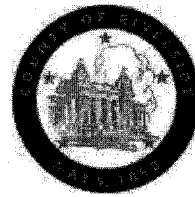


**SUBMITTAL TO THE BOARD OF SUPERVISORS
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA**



ITEM
3.21
(ID # 6264)

MEETING DATE:

Tuesday, January 30, 2018


FROM : EXECUTIVE OFFICE:

SUBJECT: EXECUTIVE OFFICE: Pension Advisory Review Committee (PARC) 2018 Annual Pension Report, All Districts. [\$0]

RECOMMENDED MOTION: That the Board of Supervisors:

1. Receive and file the 2018 PARC Annual Pension Report.
2. Direct staff to report back with any additional recommendations or updates on the County's pensions plans, including any legislative changes that could be incorporated in the County's Legislative Platform.
3. Direct the PARC to review the annual prepayment for FY 18/19 and to have such recommendations presented in conjunction with either the approval of the annual cash flow financing (TRAN) or with the FY 18/19 budget.
4. Adopt the recommendation to annually transfer excess OPEB Trust funds administratively to the Section 115 Pension Trust.


ACTION: Policy


Don R. Kent, Assistant CEO-County Finance Officer

1/25/2018


Michael Stock, Assistant CEO-Director of Human Resources

1/25/2018


Jon Christensen, Treasurer-Tax Collector

1/25/2018

MINUTES OF THE BOARD OF SUPERVISORS

On motion of Supervisor Washington, seconded by Supervisor Jeffries and duly carried by unanimous vote, IT WAS ORDERED that the above matter is approved as recommended.

Ayes: Jeffries, Tavaglione, Washington, Perez and Ashley
Nays: None
Absent: None
Date: January 30, 2018
xc: EO

Kecia Harper-Ihem
Clerk of the Board

By: 
Deputy

**SUBMITTAL TO THE BOARD OF SUPERVISORS COUNTY OF RIVERSIDE,
STATE OF CALIFORNIA**

FINANCIAL DATA	Current Fiscal Year:	Next Fiscal Year:	Total Cost:	Ongoing Cost:
COST	\$0	\$0	\$0	\$0
NET COUNTY COST	\$0	\$0	\$0	\$0
SOURCE OF FUNDS: N/A			Budget Adjustment	No
			For Fiscal Year:	17/18

C.E.O. RECOMMENDATION: Approve

BACKGROUND:

Summary

Board Policy B-25 (Pension Management Policy) requires the PARC to file an annual report on the County's pension plan status. The report informs the public and allows the County to continue its long-term pension reform efforts and realize a prepayment discount.

Introduction:

The County's Pension Advisory Review Committee (PARC) was established in 2003 to guide policy decisions about retirement benefits. PARC is a Brown Act Committee and presently consists of members appointed by the Board of Supervisors, including the Treasurer-Tax Collector, County Finance Officer, and the Human Resources Director (Board Policy B-25).

A key responsibility of PARC is to report to the Board and the public on important developments affecting County retirement benefit plans, analyze any proposed changes to the benefit system, and provide information about projected costs and funding status. This report includes information from the most recent actuarial report prepared for the County by John Bartel of Bartel Associates, LLC. It also includes the latest CalPERS' Valuation Reports for Miscellaneous and Safety.

REPORT SUMMARY

Pension Reform:

The Board of Supervisors took the initiative on pension reform. As a result of labor negotiations, employees of the County agreed to pay their own member contribution. Additionally, a new second retirement tier was implemented in both the Miscellaneous and Safety units with a lower benefit formula, which became effective on August 24, 2012. Thereafter, Governor Brown initiated proposals resulting in changes to pension benefits. The passage of Assembly Bill (AB) 340 created the Public Employees' Pension Reform Act (PEPRA) that implemented new lower benefit formulas, final compensation periods, and new contribution requirements for new employees hired on or after January 1, 2013 who meet the definition of a new member under PEPRA (known as Tier III). The lower benefit formula for Tier III is 2% at 62.

Listed below is a table of the changes.

**SUBMITTAL TO THE BOARD OF SUPERVISORS COUNTY OF RIVERSIDE,
STATE OF CALIFORNIA**

			Plan	EPMC	Earliest Retirement Age	PEPRA Compensation Limits	Final Compensation	Effective Date
County Plan Tier I								
	Misc.		3% at 60	No	50	N/A	12 months	N/A
	Safety		3% at 50	No	50	N/A	12 months	N/A
County Plan Tier II								
	Misc.		2% at 60	No	50	N/A	36 months	8/24/2012
	Safety		2% at 50	No	50	N/A	36 months	8/24/2012
County Plan Tier III (PEPRA)								
	Misc.		2% at 62	No	52	\$121,388*	36 months	1/1/2013
	Safety		2.7% at 57	No	50	\$145,666*	36 months	1/1/2013

*2018 Compensation Limits are Indexed Annually

Funded Status:

The June 30, 2018 projected actuarial funded status, based on the market valuation for the Miscellaneous Plan, including Pension Obligation Bonds (POBs) proceeds is expected to be 69.9%. The projected actuarial funded status based on the market valuation for the Safety Plan including POBs, is 68.9%.

Employer Rate Outlook:

Over the last few years, CalPERS made several changes that increased contribution rates beginning July 1, 2015. Some of the primary changes in rates are change in discount rate, mortality improvement, risk mitigation, fixed amortization periods, elimination of caps on rate increases and no asset smoothing. The increases became effective with the FY 15/16 rate and the rates are projected to increase. The full impact is expected to take effect in FY 23/24 and rates will remain at that peak through FY 30/31. Bartel and Associates have prepared charts in the attached report that show the expected impact.

Due to the change in assumptions listed above, the County's rates will be higher for FY 18/19 and continue to be higher for the next 10-15 years. In FY 17/18, the Miscellaneous Plan employer contribution rate is 16.9% of payroll and will increase to 18.9% in FY 18/19. The Safety Plan employer contribution rate is 28.2% and will increase to 31.6%.

Liability Management Fund:

The purpose of the fund is to reduce pension costs and accelerate the repayment of pension liabilities. By Board policy, each year PARC recommends whether the funds should be used to pay down the CalPERS' unfunded liability or the buy down of the POB. To date the excess has been sent to CalPERS' to reduce the liability.

Section 115 Pension Trust:

A Section 115 Pension Trust was established to assist the County to mitigate the CalPERS' contribution rate volatility. Assets from the Trust can only be used for pension obligations. In the past, the County has forwarded the funds from the Liability Management fund to either

**SUBMITTAL TO THE BOARD OF SUPERVISORS COUNTY OF RIVERSIDE,
STATE OF CALIFORNIA**

CalPERS to cover our unfunded liability or forwarded them to the bondholders to reduce our Pension Obligation Bonds. By placing funds from the Liability Management fund into the Section 115 Pension Trust, the County can use the Trust to reduce the volatility of CalPERS. The Trust will be an asset on the balance sheet, and the Trust can be designed for long-term earnings with higher expected rates of return than the County Treasurer's Pooled Investment Fund.

