.100	0.100	0.154	0.230
61	0.072	0.072	0.072	0.072	0.110	0.165
62	0.099	0.099	0.099	0.099	0.152	0.228
63	0.114	0.114	0.114	0.114	0.175	0.262
64	0.114	0.114	0.114	0.114	0.175	0.262
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 3% @ 55

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.035	0.035	0.035	0.035	0.070	0.090
51	0.028	0.028	0.028	0.029	0.065	0.101
52	0.032	0.032	0.032	0.039	0.066	0.109
53	0.028	0.028	0.028	0.043	0.075	0.132
54	0.038	0.038	0.038	0.074	0.118	0.333
55	0.070	0.070	0.070	0.120	0.175	0.340
56	0.060	0.060	0.060	0.110	0.165	0.330
57	0.060	0.060	0.060	0.110	0.165	0.320
58	0.080	0.080	0.080	0.100	0.185	0.350
59	0.090	0.090	0.095	0.130	0.185	0.350
60	0.150	0.150	0.150	0.150	0.185	0.350
61	0.120	0.120	0.120	0.120	0.160	0.350
62	0.150	0.150	0.150	0.150	0.200	0.350
63	0.150	0.150	0.150	0.150	0.200	0.400
64	0.150	0.150	0.150	0.150	0.175	0.350
65	1.000	1.000	1.000	1.000	1.000	1.000

- These rates also apply to County Peace officers, Local Prosecutors, Local Sheriff, School Police, and Other Safety.

Service Retirement

Public Agency Fire 3% @ 55

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.001	0.001	0.001	0.006	0.016	0.069
51	0.002	0.002	0.002	0.006	0.018	0.071
52	0.012	0.012	0.012	0.021	0.040	0.098
53	0.032	0.032	0.032	0.049	0.085	0.149
54	0.057	0.057	0.057	0.087	0.144	0.217
55	0.073	0.073	0.073	0.109	0.179	0.259
56	0.064	0.064	0.064	0.097	0.161	0.238
57	0.063	0.063	0.063	0.095	0.157	0.233
58	0.065	0.065	0.065	0.099	0.163	0.241
59	0.088	0.088	0.088	0.131	0.213	0.299
60	0.105	0.105	0.105	0.155	0.251	0.344
61	0.118	0.118	0.118	0.175	0.282	0.380
62	0.087	0.087	0.087	0.128	0.210	0.295
63	0.067	0.067	0.067	0.100	0.165	0.243
64	0.067	0.067	0.067	0.100	0.165	0.243
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 3% @ 50

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.050	0.050	0.050	0.100	0.155	0.400
51	0.040	0.040	0.040	0.090	0.140	0.380
52	0.040	0.040	0.040	0.070	0.115	0.350
53	0.040	0.040	0.040	0.080	0.135	0.350
54	0.040	0.040	0.040	0.090	0.145	0.350
55	0.070	0.070	0.070	0.120	0.175	0.340
56	0.060	0.060	0.060	0.110	0.165	0.330
57	0.060	0.060	0.060	0.110	0.165	0.320
58	0.080	0.080	0.080	0.100	0.185	0.350
59	0.090	0.090	0.095	0.130	0.185	0.350
60	0.150	0.150	0.150	0.150	0.185	0.350
61	0.120	0.120	0.120	0.120	0.160	0.350
62	0.150	0.150	0.150	0.150	0.200	0.350
63	0.150	0.150	0.150	0.150	0.200	0.400
64	0.150	0.150	0.150	0.150	0.175	0.350
65	1.000	1.000	1.000	1.000	1.000	1.000

- These rates also apply to County Peace officers, Local Prosecutors, Local Sheriff, School Police, and Other Safety.

Service Retirement

Public Agency Fire 3% @ 50

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.020	0.020	0.020	0.040	0.130	0.192
51	0.008	0.008	0.008	0.023	0.107	0.164
52	0.023	0.023	0.023	0.043	0.136	0.198
53	0.023	0.023	0.023	0.043	0.135	0.198
54	0.027	0.027	0.027	0.048	0.143	0.207
55	0.043	0.043	0.043	0.070	0.174	0.244
56	0.053	0.053	0.053	0.085	0.196	0.269
57	0.054	0.054	0.054	0.086	0.197	0.271
58	0.052	0.052	0.052	0.084	0.193	0.268
59	0.075	0.075	0.075	0.116	0.239	0.321
60	0.065	0.065	0.065	0.102	0.219	0.298
61	0.076	0.076	0.076	0.117	0.241	0.324
62	0.068	0.068	0.068	0.106	0.224	0.304
63	0.027	0.027	0.027	0.049	0.143	0.208
64	0.094	0.094	0.094	0.143	0.277	0.366
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 2% @ 57

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.040	0.040	0.040	0.040	0.040	0.080
51	0.028	0.028	0.028	0.028	0.040	0.066
52	0.028	0.028	0.028	0.028	0.043	0.061
53	0.028	0.028	0.028	0.028	0.057	0.086
54	0.028	0.028	0.028	0.032	0.069	0.110
55	0.050	0.050	0.050	0.067	0.099	0.179
56	0.046	0.046	0.046	0.062	0.090	0.160
57	0.054	0.054	0.054	0.072	0.106	0.191
58	0.060	0.060	0.060	0.066	0.103	0.171
59	0.060	0.060	0.060	0.069	0.105	0.171
60	0.113	0.113	0.113	0.113	0.113	0.171
61	0.108	0.108	0.108	0.108	0.108	0.128
62	0.113	0.113	0.113	0.113	0.113	0.159
63	0.113	0.113	0.113	0.113	0.113	0.159
64	0.113	0.113	0.113	0.113	0.113	0.239
65	1.000	1.000	1.000	1.000	1.000	1.000

- These rates also apply to County Peace officers, Local Prosecutors, Local Sheriff, School Police, and Other Safety.

