CITY OF OAKLAND

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OFFICE OF THE CITY CLERK
OAKLAND

2018 OCT 10 AM 10: 45

AGENDA REPORT

TO: Sabrina B. Landreth
City Administrator

FROM: Katano Kasaine
Director of Finance

SUBJECT: CalPERS Pension Rates for FY 2019-20 and forecast through FY 2023-24

DATE: September 27, 2018

City Administrator Approval

Date: 10/9/18

RECOMMENDATION

Staff Recommends That The City Council Receive An Informational Report On The June 30, 2017 CalPERS Actuarial Valuation Reports for Miscellaneous and Safety Plans that Establishes Employer Pension Contributions for Fiscal Year (FY) 2019-20 And Provides Forecast Employer Contribution Rates Through Fiscal Year 2023-24.

EXECUTIVE SUMMARY

In August 2018, the California Public Employees' Retirement System ("CalPERS") provided the City of Oakland ("City") with the June 30, 2017 Actuarial Valuations for Pensions for Miscellaneous and Safety employees. These valuations establish the City's Employer Contribution rates for FY 2019-20 (which begins July 1, 2019) and forecasts future Employer Contributions over a multi-year period.

As of June 30, 2017, the City's Miscellaneous Plan was 68.2 percent funded, while the City's Safety Plan was 64.2 percent funded.

Based on the actuarial valuations, the City's FY 2019-20 contribution toward CalPERS pensions will increase from approximately $132.83 million in FY 2018-19 to $149.96 million in FY 2019-20, a $17.13 million increase across all funds (12.9 percent). The City's pension contribution is estimated to be $165.52 million in FY 2020-21, an additional $15.56 million year-over-year (10.4 percent).

Citywide (All Funds)	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21
Combined Miscellaneous & Safety				
Total Employer Contribution ($)	**$117,050,492**	**$132,827,480**	**$149,961,323**	**$165,520,109**
Year-over-Year Increase (%)	--	*13.5%*	*12.9%*	*10.4%*
Year-over-Year Increase ($)	--	*$15,776,989*	*$17,133,843*	*$15,558,786*

Pension costs are increasing at rates that are more than three-times the rate of inflation in the Bay Area and are outpacing growth in the City's general revenues. These additional pension

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Finance and Management Committee
October 23, 2018

costs will have a significant impact on the City's ability to fund critical programs during the FY 2019-21 Biennial Budget deliberations.

If CalPERS achieves its expected rate of return on investments over the forecast period, the City's total contribution is forecast to increase from $149.96 million in FY 2019-20 to $198.62 million by FY 2023-24, an increase of 32.4 percent over the 5-year forecast period. This is an average annual increase of 7.3 percent per year.

BACKGROUND / LEGISLATIVE HISTORY

The City has three (3) defined benefit pension programs and a defined benefit program to pay partial costs of Other Post-Employment Benefits ("OPEB") (retiree medical) for certain classes of retirees. As shown in the table below, the City's cumulative unfunded liabilities for these employee retirement programs are $2.69 billion based on the most recent actuarial valuations. While the remainder of this report focuses on the City's CalPERS pension programs, it is important to consider the full magnitude of outstanding obligations for employee retirement benefits when considering future employer pension contributions.

Table 1. Unfunded Retirement Benefit Obligations

	Accrued Liability	Assets (MV)	Unfunded Liability	Funded Ratio	Eff. Date
Police & Fire Retirement System[1]	$673,441,000	$353,203,000	$320,238,000	52.4%	7/1/17
Other Post-Employment Benefits[2]	$853,796,061	$26,432,487	$827,363,574	3.1%	7/1/17
CalPERS - Miscellaneous	$2,616,012,657	$1,783,380,244	$832,632,413	68.2%	6/30/17
CalPERS - Safety	$1,997,661,954	$1,283,385,686	$714,276,268	64.2%	6/30/17
Sub-Total	**$6,140,911,672**	**$3,446,401,417**	**$2,694,510,255**	**43.9%**	**n/a**

In November 2015, the CalPERS Board of Administration adopted a Funding Risk Mitigation Policy to incrementally lower the discount rate (i.e., the expected rate of return on investments) in years of good investment returns, with a goal of achieving a 6.5 percent discount rate within approximately 20 years. Under the policy, the discount rate would decrease from .05 percent to 0.25 percent when actual investment returns exceed the discount rate by 2 percent to 4 percent. This action would help to accelerate pay down of the system's unfunded liabilities, and provide greater predictability and less volatility in contribution rates for employers over the long-term.

In December 2016, the CalPERS Board of Administration lowered the discount rate from 7.5 percent to 7.0 percent over a three (3) year period. The phase-in of reductions to the discount rate are as follows:

- June 30, 2016 valuation (FY 2018-19 contribution): 7.375 percent
- June 30, 2017 valuation (FY 2019-20 contribution): 7.250 percent (current year)
- June 30, 2018 valuation (FY 2020-21 contribution): 7.000 percent

[1] Partially supported by tax override revenues.
[2] The assets reflected in the table are as of August 28, 2018, which include the $20 million OPEB trust contribution authorized by the City Council in the FY 2017-19 Adopted Budget.

The required Employer Contributions for FY 2019-20 were calculated assuming a 7.25 percent discount rate. The projected Employer Contribution rates for future years were calculated using a 7.00 percent discount rate beginning in FY 2020-21 and each year thereafter.

In March 2018 the CalPERS Board adopted a new amortization policy beginning with the June 30, 2019 actuarial valuation. The new policy shortens the period over which unfunded liabilities are amortized from 30 years to 20 years and requires payments be calculated as a level dollar. In addition, the new policy removes the 5-year ramp-up and ramp-down on unfunded liabilities attributable to assumption changes and investment gains/losses. The changes will apply to new unfunded liabilities established after June 30, 2019 for contributions beginning in FY 2020-21.

ANALYSIS / POLICY ALTERNATIVES

Attached to this report are excerpts from the CalPERS Annual Valuation Reports as of June 30, 2017 for Miscellaneous and Safety Plans of the City of Oakland (the "City"). Full copies of the City's CalPERS actuarial valuations can be accessed at the following website: https://www.calpers.ca.gov/page/employers/actuarial-services/employer-contributions/public-agency-actuarial-valuation-reports. These actuarial valuations: 1) Describe the assets and liabilities of the plans; 2) Determine the required Employer Contribution rate for FY 2019-20; and, 3) Forecast future required Employer Contributions over a multi-year period. This staff report summarizes the information contained in these actuarial valuations.

As detailed in the valuation reports, the City's CalPERS pension costs continue to escalate for several reasons, including:

- Historical benefit enhancements;
- Volatile market returns and losses;
- Actuarial methodological changes (e.g., asset smoothing method and the amortization period for paydown of unfunded liabilities); and,
- Mortality improvements (i.e., increasing life expectancy).

Additional changes to the actuarial assumptions approved by the CalPERS Board of Administration in recent years (further detailed in the "Background / Legislative History" section of this report) will add significant costs to the City's budget in the near-term.

Funded Level

The funding ratio of a pension plan – which is defined as the value of current assets divided by a measure of the plan's liabilities (i.e., benefits owed) – can be a benchmark for a plans overall financial health. As shown in Table 2, as of June 30, 2017, the City's combined Market Value of Assets were $3.06 billion compared to Accrued Liabilities of $4.61 billion, resulting in a cumulative Unfunded Accrued Liability of $1.55 billion and a funding ratio of 64.1 percent.