Annual Prepayment:

CalPERS offers early payment discounts of 3.68% in lieu of periodic payments that coincide with payroll disbursements. The PARC first recommended seizing this opportunity in 2004 and expects to continue to do so if market conditions for our annual cash flow borrowing prove to be favorable in funding the pre-payment. The amount to be prepaid is a portion of up to two-thirds of the County's annual liability. In FY 17/18, the County prepaid CalPERS \$105.4 million (Safety \$34.5M + Miscellaneous \$70.9M = \$105.4 million). CalPERS changed the prepayment policy for FY 17/18 and allowing only the unfunded liability payment portion to be prepaid. The FY 18/19 required unfunded liability is \$149 million, with a prepayment option of \$143.7 million, earning a discount of \$5.3 million. A final recommendation regarding the FY 18/19 prepayment will be made in conjunction with the FY 18/19 Tax and Revenue Anticipation Notes (TRAN's) borrowing.

Other Post-Employment Benefits (OPEB):

The County invests its OPEB assets with the California Public Employers' Retirement Benefit Trust program (CERBT). Effective January 1, 2011, CalPERS introduced three new investment allocation strategies for CERBT. PARC reviewed the details of the strategies and adopted Strategy 1, an asset allocation strategy most similar to the investment allocation strategy followed by CERBT prior to January 1, 2011, with an expected rate of return of 7.61%. CERBT lowered its investment strategy expected return to 7.28%. As of June 30 2017, the CERBT is 81.1% funded. Effective July 1, 2017, PARC adopted Strategy 2, with expected rate of return 6.73%.

Impact on Citizens and Businesses:

An increase in pension costs, in turn increases the costs of services that are provided to citizens of the County. PARC recommendations have driven down the cost of pensions while maximizing resources.

SUBMITTAL TO THE BOARD OF SUPERVISORS COUNTY OF RIVERSIDE,
STATE OF CALIFORNIA

 
Lisa D Brandl 1/25/2018 Lisa D Brandl 1/25/2018

 
Michael Stock, Assistant CEO/ Director of Human Resources 1/25/2018 Lisa D Brandl 1/25/2018


Lisa D Brandl 1/25/2018

2018

Pension Advisory Review Committee



2018 Annual Pension Report

Submitted January 30, 2018

Executive Summary

The County's Pension Advisory Review Committee (PARC) was established in 2003 to guide policy decisions about retirement benefits. The PARC presently consists of members appointed by the Board of Supervisors, including the Treasurer-Tax Collector, County Finance Officer and the Human Resources Director (Board Policy B-25).

Per the Board's policy the key responsibilities of the PARC are:

- Report to the Board and the public on important developments affecting County retirement benefit plans
- Analyze any proposed changes to the benefit system, and
- Provide information about projected costs and funding status

This report includes detailed information about the County's two primary pension plans (Miscellaneous and Safety) from the most recent report prepared for the County by its outside actuarial consultant, John Bartel of Bartel Associates, LLC, and dated December 13, 2017 (Attachment 1). It also includes the latest CalPERS' Valuation Reports for those two plans (Attachments 2 and 3).

Funding status including the deposit of the Pension Obligation Bonds (POB) proceeds, but not amounts owed on the POB for FY 18/19, are expected to be 69.9% for the Miscellaneous Plan and 68.9% for the Safety Plan. Those funding levels, while well below the desired range of 80% to 90%, do place the County in a better position than many of its peers.

The report also addresses other retirement components outside of the County's core pension plans including its OPEB obligation (Other Post-Employment Benefits – Per GASB 45), its Section 115 supplemental pension trust, a status report on the County's bonds issued in 2005 to reduce its unfunded pensions liability with CalPERS and the annual prepayment program.

This report provides a one-year, 10-year and a long-term 30-year outlook. As discussed below, the County (and most other CalPERS agencies) are on the front end of a five to seven year period of rate increases. This year's actuarial report has not produced any surprises versus the last couple years. ***The good news is that there have been no significant year-to-year increases from last year's projections.*** There are actually modest projected declines from previous projections in certain years. Consistent with past projections, a plateau will be reached in 2023 and maintained prior to a long-term decline after 2030.

The key to realizing that decline and no further increases will be CalPERS' ability to perform close to its target rate. Poor investment performance following the financial crisis significantly increased the county's unfunded liability, driving up the required payments.

The County has taken a number of steps over the past decade to improve control over its retirement liabilities. Those include the negotiation of lower rate tiers, the substantial reduction of its OPEB liability, the creation of a Liability Management Fund and the formation of a Section 115 Supplemental Trust. Those efforts should continue. The prospects for additional pension reform are unclear at this time, but the County should prepare its "wish" list of legislative changes, should the discussion open up at the state

level. The list could include the ability to establish other tiers, including the incorporation of defined contribution options. Other concerns regarding CalPERS performance and management should also be addressed.

The report also addresses other retirement components outside of the County's core pension plans including its OPEB obligation (Other Post-Employment Benefits – Per GASB 45), its Section 115 Supplemental Pension Trust, a status report on the County's bonds issued in 2005 to reduce its unfunded pensions liability with CalPERS and the annual prepayment program.

The report was provided with the intent of addressing as many of the concerns raised by the Board and other stakeholders, as the impact of increasing rates with CalPERS have gone from a future forecast to an impending budgetary reality. It is anticipated that the submission of this report to the Board will be accompanied by a formal verbal presentation and discussion. The report however has identified and addressed specific questions that have come up in board discussions, formal or otherwise. Frequently Asked Questions (FAQs) are included as Attachment 4.

This annual report does not address in detail the smaller special district plans of the Riverside County Flood Control Water Conservation District, Riverside County Regional Park and Open Space District, and Riverside County Waste Management District.

Summary of Pension Plans

For the fiscal year 2016-17, CalPERS earned 11.2%, which was well above the expected return of 7.375%. While the investment return for the year was better than expected, challenges remain. CalPERS' Board has approved several assumption changes and approved the reduction of the discount rate while suspending the risk mitigation plan until June 30, 2018. These changes will have a significant effect of increasing the County's rates over the near term. Rates are projected to plateau in 2023 and begin a long-term decline. The cumulative effect of these changes pushes out the start of that projected long-term decline in rates, highlighted in last year's report, from 2031 to 2033. Separately, steps taken to achieve pension reform are showing results with total annual savings now close to \$97.6 million annually. Finally, the pension obligation bond issued in 2005 to partially fund the County's unpaid liability is projected to have a net savings of \$92.4 million by February 15, 2018.

Actuarial Changes

Over the last few years, CalPERS' actuarial staff has implemented a number of changes, at the direction of its Board, which will have the effect of increasing rates in the near term. The changes include:

Change in Discount Rate – CalPERS Board will change its discount rate:

	<u>Discount Rate</u>	<u>Initial Fiscal Year Impact</u>	<u>Full Impact</u>
06/30/16 Valuation	7.375%	18/19	22/23
06/30/17 Valuation	7.250%	19/20	23/24
06/30/18 Valuation	7.000%	20/21	24/25

Asset Smoothing – Asset smoothing will be eliminated over a five-year period. These changes were included in CalPERS' 06/30/13 valuation, with the first impact in the FY 15/16 rates with full impact in FY 19/20.

Demographic Assumptions – CalPERS also approved demographic actuarial assumption changes. The most significant change is the anticipation of future mortality improvement. This was included in the 06/30/14 valuation with the first impact in FY 16/17 and full impact in FY 20/21.

Risk Mitigation Policy – In November 2015, CalPERS adopted a funding Risk Mitigation Policy to address concerns about funding status and performance in response to the volatility and underperformance seen following the 2008 economic crisis. The purpose is to better align CalPERS investment policy with a more realistic and conservative investment philosophy and asset mix. Changes will be implemented over the course of time and the investment mix will be accompanied by reduction in the long term assumed rate of return, currently at 7.375%, and moving to below 7% over a twenty-year horizon. The movement in this direction started in 2012 with a decrease in the assumed rate of 7.75%. Components of the Risk Mitigation plan have been suspended until June 30, 2018 as part of the discount rate reductions noted above.