Service Retirement

Public Agency Fire 2% @ 57

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.005	0.005	0.005	0.005	0.008	0.012
51	0.006	0.006	0.006	0.006	0.009	0.013
52	0.012	0.012	0.012	0.012	0.019	0.028
53	0.033	0.033	0.033	0.033	0.050	0.075
54	0.045	0.045	0.045	0.045	0.069	0.103
55	0.061	0.061	0.061	0.061	0.094	0.140
56	0.055	0.055	0.055	0.055	0.084	0.126
57	0.081	0.081	0.081	0.081	0.125	0.187
58	0.059	0.059	0.059	0.059	0.091	0.137
59	0.055	0.055	0.055	0.055	0.084	0.126
60	0.085	0.085	0.085	0.085	0.131	0.196
61	0.085	0.085	0.085	0.085	0.131	0.196
62	0.085	0.085	0.085	0.085	0.131	0.196
63	0.085	0.085	0.085	0.085	0.131	0.196
64	0.085	0.085	0.085	0.085	0.131	0.196
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 2.5% @ 57

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.050	0.050	0.050	0.050	0.050	0.100
51	0.038	0.038	0.038	0.038	0.055	0.089
52	0.038	0.038	0.038	0.038	0.058	0.082
53	0.036	0.036	0.036	0.036	0.073	0.111
54	0.036	0.036	0.036	0.041	0.088	0.142
55	0.061	0.061	0.061	0.082	0.120	0.217
56	0.056	0.056	0.056	0.075	0.110	0.194
57	0.060	0.060	0.060	0.080	0.118	0.213
58	0.072	0.072	0.072	0.079	0.124	0.205
59	0.072	0.072	0.072	0.083	0.126	0.205
60	0.135	0.135	0.135	0.135	0.135	0.205
61	0.130	0.130	0.130	0.130	0.130	0.153
62	0.135	0.135	0.135	0.135	0.135	0.191
63	0.135	0.135	0.135	0.135	0.135	0.191
64	0.135	0.135	0.135	0.135	0.135	0.287
65	1.000	1.000	1.000	1.000	1.000	1.000

- These rates also apply to County Peace officers, Local Prosecutors, Local Sheriff, School Police, and Other Safety.

Service Retirement

Public Agency Fire 2.5% @ 57

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.007	0.007	0.007	0.007	0.010	0.015
51	0.008	0.008	0.008	0.008	0.012	0.018
52	0.016	0.016	0.016	0.016	0.025	0.038
53	0.042	0.042	0.042	0.042	0.064	0.096
54	0.057	0.057	0.057	0.057	0.088	0.132
55	0.074	0.074	0.074	0.074	0.114	0.170
56	0.066	0.066	0.066	0.066	0.102	0.153
57	0.090	0.090	0.090	0.090	0.139	0.208
58	0.071	0.071	0.071	0.071	0.110	0.164
59	0.066	0.066	0.066	0.066	0.101	0.151
60	0.102	0.102	0.102	0.102	0.157	0.235
61	0.102	0.102	0.102	0.102	0.157	0.236
62	0.102	0.102	0.102	0.102	0.157	0.236
63	0.102	0.102	0.102	0.102	0.157	0.236
64	0.102	0.102	0.102	0.102	0.157	0.236
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 2.7% @ 57

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.0500	0.0500	0.0500	0.0500	0.0500	0.1000
51	0.0400	0.0400	0.0400	0.0400	0.0575	0.0942
52	0.0380	0.0380	0.0380	0.0380	0.0580	0.0825
53	0.0380	0.0380	0.0380	0.0380	0.0774	0.1169
54	0.0380	0.0380	0.0380	0.0437	0.0931	0.1497
55	0.0684	0.0684	0.0684	0.0912	0.1340	0.2423
56	0.0627	0.0627	0.0627	0.0836	0.1228	0.2168
57	0.0600	0.0600	0.0600	0.0800	0.1175	0.2125
58	0.0800	0.0800	0.0800	0.0880	0.1375	0.2275
59	0.0800	0.0800	0.0800	0.0920	0.1400	0.2275
60	0.1500	0.1500	0.1500	0.1500	0.1500	0.2275
61	0.1440	0.1440	0.1440	0.1440	0.1440	0.1700
62	0.1500	0.1500	0.1500	0.1500	0.1500	0.2125
63	0.1500	0.1500	0.1500	0.1500	0.1500	0.2125
64	0.1500	0.1500	0.1500	0.1500	0.1500	0.3188
65	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

- These rates also apply to County Peace officers, Local Prosecutors, Local Sheriff, School Police, and Other Safety.

Service Retirement

Public Agency Fire 2.7% @ 57

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.0065	0.0065	0.0065	0.0065	0.0101	0.0151
51	0.0081	0.0081	0.0081	0.0081	0.0125	0.0187
52	0.0164	0.0164	0.0164	0.0164	0.0254	0.0380
53	0.0442	0.0442	0.0442	0.0442	0.0680	0.1018
54	0.0606	0.0606	0.0606	0.0606	0.0934	0.1397
55	0.0825	0.0825	0.0825	0.0825	0.1269	0.1900
56	0.0740	0.0740	0.0740	0.0740	0.1140	0.1706
57	0.0901	0.0901	0.0901	0.0901	0.1387	0.2077
58	0.0790	0.0790	0.0790	0.0790	0.1217	0.1821
59	0.0729	0.0729	0.0729	0.0729	0.1123	0.1681
60	0.1135	0.1135	0.1135	0.1135	0.1747	0.2615
61	0.1136	0.1136	0.1136	0.1136	0.1749	0.2618
62	0.1136	0.1136	0.1136	0.1136	0.1749	0.2618
63	0.1136	0.1136	0.1136	0.1136	0.1749	0.2618
64	0.1136	0.1136	0.1136	0.1136	0.1749	0.2618
65	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Service Retirement

Schools 2% @ 55

	Duration of Service					
Age	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.004	0.007	0.011	0.012	0.013	0.015
51	0.004	0.008	0.011	0.014	0.016	0.017
52	0.005	0.010	0.014	0.016	0.018	0.021
53	0.006	0.012	0.016	0.020	0.022	0.025
54	0.008	0.017	0.023	0.027	0.031	0.034
55	0.021	0.042	0.058	0.069	0.077	0.086
56	0.019	0.037	0.053	0.062	0.069	0.078
57	0.019	0.038	0.054	0.064	0.071	0.079
58	0.022	0.045	0.062	0.074	0.082	0.092
59	0.025	0.049	0.069	0.082	0.090	0.101
60	0.033	0.066	0.092	0.109	0.121	0.135
61	0.037	0.072	0.101	0.119	0.133	0.149
62	0.066	0.131	0.184	0.218	0.242	0.271
63	0.064	0.126	0.178	0.209	0.233	0.261
64	0.059	0.117	0.163	0.193	0.215	0.240
65	0.080	0.158	0.221	0.261	0.291	0.326
66	0.081	0.160	0.224	0.265	0.296	0.330
67	0.070	0.139	0.194	0.229	0.255	0.286
68	0.063	0.124	0.173	0.205	0.228	0.255
69	0.066	0.130	0.183	0.216	0.241	0.270
70	0.071	0.140	0.196	0.231	0.258	0.289

Miscellaneous

Internal Revenue Code Section 415

The limitations on benefits imposed by Internal Revenue Code Section 415 are taken into account in this valuation. Each year the impact of any changes in this limitation since the prior valuation is included and amortized as part of the actuarial gain or loss base. This results in lower contributions for those employers contributing to the Replacement Benefit Fund and protects CalPERS from prefunding expected benefits in excess of limits imposed by federal tax law.