Table 2. Assets, Liabilities, & Funded Ratio

6/30/2017 Valuation	Miscellaneous Plan*	Safety Plan	Combined Total
Market Value of Assets	$1,783,380,244	$1,283,385,686	$3,066,765,930
Total Accrued Liability	$2,616,012,657	$1,997,661,954	$4,613,674,611
Unfunded Accrued Liability	$832,632,413	$714,276,268	$1,546,908,681
Funded Ratio	**68.2%**	**64.2%**	**64.1%**

**Includes the Port of Oakland.*

As shown in Table 3 below, since the end of the Great Recession in December 2009, the City has made incremental progress toward improving the funding ratio of its CalPERS pension plans, despite significant increases in Employer Contributions and benefit reforms for certain employees under the Public Employees' Pension Reform Act ("PEPRA"). As shown below, the Miscellaneous Plan funding ratio increased from 58.4 percent as of June 30, 2009 to 68.2 percent as of June 30, 2017, while the funding ratio of the Safety Plan increased from 53.8 percent to 64.2 percent over the same time period.

Table 3. Funding Ratio Trend

Valuation Date	Miscellaneous Plan	Safety Plan	Rate of Return
June 30, 2009	58.4%	53.8%	-24.0%
June 30, 2010	64.0%	59.1%	13.3%
June 30, 2011	70.8%	67.4%	21.7%
June 30, 2012	66.4%	64.8%	0.2%
June 30, 2013	69.5%	67.9%	13.2%
June 30, 2014	72.7%	71.3%	17.7%
June 30, 2015	70.2%	67.2%	2.4%
June 30, 2016	65.4%	62.3%	0.6%
June 30, 2017	68.2%	64.2%	11.2%

The funding ratio of a pension plan should be considered in the context of the U.S. business cycle. Plans tend to have lower funding ratios during times of market downturn (e.g., recession) and should approach full funding (100 percent) at the peak of a cycle.

Employer Contributions for FY 2019-20

Beginning with FY 2017-18, CalPERS began collecting the required Employer Contribution as the sum of two components: 1) the Normal Cost, which represents the annual cost of service for the upcoming fiscal year for active employees and is paid as a percentage of payroll; and, 2) the annual payment on the Unfunded Accrued Liability ("UAL"), which is the amortized amount needed to fund past service and is paid as a fixed dollar amount.

Table 4 below shows the FY 2019-20 and FY 2020-21 projected Employer Contributions for both the Miscellaneous and Safety Plans, relative to the previous two fiscal years.

Table 4. Employer Contributions (All Funds)

	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21
Miscellaneous Plan				
Employer Contribution ($)	**$61,034,529**	**$69,032,204**	**$77,033,302**	**$83,874,358**
Year-over-Year Increase (%)	--	*13.1%*	*11.6%*	*8.9%*
Year-over-Year Increase ($)	--	*$7,997,675*	*$8,001,098*	*$6,841,056*
Safety Plan				
Employer Contribution ($)	**$56,015,962**	**$63,795,276**	**$72,928,021**	**$81,645,751**
Year-over-Year Increase (%)	--	*13.9%*	*14.3%*	*12.0%*
Year-over-Year Increase ($)	--	*$7,779,313*	*$9,132,745*	*$8,717,730*
Combined Miscellaneous & Safety				
Total Employer Contribution ($)	**$117,050,492**	**$132,827,480**	**$149,961,323**	**$165,520,109**
Year-over-Year Increase (%)	--	*13.5%*	*12.9%*	*10.4%*
Year-over-Year Increase ($)	--	*$15,776,989*	*$17,133,843*	*$15,558,786*
FY 2019-21 Biennial Budget Cumulative Increase (All Funds) =>			**$17,133,843**	**$32,692,629**
FY 2019-21 Biennial Budget Cumulative Increase GPF (1010) =>			**$10,228,904**	**$19,517,499**

While the Normal Cost for both Miscellaneous and Safety employees is expected to remain relatively constant, the City's fixed UAL payment will increase significantly as additional unfunded liabilities are amortized. In total, the Citywide pension contribution for FY 2019-20 will increase by more than $17.13 million over FY 2018-19 levels, an increase of 12.9 percent year-over-year. The City's pension contribution is estimated to be $165.52 million in FY 2020-21, an additional $15.56 million year-over-year (10.4 percent). **These expenditure growth rates are anticipated to outpace the City's growth in general revenues and will have a significant impact on the City's ability to fund services in the FY 2019-21 Biennial Budget.**

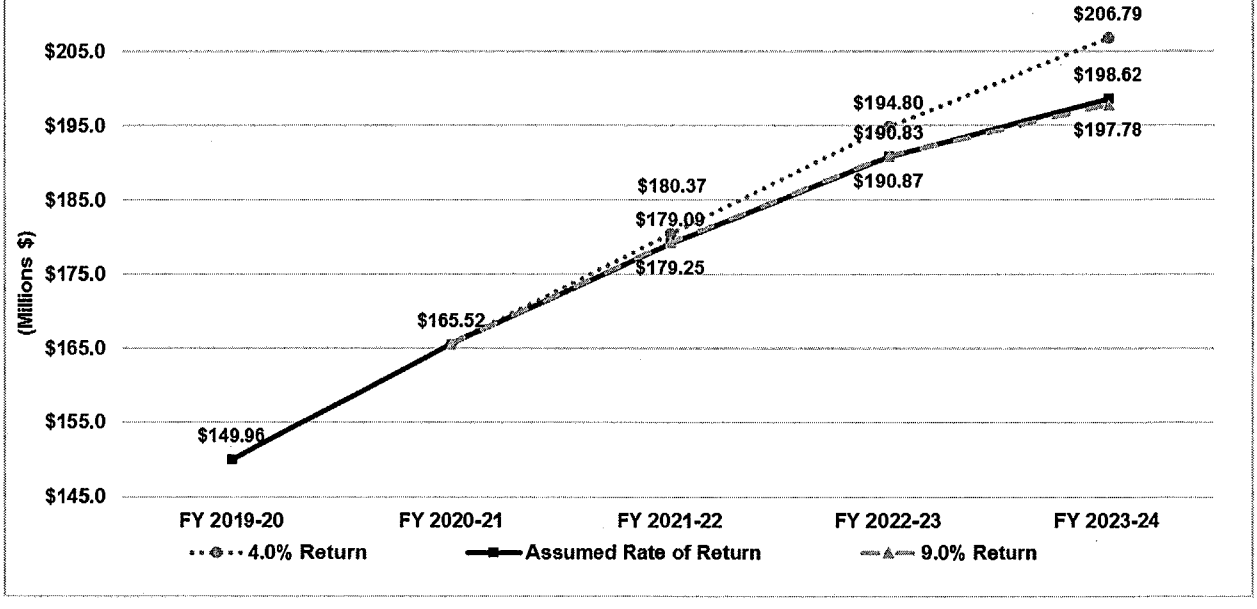
Multi-Year Forecast

CalPERS provides an analysis of Employer Contributions under various investment return scenarios based on an analysis of possible future returns.

Tables 5 below shows the effect of investment returns on Employer Contributions under the following alternative investment scenarios:

1. *Low Return*: 4.0 percent in FY 2018-19 and each year thereafter;
2. *Actuarial Assumed Return*: Assumed rate of return in each year; and,
3. *High Return*: 9.0 percent in FY 2018-19 and each year thereafter.

Table 5. Forecast Employer Contribution Rates for Miscellaneous & Safety Combined
4.0% Return, Assumed Rate of Return, & 9.0% Return



As shown in the table above, if CalPERS achieves its expected rate of return over the forecast period, the City's total contribution is forecast to increase from $149.96 million in FY 2019-20 to $198.62 million by FY 2023-24, an increase of 32.4 percent over the 5-year forecast period. This is an average annual Employer Contribution increase of 7.3 percent per year, more than double the annual rate of inflation.

If CalPERS achieves a 25th percentile return (approximately equal to a 4.0 percent gain each year), the effect on the City's contribution increased by about $8.0 million in FY 2023-24, from $198.62 million to more than $206.79 million.

Even under a more optimistic return scenario (approximately equal to a 9.0 percent gain each year), the City's contribution toward pensions will continue to increase through FY 2023-24. **It is important to note that these scenarios do not reflect the impact of investment losses on the City's contribution rates due to broader market corrections, such as a recession.**

As shown in this report, the City's pension contributions are forecast to increase substantially in the near-term. Generating the financial capacity to fund these future rate increases will be extremely challenging for the City of Oakland and pose an acute risk to service levels in the near-term and will have to be addressed during the FY 2019-21 Biennial Budget deliberations.