Funding Status

The June 30, 2018 projected actuarial funded status based on the market valuation for:

- a. The Miscellaneous Plan, including the deposit of the Pension Obligation Bonds (POB) proceeds, but not amounts owed on the POB, is expected to be **69.9%**. By way of comparison, the last years' ratios were 74.2%, 71.9% and 77.3%.
- b. The Safety Plan, including POB proceeds, but not amounts owed on the POB, is expected to be **68.9%**. By way of comparison, the last years' ratios were 71.9%, 69.8% and 75.2%.

Those funding levels, while well below the desired range of 80% to 90%, do place the County in a better position than many of its peers. The Bartel Report reflects the County to be ranked between the 25th and 50th percentile in terms of its funded percentage.

Employer Rate Outlook

This report provides a one, ten and a long-term 30 year outlook. As discussed below, the County (and most other CalPERS agencies) are on the front end of a five to seven year period of rate increases. This year's actuarial report has not produced any surprises versus the last couple of years.

The employer contribution rates for the Miscellaneous Plan will increase from 16.9% of payroll in FY 17/18 to 18.9% in FY 18/19. The asset and assumption changes are partially offset by prior gains. The components for the rate change are as follows:

**Composition of the FY 18-19
Miscellaneous Plan Employer Rate ¹**

• 2017/18 Employer Rate	16.9%
• Asset Method Change	0.7%
• Assumption Change	0.6%
• 06/30/14 (Gains)/Losses	(0.6%)
• 06/30/15 (Gains)/Losses	0.5%
• 06/30/16 Discount Rate Change	0.5%
• 06/30/16 (Gains)/Losses	<u>0.3%</u>
Total	18.9%

1. Does not include POB debt service.

The Safety Plan employer contribution rates will increase from 28.2% in FY 17/18 to 31.6% in FY 18/19. The components of the rate changes are as follows:

**Composition of the FY 18-19
Safety Plan Employer Rate ¹**

• 2017/18 Employer Rate	28.2%
• Payroll Increase	(0.3%)
• Asset Method Change	1.4%
• 06/30/14 Assumption Change	1.0%
• 06/30/14 (Gain)/Losses	(0.8%)
• 06/30/15 (Gain)/Losses	0.7%
• 06/30/16 Discount Rate Change	1.1%
• 06/30/16 (Gains)/Losses	<u>0.3%</u>
Total	31.6%

1. Does not include POB debt service.

Higher rates are projected for the next 5 - 6 years as future rates are expected to rise due to the changes outlined above. As described earlier, CalPERS has made several changes that increased contribution rates. These projections are based on data from the Bartel Associates Report and the rates include POB debt service.

FY	Miscellaneous Plan		Safety Plan	
	County Rate ¹	Rate change	County Rate ²	Rate change
16/17	19.10%	NA	28.80%	NA
17/18	19.40%	0.3%	30.30%	1.5%
18/19	21.20%	1.8%	33.70%	3.4%
19/20	23.50%	2.3%	37.60%	3.9%
20/21	26.10%	2.6%	41.60%	4.0%
21/22	27.90%	1.8%	44.20%	2.6%
22/23	29.40%	1.5%	46.30%	2.1%
23/24	30.10%	0.7%	47.50%	1.2%

1. Includes Pension Obligation Bonds debt service, which are about 2.4 % through 2023/24; 1.6% in 2024/25; and 0.4% thereafter. Miscellaneous POB debt service ends in 2035.
2. Includes Pension Obligation Bonds debt service, which are about 2.1 % through 2023/24; 1.4% in 2024/25; and 0.4% thereafter. Safety POB debt service ends in 2035.
3. Neither rate includes employee contribution.

Comparison of Projected Rates - 2017 vs 2018

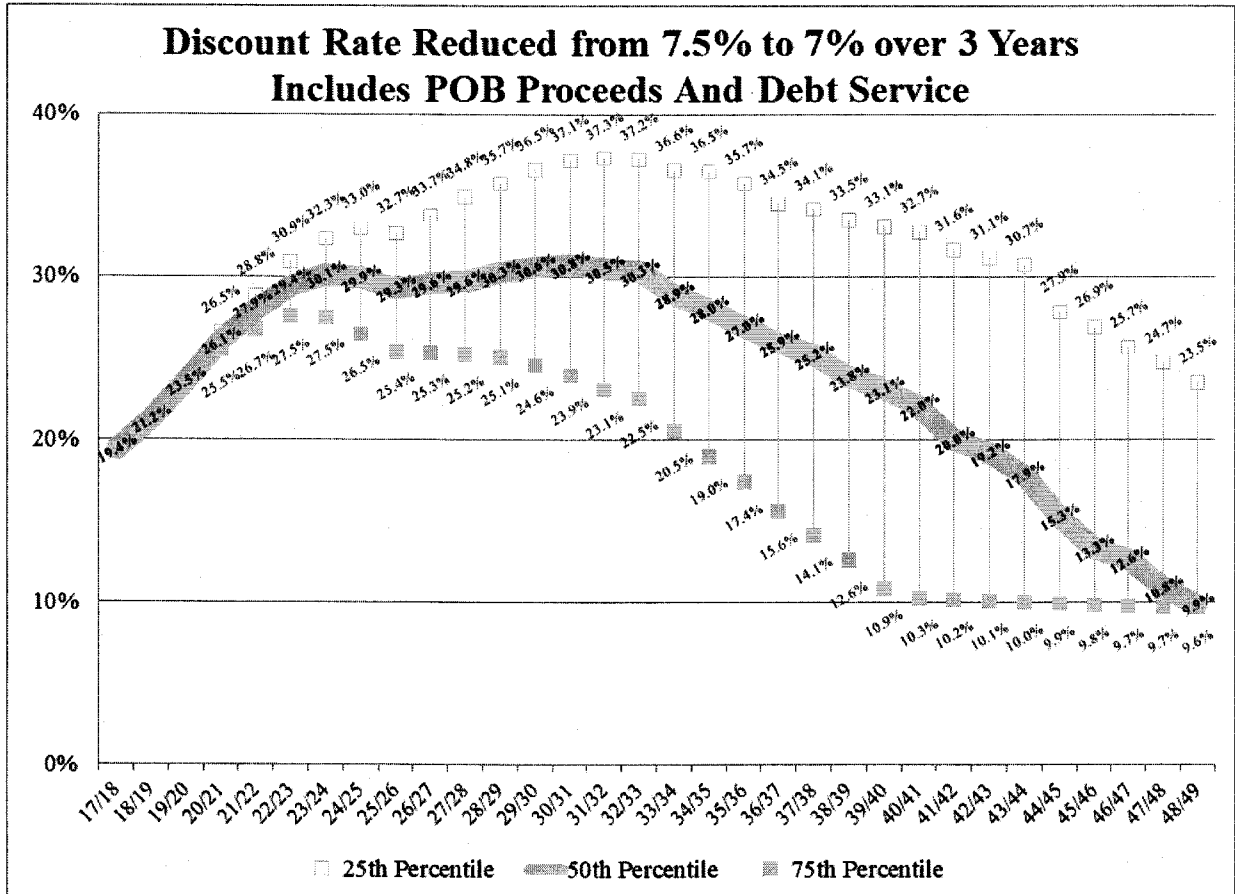
The following table compares last year’s projected rates with this year’s projections. The good news is that there have been no significant year-to-year increases from last year’s projections. There are actually modest projected declines from previous projections in certain years. Consistent with past projections a plateau will be reached in 2023 and maintained prior to a long-term decline after 2030. The key to realizing that decline and no further increase will be CalPERS’ ability to perform close to its target rate.