Internal Revenue Code Section 401(a) (17)

The limitations on compensation imposed by Internal Revenue Code Section 401(a) (17) are taken into account in this valuation. Each year, the impact of any changes in the compensation limitation since the prior valuation is included and amortized as part of the actuarial gain or loss base. The compensation limit for classic members for the 2017 calendar year is $270,000.

Appendix B

Principal Plan Provisions

The following is a description of the principal plan provisions used in calculating costs and liabilities. We have indicated whether a plan provision is standard or optional. Standard benefits are applicable to all members while optional benefits vary among employers. Optional benefits that apply to a single period of time, such as Golden Handshakes, have not been included. Many of the statements in this summary are general in nature, and are intended to provide an easily understood summary of the Public Employees' Retirement Law. The law itself governs in all situations.

Service Retirement

Eligibility

A classic CalPERS member or PEPRA Safety member becomes eligible for Service Retirement upon attainment of age 50 with at least 5 years of credited service (total service across all CalPERS employers, and with certain other retirement systems with which CalPERS has reciprocity agreements). For employees hired into a plan with the 1.5 percent at 65 formula, eligibility for service retirement is age 55 with at least 5 years of service. PEPRA miscellaneous members become eligible for service retirement upon attainment of age 52 with at least 5 years of service.

Benefit

The service retirement benefit is a monthly allowance equal to the product of the *benefit factor*, *years of service*, and *final compensation.*

- The *benefit factor* depends on the benefit formula specified in your agency's contract. The table below shows the factors for each of the available formulas. Factors vary by the member's age at retirement. Listed are the factors for retirement at whole year ages:

Miscellaneous Plan Formulas

Retirement Age	1.5% at 65	2% at 60	2% at 55	2.5% at 55	2.7% at 55	3% at 60	PEPRA 2% at 62
50	0.5000%	1.092%	1.426%	2.000%	2.000%	2.000%	N/A
51	0.5667%	1.156%	1.522%	2.100%	2.140%	2.100%	N/A
52	0.6334%	1.224%	1.628%	2.200%	2.280%	2.200%	1.000%
53	0.7000%	1.296%	1.742%	2.300%	2.420%	2.300%	1.100%
54	0.7667%	1.376%	1.866%	2.400%	2.560%	2.400%	1.200%
55	0.8334%	1.460%	2.000%	2.500%	2.700%	2.500%	1.300%
56	0.9000%	1.552%	2.052%	2.500%	2.700%	2.600%	1.400%
57	0.9667%	1.650%	2.104%	2.500%	2.700%	2.700%	1.500%
58	1.0334%	1.758%	2.156%	2.500%	2.700%	2.800%	1.600%
59	1.1000%	1.874%	2.210%	2.500%	2.700%	2.900%	1.700%
60	1.1667%	2.000%	2.262%	2.500%	2.700%	3.000%	1.800%
61	1.2334%	2.134%	2.314%	2.500%	2.700%	3.000%	1.900%
62	1.3000%	2.272%	2.366%	2.500%	2.700%	3.000%	2.000%
63	1.3667%	2.418%	2.418%	2.500%	2.700%	3.000%	2.100%
64	1.4334%	2.418%	2.418%	2.500%	2.700%	3.000%	2.200%
65	1.5000%	2.418%	2.418%	2.500%	2.700%	3.000%	2.300%
66	1.5000%	2.418%	2.418%	2.500%	2.700%	3.000%	2.400%
67 & up	1.5000%	2.418%	2.418%	2.500%	2.700%	3.000%	2.500%

Safety Plan Formulas

Retirement Age	½ at 55 *	2% at 55	2% at 50	3% at 55	3% at 50
50	1.783%	1.426%	2.000%	2.400%	3.000%
51	1.903%	1.522%	2.140%	2.520%	3.000%
52	2.035%	1.628%	2.280%	2.640%	3.000%
53	2.178%	1.742%	2.420%	2.760%	3.000%
54	2.333%	1.866%	2.560%	2.880%	3.000%
55 & Up	2.500%	2.000%	2.700%	3.000%	3.000%

* For this formula, the benefit factor also varies by entry age. The factors shown are for members with an entry age of 35 or greater. If entry age is less than 35, then the age 55 benefit factor is 50 percent divided by the difference between age 55 and entry age. The benefit factor for ages prior to age 55 is the same proportion of the age 55 benefit factor as in the above table.

PEPRA Safety Plan Formulas

Retirement Age	2% at 57	2.5% at 57	2.7% at 57
50	1.426%	2.000%	2.000%
51	1.508%	2.071%	2.100%
52	1.590%	2.143%	2.200%
53	1.672%	2.214%	2.300%
54	1.754%	2.286%	2.400%
55	1.836%	2.357%	2.500%
56	1.918%	2.429%	2.600%
57 & Up	2.000%	2.500%	2.700%

- The *years of service* is the amount credited by CalPERS to a member while he or she is employed in this group (or for other periods that are recognized under the employer's contract with CalPERS). For a member who has earned service with multiple CalPERS employers, the benefit from each employer is calculated separately according to each employer's contract, and then added together for the total allowance. An agency may contract for an optional benefit where any unused sick leave accumulated at the time of retirement will be converted to credited service at a rate of 0.004 years of service for each day of sick leave.

- The *final compensation* is the monthly average of the member's highest 36 or 12 consecutive months' full-time equivalent monthly pay (no matter which CalPERS employer paid this compensation). The standard benefit is 36 months. Employers had the option of providing a final compensation equal to the highest 12 consecutive months for classic plans only. Final compensation must be defined by the highest 36 consecutive months' pay under the 1.5% at 65 formula. PEPRA members have a cap on the annual salary that can be used to calculate final compensation for all new members based on the Social Security contribution and benefit base. For employees that participate in Social Security this cap is $118,775 for 2017 and for those employees that do not participate in Social Security the cap for 2017 is $142,530. Adjustments to the caps are permitted annually based on changes to the CPI for all urban consumers.

- Employees must be covered by Social Security with the 1.5% at 65 formula. Social Security is optional for all other benefit formulas. For employees covered by Social Security, the modified formula is the standard benefit. Under this type of formula, the final compensation is offset by $133.33 (or by one third if the final compensation is less than $400). Employers may contract for the full benefit with Social Security that will eliminate the offset applicable to the final compensation. For employees not covered by Social Security, the full benefit is paid with

no offsets. Auxiliary organizations of the CSUC system may elect reduced contribution rates, in which case the offset is $317 if members are not covered by Social Security or $513 if members are covered by Social Security.