FISCAL IMPACT

This item is for informational purposes only and does not have a direct fiscal impact or cost.

PUBLIC OUTREACH / INTEREST

This item did not require additional public outreach, other than posting on the City's website.

COORDINATION

This report was prepared by the Finance Department.

SUSTAINABLE OPPORTUNITIES

Economic: There are no economic opportunities associated with this item.

Environmental: There are no environmental opportunities associated with this item.

Social Equity: There are no social equity opportunities associated with this item.

ACTION REQUESTED OF THE CITY COUNCIL

Staff Recommends That The City Council Receive An Informational Report On The June 30, 2017 CalPERS Actuarial Valuation Reports for Miscellaneous and Safety Plans that Establishes Employer Pension Contributions for Fiscal Year (FY) 2019-20 And Provides Forecast Employer Contribution Rates Through Fiscal Year 2023-24.

For questions regarding this report, please contact Adam Benson, Budget Administrator, at (510) 238-2026.

Respectfully submitted,

Katano Kasaine
Director of Finance, Finance Department

Prepared by:
Adam Benson, Budget Administrator
Finance Department, Budget Bureau

Attachments (2):

Attachment A: Excerpt Miscellaneous Plan, Annual Valuation Report as of June 30, 2017.
Attachment B: Excerpt Safety Plan, Annual Valuation Report as of June 30, 2017.

California Public Employees' Retirement System
Actuarial Office
P.O. Box 942701
Sacramento, CA 94229-2701
TTY: (916) 795-3240
(888) 225-7377 phone • (916) 795-2744 fax
www.calpers.ca.gov

July 2018

Miscellaneous Plan of the City of Oakland (CalPERS ID: 4015143822)
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	11.559%	$73,490,639	7.25%
Projected Results			
2020-21	*12.4%*	*$79,550,000*	*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.

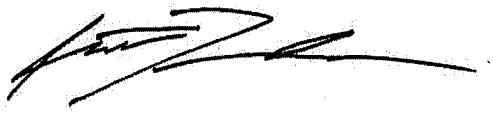
The CalPERS Board of Administration adopted a Risk Mitigation Policy which is designed to reduce funding risk over time. This Policy has been temporarily suspended during the period over which the discount rate is being lowered. More details on the Risk Mitigation Policy can be found on our website.

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 Miscellaneous Plan of the City of Oakland

(CalPERS ID: 4015143822)
(Rate Plan ID: 899)

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

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 Miscellaneous Plan of the City of Oakland 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

Required Employer Contribution		Fiscal Year 2019-20
Employer Normal Cost Rate		**11.559%**
Plus, Either		
1) Monthly Employer Dollar UAL Payment	**$**	**6,124,220**
Or		
2) Annual UAL Prepayment Option	**$**	**70,963,230**
Required PEPRA Member Contribution Rate		**7.25%**

*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		19.069%		19.259%
Employee Contribution[1]		7.767%		7.700%
Employer Normal Cost[2]		11.302%		11.559%
Projected Annual Payroll for Contribution Year	$	233,807,979	$	239,639,480
Estimated Employer Contributions Based On Projected Payroll				
Total Normal Cost	$	44,584,843	$	46,152,167
Employee Contribution[1]		18,159,866		18,452,240
Employer Normal Cost[2]		26,424,977		27,699,927
Unfunded Liability Contribution		64,318,649		73,490,639
% of Projected Payroll (illustrative only)		27.509%		30.667%
Estimated Total Employer Contribution	$	90,743,626	$	101,190,566
% of Projected Payroll (illustrative only)		38.811%		42.226%

[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	$ 2,794,339,245	$ 2,911,227,952
2. Entry Age Normal Accrued Liability	2,519,676,541	2,616,012,657
3. Market Value of Assets (MVA)	$ 1,647,526,747	$ 1,783,380,244
4. Unfunded Accrued Liability (UAL) [(2) – (3)]	$ 872,149,794	$ 832,632,413
5. Funded Ratio [(3) / (2)]	65.4%	68.2%

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 %	11.559%	12.4%	12.4%	12.4%	12.4%	12.4%
UAL Payment	73,490,639	79,550,000	86,685,000	92,865,000	96,404,000	81,287,000
*Total as a % of Payroll**	*42.2%*	*44.8%*	*46.7%*	*48.2%*	*48.5%*	*42.1%*
Projected Payroll	*239,639,480*	*245,631,558*	*252,386,425*	*259,327,052*	*266,458,547*	*273,786,157*

*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.

Reconciliation of the Market Value of Assets

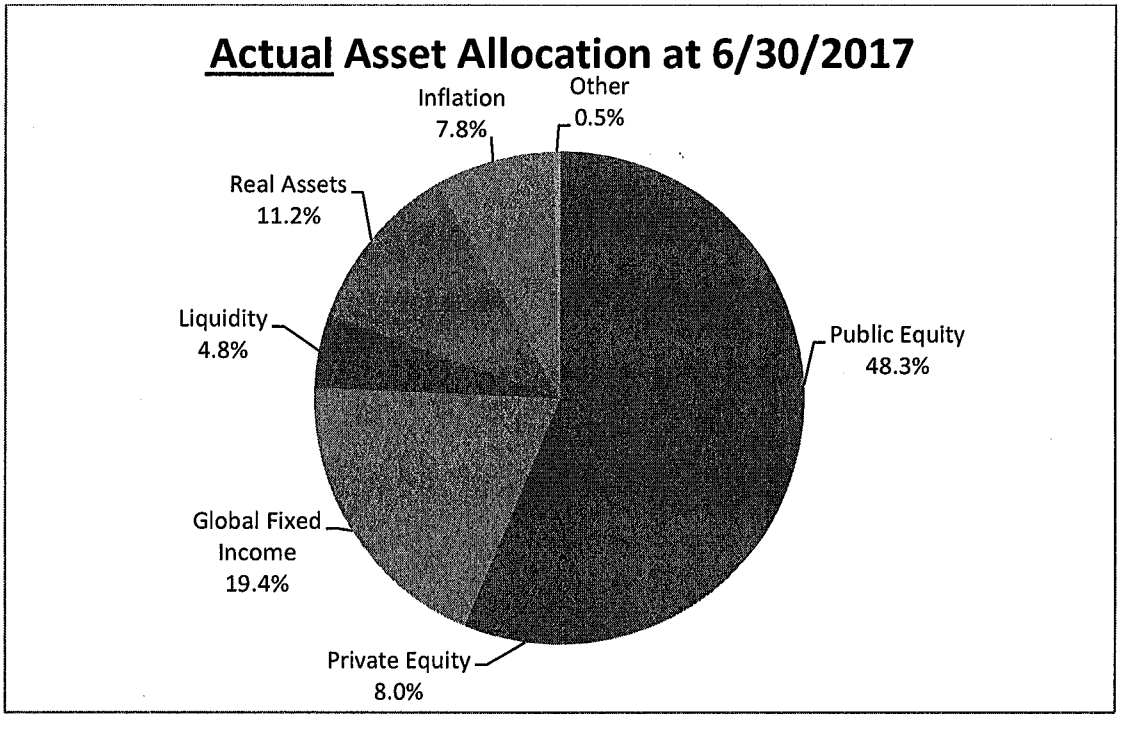
1.	Market Value of Assets as of 6/30/16 including Receivables	$	1,647,526,747
2.	Change in Receivables for Service Buybacks		(479,805)
3.	Employer Contributions		75,893,338
4.	Employee Contributions		17,183,131
5.	Benefit Payments to Retirees and Beneficiaries		(136,461,562)
6.	Refunds		(1,917,504)
7.	Lump Sum Payments		0
8.	Transfers and Miscellaneous Adjustments		1,367,261
9.	Net Investment Return		180,268,638
10.	Market Value of Assets as of 6/30/17 including Receivables	$	1,783,380,244

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.