FY	Miscellaneous Plan		Safety Plan	
	PARC 2018 Report	PARC 2017 Report	PARC 2018 Report	PARC 2017 Report
16/17	19.10%	19.10%	28.80%	28.80%
17/18	19.40%	19.90%	30.30%	30.70%
18/19	21.20%	22.20%	33.70%	34.60%
19/20	23.50%	24.30%	37.60%	38.20%
20/21	26.10%	26.30%	41.60%	41.60%
21/22	27.90%	27.90%	44.20%	44.10%
22/23	29.40%	29.00%	46.30%	46.10%
23/24	30.10%	29.60%	47.50%	47.30%

Longer Term Projections

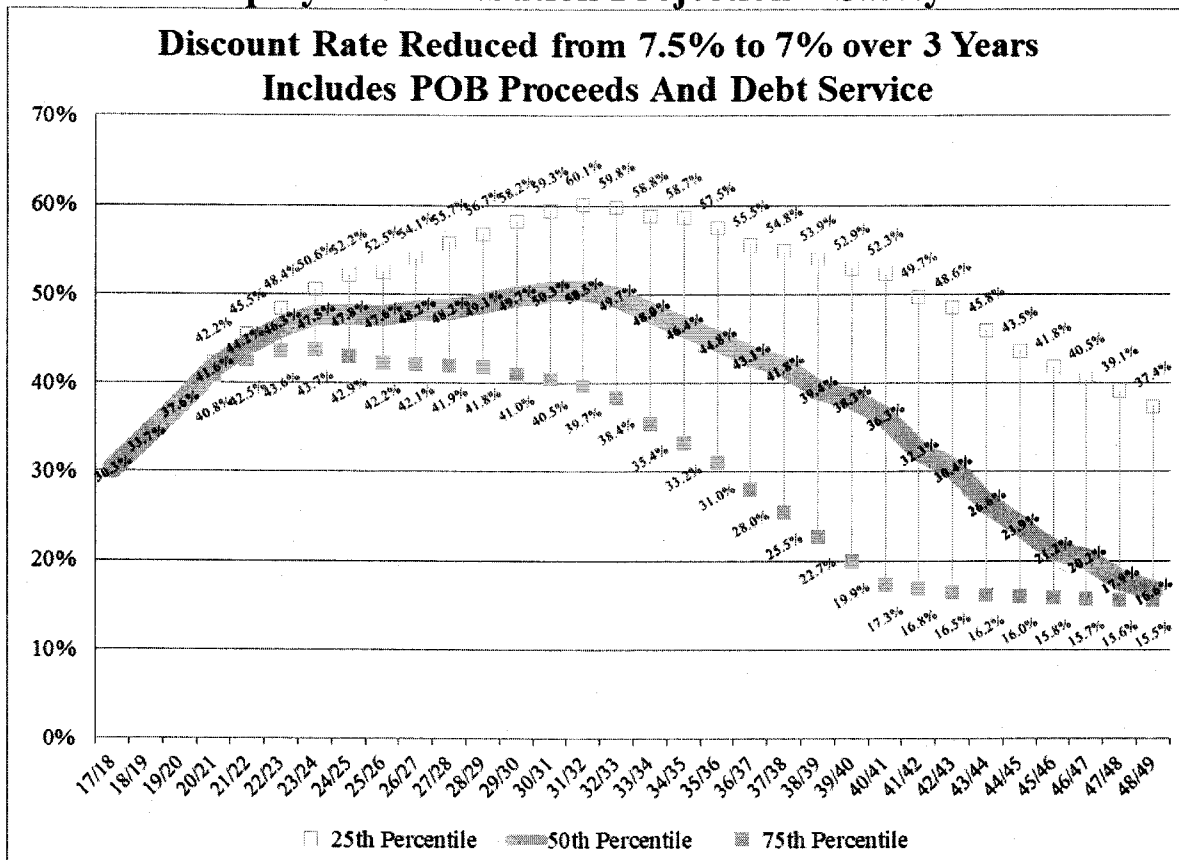
Listed below are two charts that show the projected employer contribution rates over the next thirty years for the County's Miscellaneous and Safety Plans, with a discount rate reduction from 7.5% to 7% over 3 years. Over the next few years, rates are expected to increase as CalPERS' assumption changes are absorbed and the reduction in the discount rate is implemented. (As also seen in the preceding table.) Once the smoothing is complete and assuming no other changes, the rates should decline over a sustained period. Note, that even with very poor investment returns, the contribution rates exhibit a long-term decline after a higher peak is reached. The fact that all scenarios show a decline is due to CalPERS amortization policy to pay off the unfunded liability on a fixed period. The decline reflects the increasing impact of the changes to the benefit formulas, as more and more of the employee population become subject to the new lower tiers.

Table 3
Employer Contribution Projections - Miscellaneous



Source: Bartel Associates Report dated December 13, 2017. See attached report for a discussion of the stochastic analysis, which incorporate the likelihood of expected outcome of several factors which produced the three scenarios.

**Table 4
Employer Contribution Projection – Safety**



Source: Bartel Associates report dated December 13, 2017. See attached report for a discussion of the stochastic analysis, which incorporate the likelihood of expected outcome of several factors which produced the three scenarios.

Investment Earnings

Aside from actuarial and demographic assumptions, the primary driver of the rate formula is CalPERS investment performance. Poor investment performance following the financial crisis significantly increased the County's unfunded liability, driving up the required payments.

Table 5
CalPERS' Investment Earnings

	Market Value of Assets	Net Accumulated (Arithmetic) Market Increase/(Decrease) Since 2008 ¹
▪ June 30, 2008 Return	(5.1%)	(5.1%)
▪ June 30, 2009 Return	(24.0)%	(29.1%)
▪ June 30, 2010 Return	13.3%	(15.8%)
▪ June 30, 2011 Return	21.7%	5.9%
▪ June 30, 2012 Return	0.10%	6.0%
▪ June 30, 2013 Return	13.2%	19.2%
▪ June 30, 2014 Return	18.4%	37.6%
▪ June 30, 2015 Return	2.4%	40.0%
▪ June 30, 2016 Return	0.6%	40.6%
▪ June 30, 2017 Return	11.2%	51.8%

¹ Actual Return. Expected return through the same period was 76%, at assumed rate of 7.75% prior to 2014, 7.5% from 2013 through 2016 and 7.375% for 2017.

Pension Obligation Bond (POB)

The County sold \$400 million in Pension Obligation Bonds (POBs) in 2005 to lock in a borrowing cost of 4.91%, refinancing its prior unfunded liability, which was carrying a 7.5% rate. As discussed earlier, the rate is expected to drop from the current level of 7.375% to 6% over a twenty-year period. At the same time, the County converted its repayment from a rolling 30 year amortization schedule to a fixed amortization schedule of 30 and 25 years for the Miscellaneous and Safety Plans respectively. Upon deposit of the bond proceeds with CalPERS, the County's rate was reduced and replaced by the lower amount of the bonds' debt service.