- The miscellaneous and PEPRA safety service retirement benefit is not capped. The classic Safety service retirement benefit is capped at 90 percent of final compensation.

Vested Deferred Retirement

Eligibility for Deferred Status

A CalPERS member becomes eligible for a deferred vested retirement benefit when he or she leaves employment, keeps his or her contribution account balance on deposit with CalPERS, **and** has earned at least 5 years of credited service (total service across all CalPERS employers, and with certain other retirement systems with which CalPERS has reciprocity agreements).

Eligibility to Start Receiving Benefits

The CalPERS classic members and PEPRA safety members become eligible to receive the deferred retirement benefit upon satisfying the eligibility requirements for deferred status and upon attainment of age 50 (55 for employees hired into a 1.5% @ 65 plan). PEPRA miscellaneous members become eligible to receive the deferred retirement benefit upon satisfying the eligibility requirements for deferred status and upon attainment of age 52.

Benefit

The vested deferred retirement benefit is the same as the service retirement benefit, where the benefit factor is based on the member's age at allowance commencement. For members who have earned service with multiple CalPERS employers, the benefit from each employer is calculated separately according to each employer's contract, and then added together for the total allowance.

Non-Industrial (Non-Job Related) Disability Retirement

Eligibility

A CalPERS member is eligible for Non-Industrial Disability Retirement if he or she becomes *disabled* and has at least 5 years of credited service (total service across all CalPERS employers, and with certain other retirement systems with which CalPERS has reciprocity agreements). There is no special age requirement. *Disabled* means the member is unable to perform his or her job because of an illness or injury, which is expected to be permanent or to last indefinitely. The illness or injury does not have to be job related. A CalPERS member must be actively employed by any CalPERS employer at the time of disability in order to be eligible for this benefit.

Standard Benefit

The standard Non-Industrial Disability Retirement benefit is a monthly allowance equal to 1.8 percent of final compensation, multiplied by *service*, which is determined as follows:

- *Service* is CalPERS credited service, for members with less than 10 years of service or greater than 18.518 years of service; or

- *Service* is CalPERS credited service plus the additional number of years that the member would have worked until age 60, for members with at least 10 years but not more than 18.518 years of service. The maximum benefit in this case is 33 1/3 percent of final compensation.

Improved Benefit

Employers have the option of providing the improved Non-Industrial Disability Retirement benefit. This benefit provides a monthly allowance equal to 30 percent of final compensation for the first 5 years of service, plus 1 percent for each additional year of service to a maximum of 50 percent of final compensation.

Members who are eligible for a larger service retirement benefit may choose to receive that benefit in lieu of a disability benefit. Members eligible to retire, and who have attained the normal retirement age determined by their service retirement benefit formula, will receive the same dollar amount for disability retirement as that payable for service retirement. For members who have earned service with multiple CalPERS employers, the benefit attributed to each employer is the total disability allowance multiplied by the ratio of service with a particular employer to the total CalPERS service.

Industrial (Job Related) Disability Retirement

All safety members have this benefit. For miscellaneous members, employers have the option of providing this benefit. An employer may choose to provide the increased benefit option or the improved benefit option.

Eligibility

An employee is eligible for Industrial Disability Retirement if he or she becomes disabled while working, where disabled means the member is unable to perform the duties of the job because of a work-related illness or injury, which is expected to be permanent or to last indefinitely. A CalPERS member who has left active employment within this group is not eligible for this benefit, except to the extent described below.

Standard Benefit

The standard Industrial Disability Retirement benefit is a monthly allowance equal to 50 percent of final compensation.

Increased Benefit (75 percent of Final Compensation)

The increased Industrial Disability Retirement benefit is a monthly allowance equal to 75 percent final compensation for total disability.

Improved Benefit (50 percent to 90 percent of Final Compensation)

The improved Industrial Disability Retirement benefit is a monthly allowance equal to the Workman's Compensation Appeals Board permanent disability rate percentage (if 50 percent or greater, with a maximum of 90 percent) times the final compensation.

For a CalPERS member not actively employed in this group who became disabled while employed by some other CalPERS employer, the benefit is a return of accumulated member contributions with respect to employment in this group. With the standard or increased benefit, a member may also choose to receive the annuitization of the accumulated member contributions.

If a member is eligible for service retirement and if the service retirement benefit is more than the industrial disability retirement benefit, the member may choose to receive the larger benefit.

Post-Retirement Death Benefit

Standard Lump Sum Payment

Upon the death of a retiree, a one-time lump sum payment of $500 will be made to the retiree's designated survivor(s), or to the retiree's estate.

Improved Lump Sum Payment

Employers have the option of providing an improved lump sum death benefit of $600, $2,000, $3,000, $4,000 or $5,000.

Form of Payment for Retirement Allowance

Standard Form of Payment

Generally, the retirement allowance is paid to the retiree in the form of an annuity for as long as he or she is alive. The retiree may choose to provide for a portion of his or her allowance to be paid to any designated beneficiary after the retiree's death. CalPERS provides for a variety of such benefit options, which the retiree pays for by taking a reduction in his or her retirement allowance. Such reduction takes into account the amount to be provided to the beneficiary and the probable duration of payments (based on the ages of the member and beneficiary) made subsequent to the member's death.

Improved Form of Payment (Post-Retirement Survivor Allowance)

Employers have the option to contract for the post-retirement survivor allowance.

For retirement allowances with respect to service subject to the modified formula, 25 percent of the retirement allowance will automatically be continued to certain statutory beneficiaries upon the death of the retiree, without a reduction in the retiree's allowance. For retirement allowances with respect to service subject to the full or supplemental formula, 50 percent of the retirement allowance will automatically be continued to certain statutory beneficiaries upon the death of the retiree, without a reduction in the retiree's allowance. This additional benefit is referred to as post-retirement survivor allowance (PRSA) or simply as survivor continuance.

In other words, 25 percent or 50 percent of the allowance, the continuance portion, is paid to the retiree for as long as he or she is alive, and that same amount is continued to the retiree's spouse (or if no eligible spouse, to unmarried child(ren) until they attain age 18; or, if no eligible child(ren), to a qualifying dependent parent) for the rest of his or her lifetime. This benefit will not be discontinued in the event the spouse remarries.

The remaining 75 percent or 50 percent of the retirement allowance, which may be referred to as the option portion of the benefit, is paid to the retiree as an annuity for as long as he or she is alive. Or, the retiree may choose to provide for some of this option portion to be paid to any designated beneficiary after the retiree's death. Benefit options applicable to the option portion are the same as those offered with the standard form. The reduction is calculated in the same manner but is applied only to the option portion.