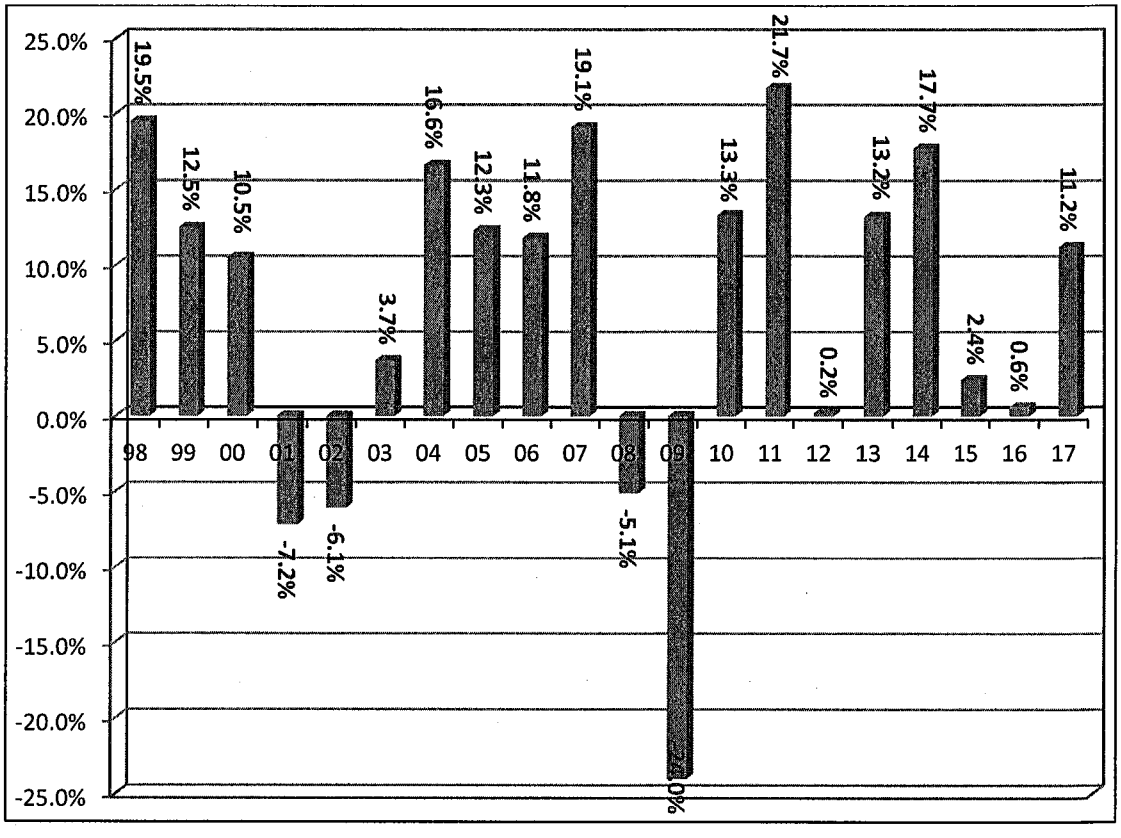
The asset allocation and market value of assets shown below reflect the values of the Public Employees' Retirement Fund (PERF) in its entirety as of June 30, 2017. The assets for City of Oakland Miscellaneous Plan are part of the PERF and are invested accordingly.

(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%

Development of Accrued and Unfunded Liabilities

		June 30, 2016	June 30, 2017
1. Present Value of Projected Benefits			
a) Active Members	$	1,104,515,554	1,129,478,119
b) Transferred Members		72,604,623	71,824,528
c) Terminated Members		41,035,819	47,983,680
d) Members and Beneficiaries Receiving Payments		1,576,183,249	1,661,941,625
e) Total	$	2,794,339,245	2,911,227,952
2. Present Value of Future Employer Normal Costs	$	158,630,946	172,012,889
3. Present Value of Future Employee Contributions	$	116,031,758	123,202,406
4. Entry Age Normal Accrued Liability			
a) Active Members [(1a) - (2) - (3)]	$	829,852,850	834,262,824
b) Transferred Members (1b)		72,604,623	71,824,528
c) Terminated Members (1c)		41,035,819	47,983,680
d) Members and Beneficiaries Receiving Payments (1d)		1,576,183,249	1,661,941,625
e) Total	$	2,519,676,541	2,616,012,657
5. Market Value of Assets (MVA)	$	1,647,526,747	1,783,380,244
6. Unfunded Accrued Liability (UAL) [(4e) - (5)]	$	872,149,794	832,632,413
7. Funded Ratio [(5) / (4e)]		65.4%	68.2%

(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	$	872,149,794
b) Expected Payment on the UAL during 2016-17		50,823,318
c) Interest through 6/30/17 [.07375 x (1a) - ((1.07375)^{½} - 1) x (1b)]		62,480,273
d) Expected UAL before all other changes [(1a) - (1b) + (1c)]		883,806,749
e) Change due to plan changes		0
f) Change due to assumption change		24,007,660
g) Expected UAL after all other changes [(1d) + (1e) + (1f)]		907,814,409
h) Actual UAL as of 6/30/17		832,632,413
i) Total (Gain)/Loss for 2016-17 [(1h) - (1g)]	$	(75,181,996)
2. Contribution (Gain)/Loss for the Year		
a) Expected Contribution (Employer and Employee)	$	92,542,472
b) Interest on Expected Contributions		3,351,804
c) Actual Contributions		93,076,469
d) Interest on Actual Contributions		3,371,145
e) Expected Contributions with Interest [(2a) + (2b)]		95,894,276
f) Actual Contributions with Interest [(2c) + (2d)]		96,447,614
g) Contribution (Gain)/Loss [(2e) - (2f)]	$	(553,338)
3. Asset (Gain)/Loss for the Year		
a) Market Value of Assets as of 6/30/16	$	1,647,526,747
b) Prior Fiscal Year Receivables		(5,271,029)
c) Current Fiscal Year Receivables		4,791,224
d) Contributions Received		93,076,469
e) Benefits and Refunds Paid		(138,379,066)
f) Transfers and Miscellaneous Adjustments		1,367,261
g) Expected Int. [.07375 x (3a + 3b) + ((1.07375)^{½} - 1) x ((3d) + (3e) + (3f))]		119,525,061
h) Expected Assets as of 6/30/17 [(3a) + (3b) + (3c) + (3d) + (3e) + (3f) + (3g)]		1,722,636,667
i) Market Value of Assets as of 6/30/17		1,783,380,244
j) Asset (Gain)/Loss [(3h) - (3i)]	$	(60,743,577)
4. Liability (Gain)/Loss for the Year		
a) Total (Gain)/Loss (1i)	$	(75,181,996)
b) Contribution (Gain)/Loss (2g)		(553,338)
c) Asset (Gain)/Loss (3j)		(60,743,577)
d) Liability (Gain)/Loss [(4a) - (4b) - (4c)]	$	(13,885,081)