The POBs current outstanding total of \$266.4 million and the bonds have a remaining 17-year life. Bartel's analysis is projecting that as of February 15, 2018, the County will realize \$92.4 million net savings as a result of the sale of the bonds in February 2005. The POBs have a relatively low break-even rate (4.91%) versus CalPERS' expected return of 7.25%. Even if CalPERS were to earn a rate slightly below the bond rate for the remaining term of the bonds, and well below new long-term target rate of 6.0%, the County can still expect to show savings.

Liability Management Fund

The Liability Management Fund (LMF) was established under the POB documents and incorporated into the Board's pension policy. A portion of the projected annual savings from the POB issuance is collected from departments for the purpose of reducing long term pension costs and accelerating the repayment of pension liabilities. These cash flow savings, occur annually and independent of the lifecycle savings mentioned above. The amount collected is set aside in the LMF, held by the County's bond trustee, and each year PARC recommends whether the funds should be used to pay down the CalPERS' unfunded liability or to pay down the POBs. To date the excess has been sent to CalPERS' to reduce the liability. This year the excess is recommended to be sent to the Section 115 Supplemental Pension Trust discussed below, and in future years the recommendation is being made to allow this to be made without subsequent Board approval.

Section 115 Supplemental Pension Trust

A Section 115 Supplemental Pension Trust was established in 2016 (Board Resolution No. 2016-214) to help the County independently mitigate CalPERS' contribution rate volatility. Assets in the Supplemental Pension Trust cannot be used for other purposes except for reimbursing the County for CalPERS' contributions or for making payments directly to CalPERS. Furthermore, unlike assets in CalPERS, the County can directly control the investments in the Supplement Pension Trust. Funds are managed by professional money managers, in a manner consistent with the County's risk profile in a combination of debt and equity investments.

The County can use the Trust to reduce the volatility of CalPERS rates. To the extent excess funds were to become available to reduce the County's pension liabilities, the Trust would be the first option for those funds, versus CalPERS, due to the greater control and flexibility afforded to the County. Clearly, in the

near term, barring any sudden windfalls, such funds will be limited, but over the lifecycle of the current long-term forecast. CalPERS rates are expected to decline under even the worst case projected scenario. Upon such a decline, the prudent step would be to retain a portion of those savings rather than passing along the full rate decrease, and depositing such savings into the Trust. Such a program would allow the County to move much faster to reach full funding, if it were not there already, as a result of higher than expected earnings.

The Trust was formed with Public Agency Retirement Services (PARS) managing the assets for the County (PARS is the administrator, Highmark/Union Bank is the investment manager). Excess funds from the Liability Management Fund and OPEB disbursements were placed in the Trust to fund the initial deposit. The current balance in the Trust is \$5.1 million. The County expects the Trust to grow slowly making funds available for use in pension obligations in future years.

Annual Prepayment

CalPERS offers early payment discounts of 3.68% for 2017/18 in lieu of the periodic payments that coincide with payroll disbursements. PARC first recommended utilizing this approach in 2004 and the County has prepaid a portion of the annual payment every year since. From a mechanical standpoint, the County makes an initial deposit which reduces the amount that would otherwise be collected during the year. The discount, of course, reduces the total required payment. In order to fund the initial payment, the County typically includes the prepayment amount as part of the annual TRAN borrowing. An alternative would be to borrow internally by drawing down General Fund cash. The amount needed to repay the amount borrowed is collected from departments during the course of the year.

CalPERS changed its prepayment policy for FY 17/18 and now allows only the unfunded liability payment portion to be prepaid, reducing the potential amount to be prepaid. In FY 17/18, the County prepaid CalPERS \$105.4 million (Safety \$34.5 + Miscellaneous \$70.9 = \$105.4 million). The FY 18/19 required payment for the unfunded liability is \$149 million, with an optional prepayment amount of \$143.7 million, producing a potential discount of approximately \$5.3 million. A final recommendation regarding the FY 18/19 prepayment will be made in conjunction with the FY 18/19 TRAN borrowing.

Pension Reform

Pension reform has become a topic of concern almost immediately following the move to higher benefit formulas across California including Riverside County at the beginning of the millennium. After internal discussion, the County took the lead in initiating pension reform with its bargaining units in advance of any action by the state. As a result of collective bargaining, employees of the County agreed to pay their own member contribution, e.g. eliminating the Employer Paid Member Contribution (EPMC). Additionally, a new second retirement Tier (Tier II) was implemented with a lower benefit formula, which became effective on August 24, 2012. A new tier was added in both the Miscellaneous and Safety units of the County.

Shortly thereafter with little forewarning, Governor Brown initiated proposals resulting in changes to pension benefits. The passage of Assembly Bill 340 (AB 340) on September 12, 2012, created the Public Employees' Pension Reform Act (PEPRA) implementing new lower benefit formulas, shorter final compensation periods, and new contribution requirements for new employees hired on or after January 1, 2013, who meet the definition of a new member under PEPRA (known as Tier III). The lower benefit formula for Tier III is 2% at 62 for Miscellaneous and 2.7% at 57 for Safety. Employee contribution rates for Tier III vary based on PEPRA rules. Listed below is a table with the new options and the important changes.

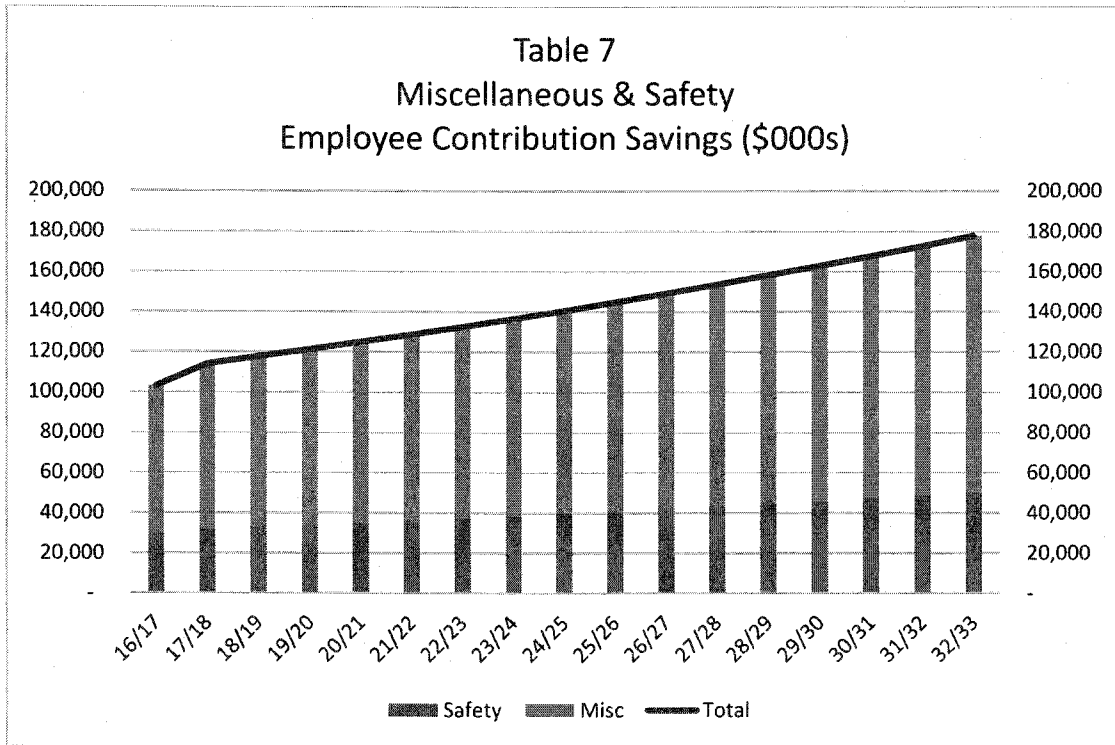
Table 6
Summary of Riverside County CalPERS Pension Tiers