Pre-Retirement Death Benefits

Basic Death Benefit

This is a standard benefit.

Eligibility

An employee's beneficiary (or estate) may receive the basic death benefit if the member dies while actively employed. A CalPERS member must be actively employed with the CalPERS employer providing this benefit to be eligible for this benefit. A member's survivor who is eligible for any other pre-retirement death benefit may choose to receive that death benefit instead of this basic death benefit.

Benefit

The basic death benefit is a lump sum in the amount of the member's accumulated contributions, where interest is currently credited at 7.5 percent per year, plus a lump sum in the amount of one month's salary for each completed year of current service, up to a maximum of six months' salary. For purposes of this benefit, one month's salary is defined as the member's average monthly full-time rate of compensation during the 12 months preceding death.

1957 Survivor Benefit

This is a standard benefit.

Eligibility

An employee's *eligible survivor(s)* may receive the 1957 Survivor benefit if the member dies while actively employed, has attained at least age 50 for classic and safety PEPRA members and age 52 for miscellaneous PEPRA members, and has at least 5 years of credited service (total service across all CalPERS employers and with certain other retirement systems with which CalPERS has reciprocity agreements). A CalPERS member must be actively employed with the CalPERS employer providing this benefit to be eligible for this benefit. An eligible survivor means the surviving spouse to whom the member was married at least one year before death or, if there is no eligible spouse, to the member's unmarried child(ren) under age 18. A member's survivor who is eligible for any other pre-retirement death benefit may choose to receive that death benefit instead of this 1957 Survivor benefit.

Benefit

The 1957 Survivor benefit is a monthly allowance equal to one-half of the unmodified service retirement benefit that the member would have been entitled to receive if the member had retired on the date of his or her death. If the benefit is payable to the spouse, the benefit is discontinued upon the death of the spouse. If the benefit is payable to dependent child(ren), the benefit will be discontinued upon death or attainment of age 18, unless the child(ren) is disabled. The total amount paid will be at least equal to the basic death benefit.

Optional Settlement 2 Death Benefit

This is an optional benefit.

Eligibility

An employee's *eligible survivor* may receive the Optional Settlement 2 Death benefit if the member dies while actively employed, has attained at least age 50 for classic and safety PEPRA members and age 52 for miscellaneous PEPRA members, and has at least 5 years of credited service (total service across all CalPERS employers and with certain other retirement systems with which CalPERS has reciprocity agreements). A CalPERS member who is no longer actively employed with **any** CalPERS employer is not eligible for this benefit. An *eligible survivor* means the surviving spouse to whom the member was married at least one year before death. A member's survivor who is eligible for any other pre-retirement death benefit may choose to receive that death benefit instead of this Optional Settlement 2 Death benefit.

Benefit

The Optional Settlement 2 Death benefit is a monthly allowance equal to the service retirement benefit that the member would have received had the member retired on the date of his or her death and elected 100 percent to continue to the eligible survivor after the member's death. The allowance is payable as long as the surviving spouse lives, at which time it is continued to any unmarried child(ren) under age 18, if applicable. The total amount paid will be at least equal to the basic death benefit.

Special Death Benefit

This is a standard benefit for safety members. An employer may elect to provide this benefit for miscellaneous members.

Eligibility

An employee's *eligible survivor(s)* may receive the special death benefit if the member dies while actively employed and the death is job-related. A CalPERS member who is no longer actively employed with **any** CalPERS employer is not eligible for this benefit. An *eligible survivor* means the surviving spouse to whom the member was married prior to the onset of the injury or illness that resulted in death. If there is no eligible spouse, an eligible survivor means the member's unmarried child(ren) under age 22. An eligible survivor who chooses to receive this benefit will not receive any other death benefit.

Benefit

The special death benefit is a monthly allowance equal to 50 percent of final compensation, and will be increased whenever the compensation paid to active employees is increased but ceasing to increase when the member would have attained age 50. The allowance is payable to the surviving spouse until death at which time the allowance is continued to any unmarried child(ren) under age 22. There is a guarantee that the total amount paid will at least equal the basic death benefit.

If the member's death is the result of an accident or injury caused by external violence or physical force incurred in the performance of the member's duty, and there are *eligible* surviving child(ren) (*eligible* means unmarried child(ren) under age 22) in addition to an eligible spouse, then an **additional monthly allowance** is paid equal to the following:

- if 1 eligible child: 12.5 percent of final compensation
- if 2 eligible children: 20.0 percent of final compensation
- if 3 or more eligible children: 25.0 percent of final compensation

Alternate Death Benefit for Local Fire Members

This is an optional benefit available only to local fire members.

Eligibility

An employee's *eligible survivor(s)* may receive the alternate death benefit in lieu of the basic death benefit or the 1957 Survivor benefit if the member dies while actively employed and has at least 20 years of total CalPERS service. A CalPERS member who is no longer actively employed with **any** CalPERS employer is not eligible for this benefit. An *eligible survivor* means the surviving spouse to whom the member was married prior to the onset of the injury or illness that resulted in death. If there is no eligible spouse, an eligible survivor means the member's unmarried child(ren) under age 18.

Benefit

The Alternate Death benefit is a monthly allowance equal to the service retirement benefit that the member would have received had the member retired on the date of his or her death and elected Optional Settlement 2. (A retiree who elects Optional Settlement 2 receives an allowance that has been reduced so that it will continue to be paid after his or her death to a surviving beneficiary.) If the member has not yet attained age 50, the benefit is equal to that which would be payable if the member had retired at age 50, based on service credited at the time of death. The allowance is payable as long as the surviving spouse lives, at which time it is continued to any unmarried child(ren) under age 18, if applicable. The total amount paid will be at least equal to the basic death benefit.

Cost-of-Living Adjustments (COLA)

Standard Benefit

Retirement and survivor allowances are adjusted each year in May for cost of living, beginning the second calendar year after the year of retirement. The standard cost-of-living adjustment (COLA) is 2 percent. Annual adjustments are calculated by first determining the lesser of 1) 2 percent compounded from the end of the year of retirement or 2) actual rate of inflation. The resulting increase is divided by the total increase provided in prior years. For any given year, the COLA adjustment may be less than 2 percent (when the rate of inflation is low), may be greater than the rate of inflation (when the rate of inflation is low after several years of high inflation) or may even be greater than 2 percent (when inflation is high after several years of low inflation).