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	06/30/03	No Ramp	5	$97,060,831	$16,305,151	$87,211,870	$16,691,689	$76,248,554	$17,134,922
ASSUMPTION CHANGE	06/30/03	No Ramp	6	$40,028,576	$6,004,054	$36,712,755	$6,143,490	$33,012,135	$6,307,273
METHOD CHANGE	06/30/04	No Ramp	7	$(4,389,665)	$(597,137)	$(4,089,511)	$(610,713)	$(3,753,537)	$(627,044)
ASSUMPTION CHANGE	06/30/09	No Ramp	12	$72,007,156	$6,946,429	$70,033,844	$7,087,548	$67,771,321	$7,278,892
SPECIAL (GAIN)/LOSS	06/30/09	No Ramp	22	$25,922,798	$1,755,516	$25,984,161	$1,783,498	$26,020,994	$1,832,157
GOLDEN HANDSHAKE	06/30/10	No Ramp	13	$10,460,271	$960,056	$10,224,392	$979,110	$9,951,678	$1,005,579
SPECIAL (GAIN)/LOSS	06/30/10	No Ramp	23	$(47,309,255)	$(3,130,640)	$(47,497,036)	$(3,179,295)	$(47,648,043)	$(3,266,106)
ASSUMPTION CHANGE	06/30/11	No Ramp	14	$44,927,947	$3,940,105	$44,104,788	$4,016,480	$43,142,856	$4,125,197
SPECIAL (GAIN)/LOSS	06/30/11	No Ramp	24	$18,897,648	$1,223,747	$19,000,396	$1,242,288	$19,091,391	$1,276,236
PAYMENT (GAIN)/LOSS	06/30/12	No Ramp	25	$22,954,285	$1,456,550	$23,110,045	$1,478,060	$23,254,821	$1,518,481
(GAIN)/LOSS	06/30/12	No Ramp	25	$116,404,525	$7,386,375	$117,194,406	$7,495,458	$117,928,586	$7,700,439
(GAIN)/LOSS	06/30/13	100% →	26	$293,377,856	$11,846,476	$302,379,353	$16,033,212	$307,697,609	$20,590,015
ASSUMPTION CHANGE	06/30/14	80% ↗	17	$143,129,460	$5,328,350	$147,988,222	$8,141,480	$150,285,923	$11,150,623
(GAIN)/LOSS	06/30/14	80% ↗	27	$(190,188,513)	$(5,202,647)	$(198,589,237)	$(7,916,463)	$(204,788,543)	$(10,844,766)
(GAIN)/LOSS	06/30/15	60% ↗	28	$82,262,962	$1,158,384	$87,027,386	$2,348,320	$90,904,915	$3,619,302
ASSUMPTION CHANGE	06/30/16	40% ↗	19	$38,577,814	$(1,153,150)	$42,568,926	$803,291	$44,823,272	$1,650,571
(GAIN)/LOSS	06/30/16	40% ↗	29	$119,682,052	$0	$128,359,001	$1,781,196	$135,820,394	$3,660,552
ASSUMPTION CHANGE	06/30/17	20% ↗	20	$24,007,660	$(1,378,974)	$27,176,303	$(1,418,619)	$30,615,729	$576,975
(GAIN)/LOSS	06/30/17	20% ↗	30	$(75,181,995)	$0	$(80,632,690)	$0	$(86,478,560)	$(1,198,659)
TOTAL				**$832,632,413**	**$52,848,645**	**$838,267,374**	**$62,900,030**	**$833,901,495**	**$73,490,639**

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			
			15 Year Amortization		10 Year Amortization	
Date	**Balance**	**Payment**	**Balance**	**Payment**	**Balance**	**Payment**
6/30/2019	833,901,495	73,490,639	833,901,495	75,827,423	833,901,495	103,419,893
6/30/2020	818,251,291	79,015,627	815,831,279	78,007,462	787,256,083	106,393,215
6/30/2021	795,744,681	84,716,631	794,193,290	80,250,176	734,149,659	109,452,020
6/30/2022	765,702,293	89,366,625	768,663,957	82,557,369	674,025,273	112,598,765
6/30/2023	728,666,222	91,239,596	738,894,381	84,930,893	606,283,049	115,835,980
6/30/2024	687,005,360	74,118,905	704,508,453	87,372,656	530,277,005	119,166,264
6/30/2025	660,054,543	68,773,284	665,100,816	89,884,620	445,311,626	122,592,294
6/30/2026	636,685,801	71,515,173	620,234,696	92,468,803	350,638,208	126,116,823
6/30/2027	608,783,281	73,571,233	569,439,562	95,127,281	245,450,909	129,742,681
6/30/2028	576,728,540	75,686,408	512,208,619	97,862,190	128,882,534	133,472,783
6/30/2029	540,159,322	77,862,390	447,996,117	100,675,728		
6/30/2030	498,685,353	80,100,934	376,214,465	103,570,155		
6/30/2031	451,886,251	72,176,008	296,231,129	106,547,797		
6/30/2032	409,901,394	68,767,820	207,365,307	109,611,047		
6/30/2033	368,402,208	60,464,845	108,884,365	112,762,364		
6/30/2034	332,493,022	56,675,967				
6/30/2035	297,904,241	51,711,192				
6/30/2036	265,949,375	46,414,093				
6/30/2037	237,163,538	45,412,859				
6/30/2038	207,327,622	44,315,692				
6/30/2039	176,464,847	44,572,691				
6/30/2040	143,098,367	45,854,156				
6/30/2041	105,985,710	36,071,892				
6/30/2042	76,313,056	40,677,369				
6/30/2043	39,719,627	34,167,431				
6/30/2044	7,214,971	7,399,005				
6/30/2045	75,531	78,221				
6/30/2046						
6/30/2047						
6/30/2048						
Totals	**1,594,216,686**		**1,397,455,964**		**1,178,790,718**	
Interest Paid	**760,315,191**		**563,554,469**		**344,889,223**	
Estimated Savings			**196,760,722**		**415,425,968**	

* 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	11.302%
b) Employee Contribution	7.767%
c) Total Normal Cost	19.069%
2. Changes since the prior year annual valuation	
a) Effect of changes in demographics results	(0.419%)
b) Effect of plan changes	0.000%
c) Effect of changes in assumptions	0.609%
d) Net effect of the changes above [sum of (a) through (c)]	0.190%
3. For Period 7/1/19 – 6/30/20	
a) Employer Normal Cost	11.559%
b) Employee Contribution	7.700%
c) Total Normal Cost	19.259%
Employer Normal Cost Change [(3a) – (1a)]	0.257%
Employee Contribution Change [(3b) – (1b)]	(0.067%)

Unfunded Liability Contribution ($)

1. For Period 7/1/18 – 6/30/19	64,318,649
2. Changes since the prior year annual valuation	
a) Effect of (gain)/loss during prior year[1]	(1,198,659)
b) Effect of plan changes	0
c) Effect of changes in assumptions[2]	576,975
d) Changes to prior year amortization payments[3]	9,793,674
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)]	9,171,990
3. For Period 7/1/19 – 6/30/20 [(1) + (2g)]	73,490,639

[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	11.122%	16.173%	N/A
2014 - 15	10.988%	19.171%	N/A
2015 - 16	11.205%	21.731%	N/A
2016 - 17	11.321%	22.911%	N/A
2017 - 18	11.081%	N/A	55,380,769
2018 - 19	11.302%	N/A	64,318,649
2019 - 20	11.559%	N/A	73,490,639

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	$ 2,025,140,791	$ 1,433,446,834	$ 591,693,957	70.8%	$ 194,123,412
06/30/12	2,080,205,749	1,380,840,100	699,365,649	66.4%	184,568,347
06/30/13	2,153,399,419	1,496,650,907	656,748,512	69.5%	183,384,391
06/30/14	2,341,202,493	1,701,426,635	639,775,858	72.7%	194,720,748
06/30/15	2,409,031,753	1,691,228,930	717,802,823	70.2%	200,577,831
06/30/16	2,519,676,541	1,647,526,747	872,149,794	65.4%	213,967,422
06/30/17	2,616,012,657	1,783,380,244	832,632,413	68.2%	220,104,450

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	12.4%	12.4%	12.4%	12.4%
UAL Contribution	$79,550,000	$88,417,000	$98,140,000	$107,125,000
4.0%				
Normal Cost	12.4%	12.4%	12.4%	12.4%
UAL Contribution	$79,550,000	$87,551,000	$95,529,000	$101,871,000
7.0%				
Normal Cost	12.4%	12.4%	12.4%	12.4%
UAL Contribution	$79,550,000	$86,685,000	$92,865,000	$96,404,000
9.0%				
Normal Cost	12.4%	12.6%	12.9%	13.1%
UAL Contribution	$79,550,000	$86,047,000	$91,178,000	$93,221,000
12.0%				
Normal Cost	12.4%	12.6%	12.9%	13.1%
UAL Contribution	$79,550,000	$85,187,000	$88,464,000	$87,502,000

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)	19.259%	$2,616,012,657	$832,632,413	68.2%
6.0%	25.164%	$3,016,537,025	$1,233,156,781	59.1%
7.0%	20.067%	$2,684,053,267	$900,673,023	66.4%
8.0%	16.192%	$2,407,140,350	$623,760,106	74.1%

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	$	1,778,589,020
2. Payroll		220,104,450
3. Asset Volatility Ratio (AVR) [(1) / (2)]		8.1
4. Accrued Liability (7.25% discount rate)	$	2,616,012,657
5. Liability Volatility Ratio (LVR) [(4) / (2)]		11.9
6. Accrued Liability (7.00% discount rate)		2,684,053,267
7. Projected Liability Volatility Ratio [(6) / (2)]		12.2

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%
$1,783,380,244	$4,823,363,043	37.0%	$3,039,982,799	$4,346,959,665	41.0%	$2,563,579,421

[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.