			Plan	EPMC	Earliest Retirement Age	PEPRA Compensation Limits	Final Compensation	Effective Date
County Plan Tier I								
	Misc.		3% at 60	No	50	N/A	12 months	N/A
	Safety		3% at 50	No	50	N/A	12 months	N/A
County Plan Tier II								
	Misc.		2% at 60	No	50	N/A	36 months	8/24/2012
	Safety		2% at 50	No	50	N/A	36 months	8/24/2012
County Plan Tier III (PEPRA)								
	Misc.		2% at 62	No	52	\$121,388*	36 months	1/1/2013
	Safety		2.7% at 57	No	50	\$145,666*	36 months	1/1/2013

*2018 Compensation Limits are Indexed Annually

The combined effects of the County's negotiations and the revisions to state pension law, will lower the County's pension costs in the long term. In the near term, those positive effects are being obscured by the increased contributions to offset the period of losses and underperformance following the 2008 financial crisis.

The decline in long-term rates shown in Tables 2 and 3 above, is driven by the fact that by over time, a majority of the County's employees are projected to be members of the new lower tiers. The following table isolates the projected gross savings as a result of eliminating the payment of the employee contribution by the County.



The prospects for additional pension reform are unclear at this time, but the County should prepare its “wish” list of legislative changes, should the discussion open up at the state level. The list could include the ability to establish other tiers and including the incorporation of defined contribution options. Other concerns regarding CalPERS performance and management should also be addressed.

Other Post-Employment Benefits (OPEB)

GASB 45 modified the reporting requirements for Other Post-Employment Benefits (other than pensions) provided by state and local governments. In summary, GASB 45 dictates that the present value of these benefits should be quantified and reported in the annual financial report. Such reporting does not trigger a funding requirement. The County’s primary OPEB obligation is comprised of a modest contribution towards the cost of retiree medical care.

The County established an OPEB Trust in 2007 to reduce the actual and nominal liability. Simply by establishing the trust, the County substantially reduced its nominal liability. By actually funding the Trust, the County reduced the liability even further. The County established the trust under a master program established by CalPERS and invests its OPEB assets with the California Public Employers’ Retirement Benefit Trust program (CERBT).

Effective January 1, 2011, CalPERS introduced three new investment allocation strategies for CERBT. PARC reviewed the details of the strategies and adopted Strategy 1, an asset allocation strategy most similar to the investment allocation strategy followed by CERBT prior to January 1, 2011, with an expected rate of return of 7.61%. CERBT lowered its investment strategy expected return to 7.28%.

Effective July 1, 2017, PARC adopted Strategy 2, with expected rate of return 6.73%.

As of June 30, 2016, the CERBT was funded at 81.1%. Since the OPEB Trust fund is well funded, the committee discussed the potential of the Trust reimbursing the County for the Annual Required Contribution (ARC) and decided to have the ARC reimbursed from the Trust to the County. This strategy will allow the County to keep the Trust well-funded and will allow those funds to be used to reduce the CalPERS' pension liability.

Special Districts - Parks, Flood, and Waste

The County's Special districts participate in what CalPERS refers to as the Risk Pool. The Risk Pool is designed to accommodate smaller employers whose size is not sufficient to develop individual actuarial assumptions. Risk pool participation occurs if a rate plan has less than 100 active members on any valuation date. Risk pooling is the process of combining assets and liabilities across employers to produce large, risk sharing pools that reduce or eliminate large fluctuations in an employer's retirement contribution rate caused by unexpected demographic events.

The Riverside County Regional Park and Open Space District has three rate plans, and is in the CalPERS miscellaneous risk pool.

As of June 30, 2016, the funded status of the Riverside County Regional Park and Open Space District Tier I was 73.9 percent (funded status reduced 5.0 percentage points from 78.9 percent in Fiscal Year 2014-15); Tier II at 91.2 percent (funded status reduced 7.8 percentage points from 99.0 percent in Fiscal Year 2014-15); and the PEPR Tier III at 94.8 percent (funded status reduced 5.2 percentage points from 94.8 percent in Fiscal Year 2014-15).

The Riverside County Flood Control and Water Conservation District funded status as of June 30, 2016 was 63.9 percent. The funded status reduced 7.0 percentage points from 70.9 percent in Fiscal Year 2014-15.

The Riverside County Regional Waste Resource Management District is in the CalPERS miscellaneous risk pool. The funded status as of June 30, 2016 was 71.1 percent. The funded status reduced 4.9 percentage points from 76.0 percent in Fiscal Year 2014-15.

Recommendations

1. Receive and file the 2018 PARC Annual Pension Report.
2. Direct staff to report back with any additional recommendations or updates on the County's pension plans, including any legislative changes that could be incorporated in the County's Legislative Platform.
3. Direct the PARC to review the annual prepayment for FY 18/19 and to have such recommendations presented in conjunction with either the approval of the annual cash flow financing (TRAN) or with the FY 18/19 budget.
4. Adopt the recommendation to annually transfer excess OPEB Trust funds administratively to the Section 115 Pension Trust.

Appendices

1. *Bartel Associates CalPERS' Actuarial Issues – 6/30/16 Valuation- December 13, 2017*
2. *CalPERS 06/30/16 Miscellaneous Actuarial Valuation Reports*
3. *CalPERS 06/30/16 Safety Actuarial Valuation Reports*
4. *Frequently Asked Questions (FAQs)*

Attachment 4**FAQs****Responses to PARC presentation questions**

During the 2017 PARC presentation to the Board, several questions were asked of staff. Listed below are the responses to those questions. The responses were prepared with consultation with the County's Actuarial consultant, John Bartel.

1. Are there other options to reduce pension liability; is there anything additional being done?

There are no immediate options to reduce the pension liability. One of the options for the Board to consider is to add additional funds to the Section 115 Pension Trust now to build up funds to smooth over anticipated future increases.

2. Where do you see us compared to other agencies in the State of California?

Bartel's Annual report, slide 46, shows the County between the 25th and the 50th percentile as compared to the other Counties. Riverside County has a lower unfunded liability due to several factors that include issuance of Pension Obligation bonds, growth in the County is relatively new and as such the County has greater number of active employees than retirees and the creation of the additional tier have led to a lower unfunded liability compared to other agencies.

3. Would an additional tier help? If so what kind of tier and formula? Do you see the possibility over time of another statewide movement?

At this time, the County cannot add additional tiers, as the Public Employees' Pension Reform Act (PEPRA) is the current law.

4. Could we offer a defined contribution plan rather than a defined benefit plan?

At this time, this option is not available to the County. In order for the County to move to this plan, the California Supreme Court would have to rule in its favor, the State Legislature would have to make a change to the legislation to provide this option and CalPERS would have to create an option for agencies to opt into.

5. With our existing tiers, what are some of the cost savings?

The County has the option of offering classic hires the PEPRA benefit formulas. However, doing so would result in minimal savings; it would have a very tiny effect on pension obligations and could exacerbate recruiting issues.