Improved Benefit

Employers have the option of providing a COLA of 3 percent, 4 percent, or 5 percent, determined in the same manner as described above for the standard 2 percent COLA. An improved COLA is not available with the 1.5% at 65 formula.

Purchasing Power Protection Allowance (PPPA)

Retirement and survivor allowances are protected against inflation by PPPA. PPPA benefits are cost-of-living adjustments that are intended to maintain an individual's allowance at 80 percent of the initial allowance at retirement adjusted for inflation since retirement. The PPPA benefit will be coordinated with other cost-of-living adjustments provided under the plan.

Employee Contributions

Each employee contributes toward his or her retirement based upon the retirement formula. The standard employee contribution is as described below.

- The percent contributed below the monthly compensation breakpoint is 0 percent.
- The monthly compensation breakpoint is $0 for full and supplemental formula members and $133.33 for employees covered by the modified formula.
- The percent contributed above the monthly compensation breakpoint depends upon the benefit formula, as shown in the table below.

Benefit Formula	**Percent Contributed above the Breakpoint**
Miscellaneous, 1.5% at 65	2%
Miscellaneous, 2% at 60	7%
Miscellaneous, 2% at 55	7%
Miscellaneous, 2.5% at 55	8%
Miscellaneous, 2.7% at 55	8%
Miscellaneous, 3% at 60	8%
Miscellaneous, 2% at 62	50% of the Total Normal Cost
Miscellaneous, 1.5% at 65	50% of the Total Normal Cost
Safety, 1/2 at 55	Varies by entry age
Safety, 2% at 55	7%
Safety, 2% at 50	9%
Safety, 3% at 55	9%
Safety, 3% at 50	9%
Safety, 2% at 57	50% of the Total Normal Cost
Safety, 2.5% at 57	50% of the Total Normal Cost
Safety, 2.7% at 57	50% of the Total Normal Cost

The employer may choose to "pick-up" these contributions for classic members (Employer Paid Member Contributions or EPMC). EPMC is prohibited for new PEPRA members.

An employer may also include Employee Cost Sharing in the contract, where employees agree to share the cost of the employer contribution. These contributions are paid in addition to the member contribution.

Auxiliary organizations of the CSU system may elect reduced contribution rates, in which case the offset is $317 and the contribution rate is 6 percent if members are not covered by Social Security. If members are covered by Social Security, the offset is $513 and the contribution rate is 5 percent.

Refund of Employee Contributions

If the member's service with the employer ends, and if the member does not satisfy the eligibility conditions for any of the retirement benefits above, the member may elect to receive a refund of his or her employee contributions, which are credited with 6 percent interest compounded annually.

1959 Survivor Benefit

This is a pre-retirement death benefit available only to members not covered by Social Security. Any agency joining CalPERS subsequent to 1993 is required to provide this benefit if the members are not covered by Social Security. The benefit is optional for agencies joining CalPERS prior to 1994. Levels 1, 2 and 3 are now closed. Any new agency or any agency wishing to add this benefit or increase the current level may only choose the 4th or Indexed Level.

This benefit is not included in the results presented in this valuation. More information on this benefit is available on the CalPERS website at www.calpers.ca.gov.

Appendix C

Participant Data

- **Summary of Valuation Data**
- **Active Members**
- **Transferred and Terminated Members**
- **Retired Members and Beneficiaries**

Summary of Valuation Data

		June 30, 2016		June 30, 2017
1. **Active Members**				
a) Counts		369		378
b) Average Attained Age		41.98		41.54
c) Average Entry Age to Rate Plan		27.66		27.68
d) Average Years of Service		14.32		13.86
e) Average Annual Covered Pay	$	112,975	$	115,092
f) Annual Covered Payroll		41,687,863		43,504,868
g) Projected Annual Payroll for Contribution Year		45,553,453		47,366,075
h) Present Value of Future Payroll		385,715,126		400,335,281
2. **Transferred Members**				
a) Counts		70		70
b) Average Attained Age		43.71		43.62
c) Average Years of Service		5.38		5.27
d) Average Annual Covered Pay	$	100,980	$	102,755
3. **Terminated Members**				
a) Counts		48		52
b) Average Attained Age		41.13		41.17
c) Average Years of Service		3.90		3.38
d) Average Annual Covered Pay	$	71,306	$	71,712
4. **Retired Members and Beneficiaries**				
a) Counts		326		345
b) Average Attained Age		59.80		60.52
c) Average Annual Benefits	$	66,535	$	68,757
5. **Active to Retired Ratio** [(1a) / (4a)]		1.13		1.10

Counts of members included in the valuation are counts of the records processed by the valuation. Multiple records may exist for those who have service in more than one valuation group. This does not result in double counting of liabilities.

Average Annual Benefits represents benefit amounts payable by this plan only. Some members may have service with another agency and would therefore have a larger total benefit than would be included as part of the average shown here.

Active Members

Counts of members included in the valuation are counts of the records processed by the valuation. Multiple records may exist for those who have service in more than one valuation group. This does not result in double counting of liabilities.

Distribution of Active Members by Age and Service

	Years of Service at Valuation Date						
Attained Age	**0-4**	**5-9**	**10-14**	**15-19**	**20-25**	**25+**	**Total**
15-24	9	0	0	0	0	0	9
25-29	38	3	0	0	0	0	41
30-34	37	18	8	0	0	0	63
35-39	13	12	29	7	0	0	61
40-44	5	10	22	21	5	0	63
45-49	3	1	6	8	21	12	51
50-54	0	0	3	2	10	40	55
55-59	1	0	0	4	3	22	30
60-64	0	1	0	0	0	2	3
65 and over	0	0	0	0	1	1	2
All Ages	**106**	**45**	**68**	**42**	**40**	**77**	**378**

Distribution of Average Annual Salaries by Age and Service

	Years of Service at Valuation Date						
Attained Age	**0-4**	**5-9**	**10-14**	**15-19**	**20-25**	**25+**	**Average**
15-24	$77,474	$0	$0	$0	$0	$0	$77,474
25-29	81,624	106,672	0	0	0	0	83,456
30-34	90,288	106,175	116,673	0	0	0	98,177
35-39	101,726	114,266	117,436	125,752	0	0	114,419
40-44	92,735	108,124	115,151	126,416	124,189	0	116,729
45-49	139,906	97,007	116,132	119,237	138,117	139,079	132,094
50-54	0	0	123,745	113,607	137,382	138,826	136,824
55-59	89,792	0	0	120,930	161,666	123,753	126,036
60-64	0	258,320	0	0	0	116,077	163,491
65 and over	0	0	0	0	184,521	149,047	166,784
All Ages	**$89,012**	**$111,976**	**$116,770**	**$123,805**	**$139,118**	**$134,101**	**$115,092**