California Public Employees' Retirement System
Actuarial Office
P.O. Box 942701
Sacramento, CA 94229-2701
TTY: (916) 795-3240
(888) 225-7377 phone · (916) 795-2744 fax
www.calpers.ca.gov

July 2018

Safety Plan of the City of Oakland (CalPERS ID: 4015143822)
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	18.583%	$46,171,999	11.50%
Projected Results			
2020-21	*19.9%*	*$51,820,000*	*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.

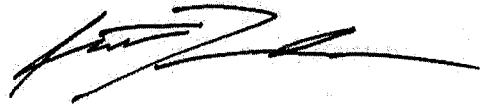
The CalPERS Board of Administration adopted a Risk Mitigation Policy which is designed to reduce funding risk over time. This Policy has been temporarily suspended during the period over which the discount rate is being lowered. More details on the Risk Mitigation Policy can be found on our website.

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 Oakland

(CalPERS ID: 4015143822)
(Rate Plan ID: 900)

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

Introduction

This report presents the results of the June 30, 2017 actuarial valuation of the Safety Plan of the City of Oakland 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		**18.583%**
Plus, Either		
1) Monthly Employer Dollar UAL Payment	**$**	**3,847,667**
Or		
2) Annual UAL Prepayment Option	**$**	**44,584,102**
Required PEPRA Member Contribution Rate		**11.50%**

*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		27.808%		28.381%
Employee Contribution[1]		9.657%		9.798%
Employer Normal Cost[2]		18.151%		18.583%
Projected Annual Payroll for Contribution Year	$	158,068,981	$	162,650,376
Estimated Employer Contributions Based On Projected Payroll				
Total Normal Cost	$	43,955,824	$	46,161,804
Employee Contribution[1]		15,264,721		15,936,484
Employer Normal Cost[2]		28,691,103		30,225,320
Unfunded Liability Contribution		38,748,282		46,171,999
% of Projected Payroll (illustrative only)		24.514%		28.387%
Estimated Total Employer Contribution	$	67,439,385	$	76,397,319
% of Projected Payroll (illustrative only)		42.665%		46.970%

[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	$ 2,254,808,154	$ 2,404,385,658
2. Entry Age Normal Accrued Liability	1,872,472,345	1,997,661,954
3. Market Value of Assets (MVA)	$ 1,166,391,681	$ 1,283,385,686
4. Unfunded Accrued Liability (UAL) [(2) – (3)]	$ 706,080,664	$ 714,276,268
5. Funded Ratio [(3) / (2)]	62.3%	64.2%

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 %	18.583%	19.9%	19.9%	19.9%	19.9%	19.9%
UAL Payment	46,171,999	51,820,000	58,405,000	63,837,000	67,248,000	70,643,000
*Total as a % of Payroll**	*47.0%*	*50.9%*	*54.0%*	*56.1%*	*57.0%*	*57.9%*
Projected Payroll	*162,650,376*	*166,717,376*	*171,302,104*	*176,012,912*	*180,853,267*	*185,826,732*

*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.

Reconciliation of the Market Value of Assets

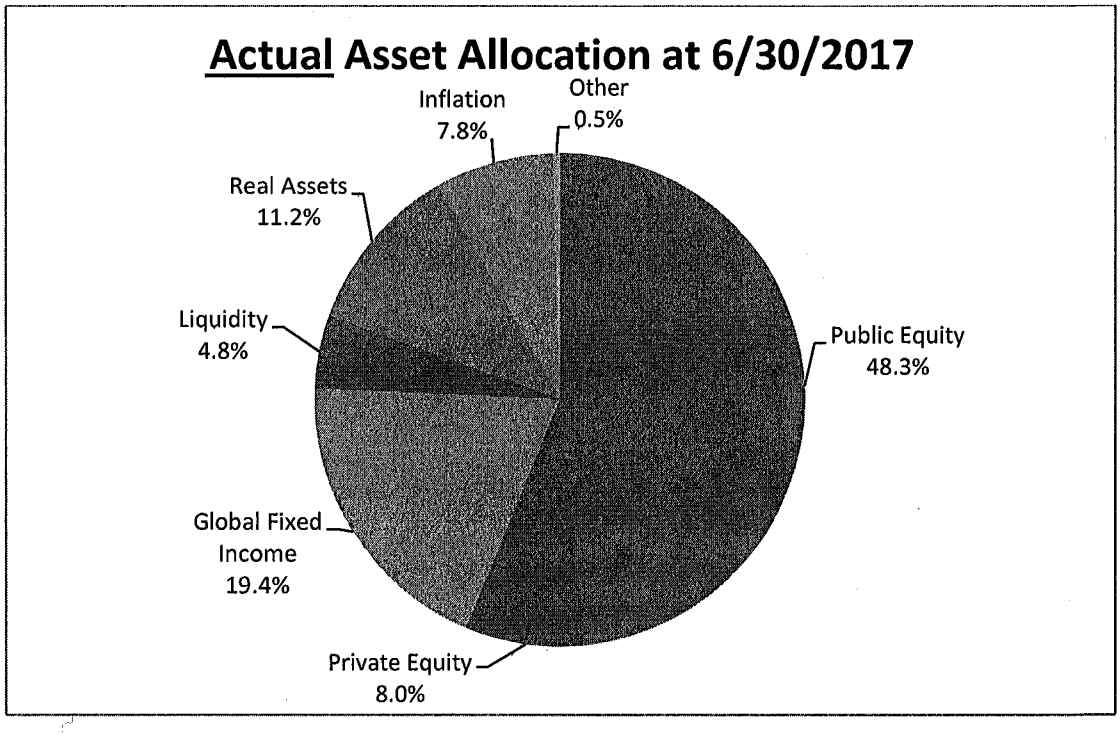
1.	Market Value of Assets as of 6/30/16 including Receivables	$	1,166,391,681
2.	Change in Receivables for Service Buybacks		(434,968)
3.	Employer Contributions		57,731,359
4.	Employee Contributions		18,345,137
5.	Benefit Payments to Retirees and Beneficiaries		(86,730,693)
6.	Refunds		(501,040)
7.	Lump Sum Payments		0
8.	Transfers and Miscellaneous Adjustments		430,267
9.	Net Investment Return		128,153,943
10.	Market Value of Assets as of 6/30/17 including Receivables	$	1,283,385,686

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.