BARTHEL
ASSOCIATES, LLC

**COUNTY OF RIVERSIDE
MISCELLANEOUS AND SAFETY PLANS**

**CalPERS Actuarial Issues – 6/30/16 Valuation
Preliminary Results**

Presented by **John Bartel, President**
Prepared by **Bianca Lin, Assistant Vice President**
Wai Man Yam, Actuarial Analyst
Bartel Associates, LLC
December 13, 2017

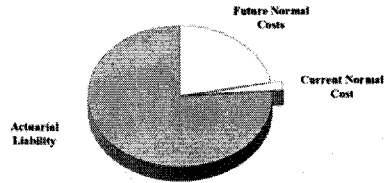
Agenda

<u>Topic</u>	<u>Page</u>
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Miscellaneous Plan:	
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DEFINITIONS

Present Value of Benefits
June 30, 2016



- **PVB - Present Value of all Projected Benefits:**
 - Discounted value (at valuation date - 6/30/16), of all future expected benefit payments based on various (actuarial) assumptions
- **Actuarial Liability:**
 - Discounted value (at valuation date) of benefits earned through valuation date [value of past service benefit]
 - Portion of PVB “earned” at measurement
- **Current Normal Cost:**
 - Portion of PVB allocated to (or “earned” during) current year
 - Value of employee and employer current service benefit



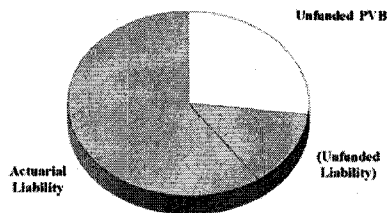
December 13, 2017

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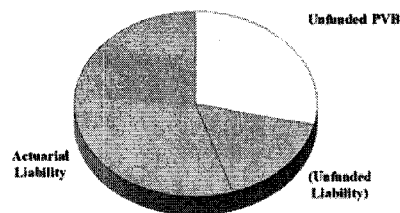


DEFINITIONS

Present Value of Benefits
June 30, 2015



Present Value of Benefits
June 30, 2016



- **Target-** Have money in the bank to cover Actuarial Liability (past service)
- **Unfunded Liability** - Money short of target at valuation date
- **Excess Assets / Surplus:**
 - Money over and above target at that point in time
 - Doesn't mean you're done contributing



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HOW WE GOT HERE

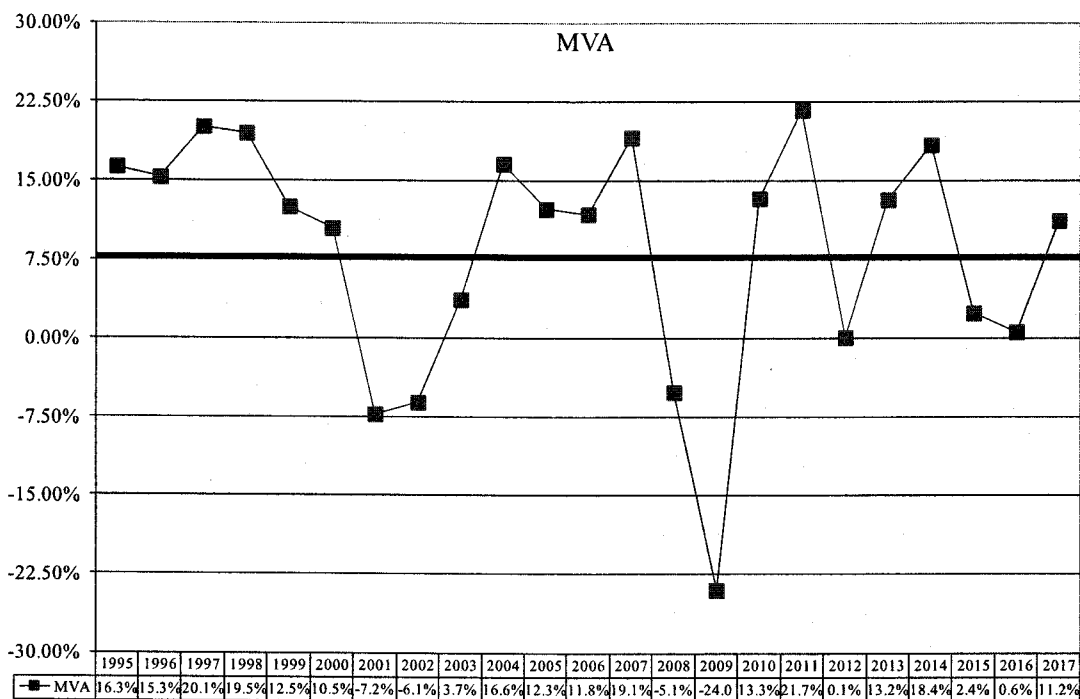
- Investment Losses
- Enhanced Benefits
- CalPERS Contribution Policy
- Demographics



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HOW WE GOT HERE – INVESTMENT RETURN



Above assumes contributions, payments, etc. received evenly throughout year.



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HOW WE GOT HERE – ENHANCED BENEFITS

- At CalPERS, Enhanced Benefits implemented using all (future & prior) service
- Typically not negotiated with cost sharing

■ County	Tier 1	Tier 2	PEPRA
● Miscellaneous	3.0%@60 FAE1	2%@60 FAE3	2%@62 FAE3
● Safety ¹	3%@50 FAE1	2%@50 FAE3	2.7%@57 FAE3

- Note:
 - FAE1 is highest one year (typically final) average earnings
 - FAE3 is highest three years (typically final three) average earnings

¹ Fire and Peace Officer members are combined in this group



HOW WE GOT HERE – OLD CONTRIBUTION POLICY

- Effective with 2003 valuations:
 - Slow (15 year) recognition of investment losses into funded status
 - Rolling 30 year amortization of all (primarily investment) losses
- Designed to:
 - First smooth rates and
 - Second pay off UAL
- Mitigated contribution volatility



HOW WE GOT HERE – DEMOGRAPHICS

- Around the State
 - Large retiree liability compared to actives
 - Declining active population

- County percentage of liability belonging to retirees:
 - Miscellaneous 43%
 - Safety 48%



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CALPERS CHANGES

- Contribution policy changes:
 - No asset smoothing
 - No rolling amortization
 - 5-year ramp up
 - Included in 6/30/13 valuation (first impact 15/16 rates; full impact 19/20)
- Assumption changes:
 - Anticipate future mortality improvement
 - Other, less significant, changes
 - Included in 6/30/14 valuation (first impact 16/17 rates; full impact 20/21)
- CalPERS Board will change their discount rate:

	<u>Rate</u>	<u>Initial</u>	<u>Full</u>
● 6/30/16 valuation	7.375%	18/19	22/23
● 6/30/17 valuation	7.25%	19/20	23/24
● 6/30/18 valuation	7.00%	20/21	24/25
- Risk mitigation suspended until 6/30/18 valuation CalPERS Board reviewing their Capital Market Assumptions, Likely no further changes to discount rate



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CALPERS CHANGES

■ Risk Mitigation Strategy

- Move to more conservative investments over time
- Only when investment return is better than expected
- Lower discount rate in concert
- Essentially use ≈50% of investment gains to pay for cost increases
- Likely get to 6.0% over 20+ years