Transferred and Terminated Members

Distribution of Transfers to Other CalPERS Plans by Age, Service, and average Salary

	Years of Service at Valuation Date							
Attained Age	**0-4**	**5-9**	**10-14**	**15-19**	**20-25**	**25+**	**Total**	**Average Salary**
15-24	0	0	0	0	0	0	0	$0
25-29	2	1	0	0	0	0	3	84,859
30-34	8	6	0	0	0	0	14	99,928
35-39	4	3	2	0	0	0	9	98,955
40-44	4	4	3	0	0	0	11	115,640
45-49	11	3	1	0	0	0	15	108,875
50-54	6	2	0	2	0	1	11	103,822
55-59	3	0	2	0	0	0	5	88,481
60-64	1	1	0	0	0	0	2	79,543
65 and over	0	0	0	0	0	0	0	0
All Ages	**39**	**20**	**8**	**2**	**0**	**1**	**70**	**102,755**

Distribution of Terminated Participants with Funds on Deposit by Age, Service, and average Salary

	Years of Service at Valuation Date							
Attained Age	**0-4**	**5-9**	**10-14**	**15-19**	**20-25**	**25+**	**Total**	**Average Salary**
15-24	1	0	0	0	0	0	1	$67,351
25-29	3	0	0	0	0	0	3	69,725
30-34	11	0	1	0	0	0	12	64,566
35-39	9	2	2	0	0	0	13	83,318
40-44	5	0	1	0	0	0	6	65,449
45-49	3	0	0	1	0	0	4	68,126
50-54	4	3	2	0	0	0	9	73,769
55-59	3	0	0	0	1	0	4	66,365
60-64	0	0	0	0	0	0	0	0
65 and over	0	0	0	0	0	0	0	0
All Ages	**39**	**5**	**6**	**1**	**1**	**0**	**52**	**71,712**

Retired Members and Beneficiaries

Distribution of Retirees and Beneficiaries by Age and Retirement Type*

Attained Age	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Total
Under 30	0	0	0	0	0	0	0
30-34	0	0	0	0	0	0	0
35-39	0	0	6	0	0	0	6
40-44	0	0	2	0	1	0	3
45-49	0	0	14	1	0	0	15
50-54	11	0	24	1	0	0	36
55-59	62	1	42	0	0	1	106
60-64	60	1	31	0	0	7	99
65-69	25	0	23	0	0	1	49
70-74	11	0	6	0	0	1	18
75-79	5	0	5	0	0	0	10
80-84	2	0	0	0	0	0	2
85 and Over	0	0	1	0	0	0	1
All Ages	**176**	**2**	**154**	**2**	**1**	**10**	**345**

Distribution of Average Annual Disbursements to Retirees and Beneficiaries by Age and Retirement Type*

Attained Age	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Average
Under 30	$0	$0	$0	$0	$0	$0	$0
30-34	0	0	0	0	0	0	0
35-39	0	0	38,404	0	0	0	38,404
40-44	0	0	52,676	0	55,463	0	53,605
45-49	0	0	43,410	93,114	0	0	46,723
50-54	64,702	0	57,617	20,344	0	0	58,746
55-59	92,631	22,951	59,684	0	0	14,834	78,185
60-64	85,362	28,488	63,311	0	0	87,598	78,041
65-69	73,188	0	47,331	0	0	31,788	60,206
70-74	46,395	0	56,969	0	0	83,122	51,960
75-79	57,783	0	47,473	0	0	0	52,628
80-84	24,412	0	0	0	0	0	24,412
85 and Over	0	0	39,986	0	0	0	39,986
All Ages	**$80,991**	**$25,720**	**$55,217**	**$56,729**	**$55,463**	**$74,293**	**$68,757**

Retired Members and Beneficiaries (continued)

Distribution of Retirees and Beneficiaries by Years Retired and Retirement Type*

Years Retired	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Total
Under 5 Yrs	70	0	32	0	0	4	106
5-9	66	0	19	2	0	2	89
10-14	27	1	30	0	1	2	61
15-19	6	0	22	0	0	1	29
20-24	6	1	21	0	0	1	29
25-29	0	0	17	0	0	0	17
30 and Over	1	0	13	0	0	0	14
All Years	**176**	**2**	**154**	**2**	**1**	**10**	**345**

Distribution of Average Annual Disbursements to Retirees and Beneficiaries by Years Retired and Retirement Type*

Years Retired	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Average
Under 5 Yrs	$90,720	$0	$86,535	$0	$0	$125,238	$90,759
5-9	88,314	0	69,774	56,729	0	44,710	82,667
10-14	57,650	28,488	56,678	0	55,463	29,051	55,721
15-19	19,153	0	38,968	0	0	62,672	35,686
20-24	60,835	22,951	40,850	0	0	31,788	44,055
25-29	0	0	38,917	0	0	0	38,917
30 and Over	38,711	0	25,503	0	0	0	26,447
All Years	**$80,991**	**$25,720**	**$55,217**	**$56,729**	**$55,463**	**$74,293**	**$68,757**

* Counts of members do not include alternate payees receiving benefits while the member is still working. Therefore, the total counts may not match information on C-1 of the report. Multiple records may exist for those who have service in more than one coverage group. This does not result in double counting of liabilities.

Appendix D

Normal Cost Information by Group

- **Normal Cost by Benefit Group**
- **PEPRA Member Contribution Rates**

Normal Cost by Benefit Group

The table below displays the Total Normal Cost broken out by benefit group for Fiscal Year 2019-20. The Total Normal Cost is the annual cost of service accrual for the fiscal year for active employees and can be viewed as the long-term contribution rate for the benefits contracted. Generally, the normal cost for a benefit group subject to more generous benefit provisions will exceed the normal cost for a group with less generous benefits. However, based on the characteristics of the members (particularly when the number of actives is small), this may not be the case. Future measurements of the Total Normal Cost for each group may differ significantly from the current values due to such factors as: changes in the demographics of the group, changes in economic and demographic assumptions, changes in plan benefits or applicable law.

Rate Plan Identifier	Benefit Group Name	Total Normal Cost FY 2019-20	Number of Actives	Payroll on 6/30/2017
75	Safety Fire First Tier	23.256%	1	114,026
25060	Safety Fire PEPRA	24.040%	32	2,533,640
25061	Safety Police PEPRA	25.424%	39	3,393,461
30203	Safety Police Second Tier	30.053%	187	23,054,876
30204	Safety Police First Tier	28.868%	1	146,032
30205	Safety Fire Second Tier	27.102%	118	14,262,833

Note that if a Benefit Group above has multiple bargaining units, each of which has separately contracted for different benefits such as Employer Paid Member Contributions, then the Normal Cost split does not reflect those differences. Additionally, if a 2nd Tier Benefit Group amended to the same benefit formula as a 1st Tier Benefit Group their Normal Costs may be dissimilar due to demographic or other population differences. In these situations you should consult with your plan actuary.