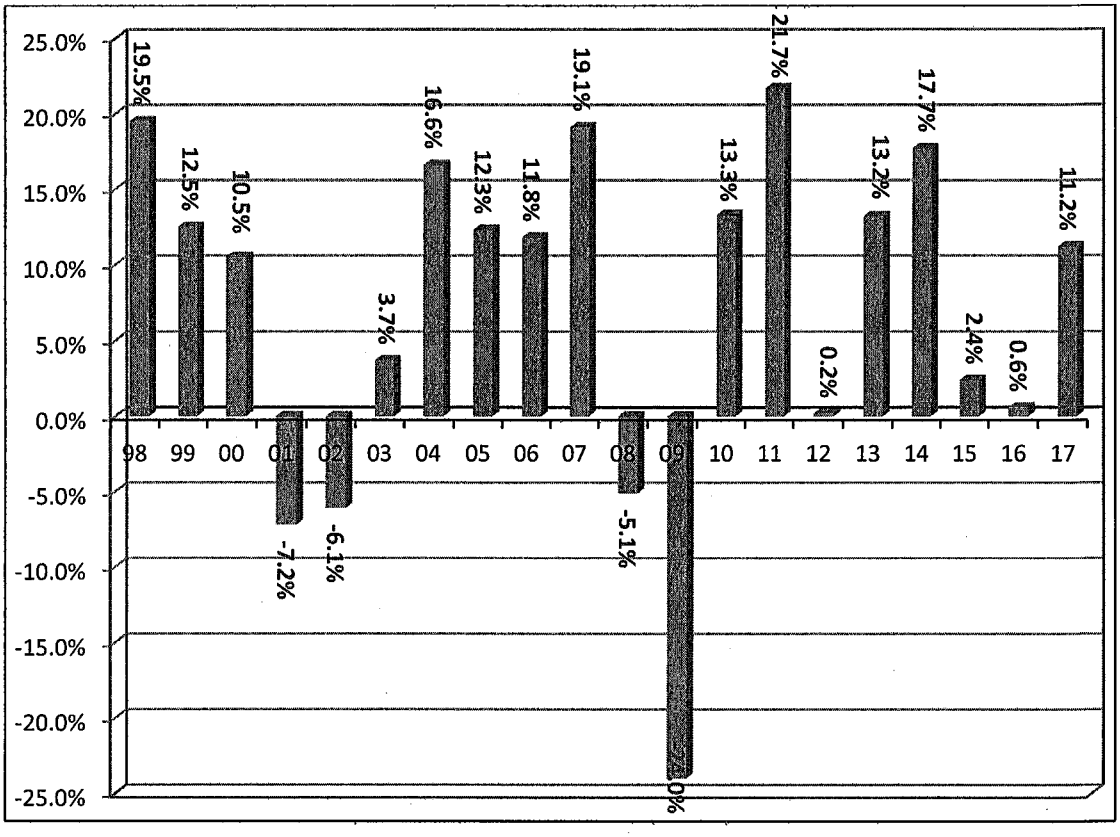
The asset allocation and market value of assets shown below reflect the values of the Public Employees' Retirement Fund (PERF) in its entirety as of June 30, 2017. The assets for City of Oakland Safety Plan are part of the PERF and are invested accordingly.

(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	$	1,010,482,677	1,056,923,949
b) Transferred Members		35,317,103	31,485,636
c) Terminated Members		10,785,704	17,103,796
d) Members and Beneficiaries Receiving Payments		1,198,222,670	1,298,872,277
e) Total	$	2,254,808,154	2,404,385,658
2. Present Value of Future Employer Normal Costs	$	240,164,006	254,905,590
3. Present Value of Future Employee Contributions	$	142,171,803	151,818,114
4. Entry Age Normal Accrued Liability			
a) Active Members [(1a) - (2) - (3)]	$	628,146,868	650,200,245
b) Transferred Members (1b)		35,317,103	31,485,636
c) Terminated Members (1c)		10,785,704	17,103,796
d) Members and Beneficiaries Receiving Payments (1d)		1,198,222,670	1,298,872,277
e) Total	$	1,872,472,345	1,997,661,954
5. Market Value of Assets (MVA)	$	1,166,391,681	1,283,385,686
6. Unfunded Accrued Liability (UAL) [(4e) - (5)]	$	706,080,664	714,276,268
7. Funded Ratio [(5) / (4e)]		62.3%	64.2%

(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	$	706,080,664
b) Expected Payment on the UAL during 2016-17		32,904,094
c) Interest through 6/30/17 [.07375 x (1a) - ((1.07375)^{½} - 1) x (1b)]		50,881,693
d) Expected UAL before all other changes [(1a) - (1b) + (1c)]		724,058,263
e) Change due to plan changes		0
f) Change due to assumption change		39,451,052
g) Expected UAL after all other changes [(1d) + (1e) + (1f)]		763,509,315
h) Actual UAL as of 6/30/17		714,276,268
i) Total (Gain)/Loss for 2016-17 [(1h) - (1g)]	$	(49,233,047)
2. Contribution (Gain)/Loss for the Year		
a) Expected Contribution (Employer and Employee)	$	74,974,372
b) Interest on Expected Contributions		2,715,503
c) Actual Contributions		76,076,496
d) Interest on Actual Contributions		2,755,421
e) Expected Contributions with Interest [(2a) + (2b)]		77,689,875
f) Actual Contributions with Interest [(2c) + (2d)]		78,831,917
g) Contribution (Gain)/Loss [(2e) - (2f)]	$	(1,142,042)
3. Asset (Gain)/Loss for the Year		
a) Market Value of Assets as of 6/30/16	$	1,166,391,681
b) Prior Fiscal Year Receivables		(2,992,235)
c) Current Fiscal Year Receivables		2,557,267
d) Contributions Received		76,076,496
e) Benefits and Refunds Paid		(87,231,733)
f) Transfers and Miscellaneous Adjustments		430,267
g) Expected Int. [.07375 x (3a + 3b) + ((1.07375)^{½} - 1) x ((3d) + (3e) + (3f))]		85,412,261
h) Expected Assets as of 6/30/17 [(3a) + (3b) + (3c) + (3d) + (3e) + (3f) + (3g)]		1,240,644,004
i) Market Value of Assets as of 6/30/17		1,283,385,686
j) Asset (Gain)/Loss [(3h) - (3i)]	$	(42,741,682)
4. Liability (Gain)/Loss for the Year		
a) Total (Gain)/Loss (1i)	$	(49,233,047)
b) Contribution (Gain)/Loss (2g)		(1,142,042)
c) Asset (Gain)/Loss (3j)		(42,741,682)
d) Liability (Gain)/Loss [(4a) - (4b) - (4c)]	$	(5,349,323)

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
FS 30-YEAR AMORTIZATION	06/30/08	No Ramp	21	$(50,292,764)	$(3,491,052)	$(50,323,601)	$(3,548,112)	$(50,297,582)	$(3,644,833)
ASSUMPTION CHANGE	06/30/09	No Ramp	12	$21,840,396	$2,106,912	$21,241,874	$2,149,715	$20,555,631	$2,207,751
SPECIAL (GAIN)/LOSS	06/30/09	No Ramp	22	$36,198,892	$2,451,423	$36,284,579	$2,490,498	$36,336,012	$2,558,445
SPECIAL (GAIN)/LOSS	06/30/10	No Ramp	23	$(4,041,714)	$(267,456)	$(4,057,757)	$(271,613)	$(4,070,658)	$(279,029)
ASSUMPTION CHANGE	06/30/11	No Ramp	14	$31,061,750	$2,724,063	$30,492,644	$2,776,866	$29,827,594	$2,852,030
SPECIAL (GAIN)/LOSS	06/30/11	No Ramp	24	$(13,843,324)	$(896,446)	$(13,918,591)	$(910,029)	$(13,985,249)	$(934,897)
PAYMENT (GAIN)/LOSS	06/30/12	No Ramp	25	$6,843,596	$434,256	$6,890,034	$440,669	$6,933,198	$452,720
(GAIN)/LOSS	06/30/12	No Ramp	25	$312,640,259	$19,838,388	$314,761,731	$20,131,364	$316,733,598	$20,681,905
(GAIN)/LOSS	06/30/13	100% →	26	$195,761,043	$7,904,750	$201,767,435	$10,698,416	$205,316,126	$13,739,015
ASSUMPTION CHANGE	06/30/14	80% ↗	17	$82,658,078	$3,077,153	$85,464,040	$4,701,751	$86,790,976	$6,439,548
(GAIN)/LOSS	06/30/14	80% ↗	27	$(110,988,693)	$(3,036,119)	$(115,891,121)	$(4,619,826)	$(119,508,862)	$(6,328,702)
(GAIN)/LOSS	06/30/15	60% ↗	28	$94,266,949	$1,327,443	$99,726,582	$2,690,991	$104,169,926	$4,147,437
ASSUMPTION CHANGE	06/30/16	40% ↗	19	$33,352,384	$(1,226,186)	$37,040,289	$698,961	$39,001,855	$1,436,203
(GAIN)/LOSS	06/30/16	40% ↗	29	$88,601,413	$0	$95,025,015	$1,318,631	$100,548,734	$2,709,931
ASSUMPTION CHANGE	06/30/17	20% ↗	20	$39,451,052	$(1,566,064)	$43,933,094	$(1,611,089)	$48,786,712	$919,419
(GAIN)/LOSS	06/30/17	20% ↗	30	$(49,233,047)	$0	$(52,802,443)	$0	$(56,630,620)	$(784,944)
TOTAL				**$714,276,268**	**$29,381,065**	**$735,633,803**	**$37,137,193**	**$750,507,391**	**$46,171,999**

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	750,507,391	46,171,999	750,507,391	56,092,209	750,507,391	68,244,321
6/30/2020	757,102,727	51,221,187	746,829,201	57,704,860	734,244,282	70,206,346
6/30/2021	758,947,208	56,493,212	741,214,256	59,363,875	714,770,195	72,224,778
6/30/2022	755,465,622	60,520,862	733,474,125	61,070,586	691,793,916	74,301,240
6/30/2023	747,560,521	62,411,457	723,405,338	62,826,366	665,001,439	76,437,401
6/30/2024	737,124,370	64,205,786	710,788,250	64,632,624	634,054,267	78,634,976
6/30/2025	724,073,363	66,051,702	695,385,835	66,490,812	598,587,580	80,895,732
6/30/2026	708,164,499	67,950,689	676,942,376	68,402,422	558,208,285	83,221,484
6/30/2027	689,135,619	69,904,269	655,182,071	70,368,992	512,492,905	85,614,102
6/30/2028	666,703,988	71,914,019	629,807,534	72,392,101	460,985,328	88,075,507
6/30/2029	640,564,737	73,981,547	600,498,180	74,473,373	403,194,381	90,607,678
6/30/2030	610,389,225	76,108,519	566,908,499	76,614,483	338,591,235	93,212,649
6/30/2031	575,823,262	75,194,447	528,666,200	78,817,149	266,606,611	95,892,512
6/30/2032	539,697,895	75,029,142	485,370,217	81,083,142	186,627,793	98,649,422
6/30/2033	501,124,631	70,550,951	436,588,578	83,414,283	97,995,412	101,485,593
6/30/2034	464,392,491	69,017,825	381,856,104	85,812,443		
6/30/2035	426,585,000	65,891,225	320,671,953	88,279,551		
6/30/2036	389,274,422	62,527,794	252,496,976	90,817,588		
6/30/2037	352,742,047	61,597,970	176,750,881	93,428,594		
6/30/2038	314,524,017	60,563,002	92,809,196	96,114,666		
6/30/2039	274,607,009	60,683,458				
6/30/2040	231,671,271	69,037,850				
6/30/2041	176,970,753	61,123,392				
6/30/2042	126,500,783	61,179,107				
6/30/2043	72,314,044	59,752,870				
6/30/2044	15,675,798	10,614,958				
6/30/2045	5,819,276	4,404,604				
6/30/2046	1,679,696	1,739,520				
6/30/2047						
6/30/2048						
Totals	**1,635,843,363**		**1,488,200,119**		**1,257,703,741**	
Interest Paid	**885,335,972**		**737,692,728**		**507,196,350**	
Estimated Savings			**147,643,244**		**378,139,622**	

* 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	18.151%
b) Employee Contribution	9.657%
c) Total Normal Cost	27.808%
2. Changes since the prior year annual valuation	
a) Effect of changes in demographics results	(0.446%)
b) Effect of plan changes	0.000%
c) Effect of changes in assumptions	1.019%
d) Net effect of the changes above [sum of (a) through (c)]	0.573%
3. For Period 7/1/19 – 6/30/20	
a) Employer Normal Cost	18.583%
b) Employee Contribution	9.798%
c) Total Normal Cost	28.381%
Employer Normal Cost Change [(3a) – (1a)]	0.432%
Employee Contribution Change [(3b) – (1b)]	0.141%

Unfunded Liability Contribution ($)

1. For Period 7/1/18 – 6/30/19	38,748,282
2. Changes since the prior year annual valuation	
a) Effect of (gain)/loss during prior year[1]	(784,944)
b) Effect of plan changes	0
c) Effect of changes in assumptions[2]	919,419
d) Changes to prior year amortization payments[3]	7,289,242
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)]	7,423,717
3. For Period 7/1/19 – 6/30/20 [(1) + (2g)]	46,171,999

[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	19.006%	14.340%	N/A
2014 - 15	19.018%	16.127%	N/A
2015 - 16	18.842%	18.844%	N/A
2016 - 17	19.167%	21.502%	N/A
2017 - 18	18.288%	N/A	32,173,315
2018 - 19	18.151%	N/A	38,748,282
2019 - 20	18.583%	N/A	46,171,999

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	$ 1,357,816,142	$ 915,113,586	$ 442,702,556	67.4%	$ 130,530,316
06/30/12	1,398,098,675	905,555,632	492,543,043	64.8%	118,924,175
06/30/13	1,487,554,559	1,009,460,115	478,094,444	67.9%	116,889,443
06/30/14	1,639,891,284	1,169,019,374	470,871,910	71.3%	116,485,068
06/30/15	1,754,078,714	1,179,020,200	575,058,514	67.2%	132,109,808
06/30/16	1,872,472,345	1,166,391,681	706,080,664	62.3%	144,655,510
06/30/17	1,997,661,954	1,283,385,686	714,276,268	64.2%	149,391,376

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	19.9%	19.9%	19.9%	19.9%
UAL Contribution	$51,820,000	$59,678,000	$67,734,000	$75,206,000
4.0%				
Normal Cost	19.9%	19.9%	19.9%	19.9%
UAL Contribution	$51,820,000	$59,041,000	$65,805,000	$71,306,000
7.0%				
Normal Cost	19.9%	19.9%	19.9%	19.9%
UAL Contribution	$51,820,000	$58,405,000	$63,837,000	$67,248,000
9.0%				
Normal Cost	19.9%	20.3%	20.7%	21.1%
UAL Contribution	$51,820,000	$57,943,000	$62,654,000	$65,063,000
12.0%				
Normal Cost	19.9%	20.3%	20.7%	21.1%
UAL Contribution	$51,820,000	$57,311,000	$60,650,000	$60,821,000

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)	28.381%	$1,997,661,954	$714,276,268	64.2%
6.0%	37.786%	$2,357,244,593	$1,073,858,907	54.4%
7.0%	29.653%	$2,057,538,927	$774,153,241	62.4%
8.0%	23.536%	$1,813,935,981	$530,550,295	70.8%

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	$	1,280,828,419
2. Payroll		149,391,376
3. Asset Volatility Ratio (AVR) [(1) / (2)]		8.6
4. Accrued Liability (7.25% discount rate)	$	1,997,661,954
5. Liability Volatility Ratio (LVR) [(4) / (2)]		13.4
6. Accrued Liability (7.00% discount rate)		2,057,538,927
7. Projected Liability Volatility Ratio [(6) / (2)]		13.8

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%
$1,283,385,686	$4,059,724,168	31.6%	$2,776,338,482	$3,585,001,741	35.8%	$2,301,616,055

[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.