PEPRA Member Contribution Rates

The table below shows the determination of the PEPRA Member contribution rates based on 50 percent of the Total Normal Cost for each respective plan on June 30, 2017. Assembly Bill (AB) 340 created PEPRA that implemented new benefit formulas and a final compensation period as well as new contribution requirements for new employees. In accordance with Section Code 7522.30(b), "new members … shall have an initial contribution rate of at least 50 percent of the normal cost rate." The normal cost for the plan is dependent on the benefit levels, actuarial assumptions and demographics of the plan particularly the entry age into the plan. Should the total normal cost of the plan change by one percent or more from the base total normal cost established for the plan, the new member rate shall be 50 percent of the new normal cost rounded to the nearest quarter percent.

		Basis for Current Rate		Rates Effective July 1, 2019			
Rate Plan Identifier	**Benefit Group Name**	**Total Normal Cost**	**Member Rate**	**Total Normal Cost**	**Change**	**Change Needed**	**Member Rate**
25060	Safety Fire PEPRA	23.320%	11.750%	24.087%	0.767%	No	11.750%
25061	Safety Police PEPRA	23.320%	11.750%	24.087%	0.767%	No	11.750%

The PEPRA employee contribution rate determined in the table above may not necessarily be 50 percent of the Total Normal Cost by Group based on the PEPRA Normal Cost calculation methodology. Each non-pooled plan is stable with a sufficiently large demographic representation of active employees. It is preferable to determine normal cost using a large active population ongoing so that this rate remains relatively stable. The total PEPRA normal cost will be calculated using all active members within a non-pooled plan until the number of members covered under the PEPRA formula meets either:

1. 50 percent of the active population, or
2. 25 percent of the active population and 100 or more PEPRA members

Once either of the conditions above is met for a non-pooled plan, the total PEPRA normal cost will be based on the active PEPRA population in the plan.

Accordingly, the total normal cost will be funded equally between employer and employee based on the demographics of the employees of that employer.

Appendix E

Glossary of Actuarial Terms

Glossary of Actuarial Terms

Accrued Liability *(also called Actuarial Accrued Liability or Entry Age Normal Accrued Liability)*
The total dollars needed as of the valuation date to fund all benefits earned in the past for *current* members.

Actuarial Assumptions
Assumptions made about certain events that will affect pension costs. Assumptions generally can be broken down into two categories: demographic and economic. Demographic assumptions include such things as mortality, disability and retirement rates. Economic assumptions include discount rate, salary growth and inflation.

Actuarial Methods
Procedures employed by actuaries to achieve certain funding goals of a pension plan. Actuarial methods include funding method, setting the length of time to fund the Accrued Liability and determining the Value of Assets.

Actuarial Valuation
The determination, as of a valuation date of the Normal Cost, Accrued liability, and related actuarial present values for a pension plan. These valuations are performed annually or when an employer is contemplating a change to their plan provisions.

Amortization Bases
Separate payment schedules for different portions of the Unfunded Liability. The total Unfunded Liability of a Risk Pool or non-pooled plan can be segregated by "cause," creating "bases" and each such base will be separately amortized and paid for over a specific period of time. However, all bases are amortized using investment and payroll assumptions from the current valuation. This can be likened to a home having a first mortgage of 24 years remaining payments and a second mortgage that has 10 years remaining payments. Each base or each mortgage note has its own terms (payment period, principal, etc.)

Generally, in an actuarial valuation, the separate bases consist of changes in unfunded liability due to contract amendments, actuarial assumption changes, actuarial methodology changes, and/or gains and losses. Payment periods are determined by Board policy and vary based on the cause of the change.

Amortization Period
The number of years required to pay off an Amortization Base.

Classic Member (under PEPRA)
A classic member is a member who joined CalPERS prior to January 1, 2013 and who is not defined as a new member under PEPRA. (See definition of new member below)

Discount Rate Assumption
The actuarial assumption that was called "investment return" in earlier CalPERS reports or "actuarial interest rate" in Section 20014 of the California Public Employees' Retirement Law (PERL).

Entry Age
The earliest age at which a plan member begins to accrue benefits under a defined benefit pension plan. In most cases, this is the age of the member on their date of hire.

Entry Age Normal Cost Method
An actuarial cost method designed to fund a member's total plan benefit over the course of his or her career. This method is designed to yield a rate expressed as a level percentage of payroll.
(The assumed retirement age less the entry age is the amount of time required to fund a member's total benefit. Generally, the older a member on the date of hire, the greater the entry age normal cost. This is mainly because there is less time to earn investment income to fund the future benefits.)

Fresh Start

A Fresh Start is when multiple amortization bases are collapsed to one base and amortized together over a new funding period.

Funded Status

A measure of how well funded, or how "on track" a plan or risk pool is with respect to assets versus accrued liabilities. A ratio greater than 100 percent means the plan or risk pool has more assets than liabilities and a ratio less than 100 percent means liabilities are greater than assets.

GASB 68

Statement No. 68 of the Governmental Accounting Standards Board. The accounting standard governing a state or local governmental employer's accounting and financial reporting for pensions. GASB 68 replaces GASB 27 effective the first fiscal year beginning after June 15, 2014.

New Member (under PEPRA)

A new member includes an individual who becomes a member of a public retirement system for the first time on or after January 1, 2013, and who was not a member of another public retirement system prior to that date, and who is not subject to reciprocity with another public retirement system.

Normal Cost

The annual cost of service accrual for the upcoming fiscal year for active employees. The normal cost should be viewed as the long-term contribution rate.

Pension Actuary

A business professional that is authorized by the Society of Actuaries, and the American Academy of Actuaries to perform the calculations necessary to properly fund a pension plan.

PEPRA

The California Public Employees' Pension Reform Act of 2013

Prepayment Contribution

A payment made by the employer to reduce or eliminate the year's required employer contribution towards the UAL.

Present Value of Benefits (PVB)

The total dollars needed as of the valuation date to fund all benefits earned in the past or expected to be earned in the future for *current* members.

Unfunded Accrued Liability (UAL)

When a plan or pool's Value of Assets is less than its Accrued Liability, the difference is the plan or pool's Unfunded Accrued Liability (or unfunded liability). If the unfunded liability is positive, the plan or pool will have to pay contributions exceeding the Normal Cost.