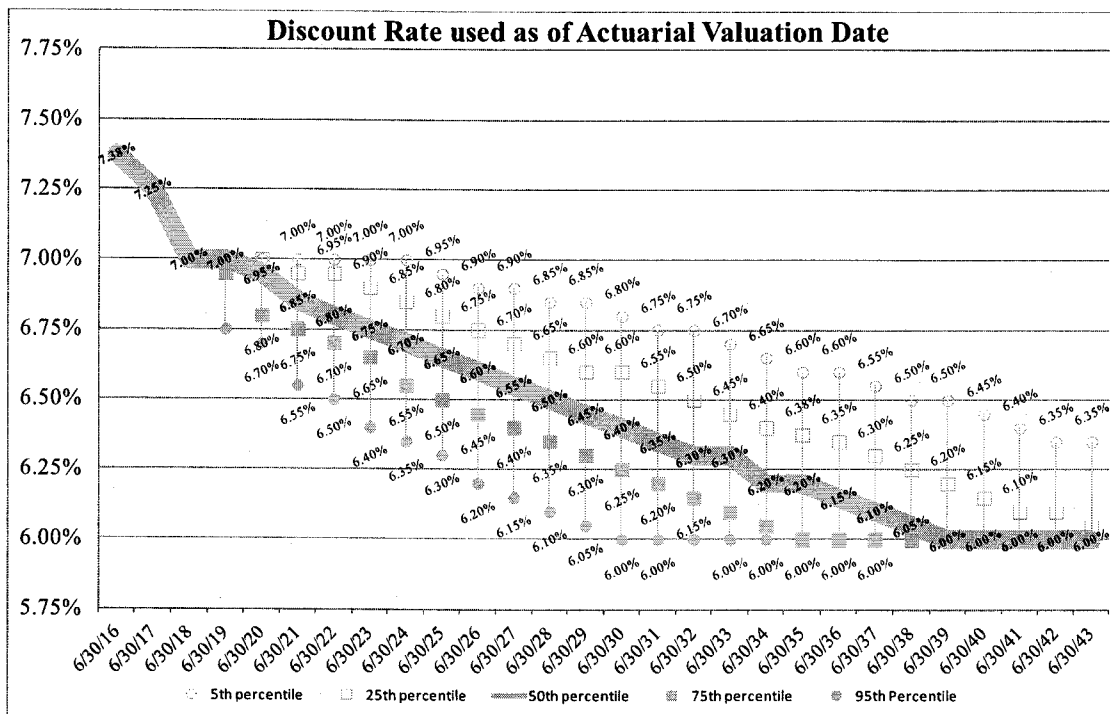


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CALPERS CHANGES



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SUMMARY OF DEMOGRAPHIC INFORMATION - MISCELLANEOUS

	1996	2006	2015	2016
Actives				
■ Counts	8,515	13,806	16,891	17,201
■ Average				
• Age	42	43	44	44
• County Service	8	8	10	10
• PERSable Wages	\$32,300	\$47,800	\$59,200	\$63,400
■ Total PERSable Wages (millions)	314.1	725.7	1,093.0	1,191.4
Receiving Payments				
■ Counts				
• Service		4,642	8,149	8,597
• Disability		588	614	619
• Beneficiaries		662	904	916
• Total	3,365	5,892	9,667	10,132
■ Average Annual County Provided Benefit ²				
• Service		\$15,600	\$24,900	\$25,700
• Disability		7,500	9,100	8,800
• Service Retirements in last 5 years		21,400	27,000	26,800

² Average County provided pensions are based on County service & County benefit formula, and are not representative of benefits for long service employees.

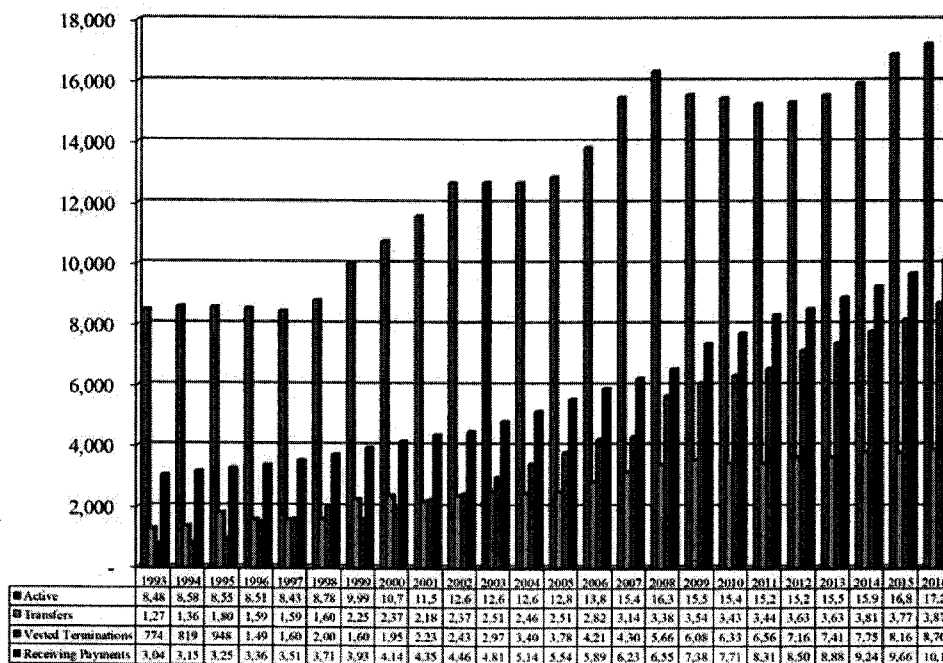


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MEMBERS INCLUDED IN VALUATION - MISCELLANEOUS



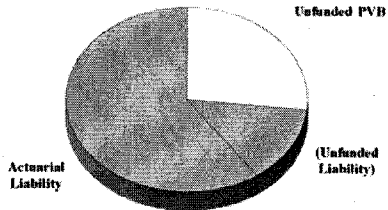
December 13, 2017

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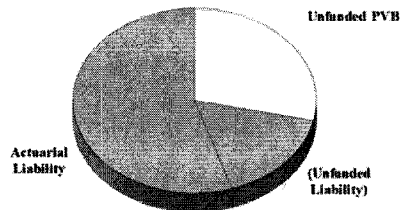


FUNDED RATIO - MISCELLANEOUS

Present Value of Benefits
June 30, 2015



Present Value of Benefits
June 30, 2016



<u>June 30, 2015</u>		<u>June 30, 2016</u>
\$ 3,159,700,000	Active AAL	\$ 3,560,100,000
2,700,900,000	Retiree AAL	2,948,000,000
<u>313,900,000</u>	Inactive AAL	<u>342,000,000</u>
6,174,500,000	Total AAL	6,850,100,000
<u>4,775,100,000</u>	Market Asset Value	<u>4,799,600,000</u>
(1,399,400,000)	(Unfunded Liability)	(2,050,500,000)



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FUNDED RATIO - MISCELLANEOUS

- What happened between 6/30/15 and 6/30/16?
 - Unfunded Liability (Increase)/Decrease ≈ \$(651.1) million
- Gains (losses)
 - Asset gain/(loss) ≈ \$(338.6) million
 - Assumption Change ≈ \$(111.9) million
 - Actuarial gain/(loss) ≈ \$(156.5) million
 - Average Salary \$59,200 → \$63,400
 - Number of Actives 1,6891 → 1,7201
 - Number of Inactives 1,1941 → 1,2580
 - Number of Retirees 9,667 → 10,132
 - Other gain/(loss) ≈ \$(44.1) million
 - Contributions
 - Other (expected)

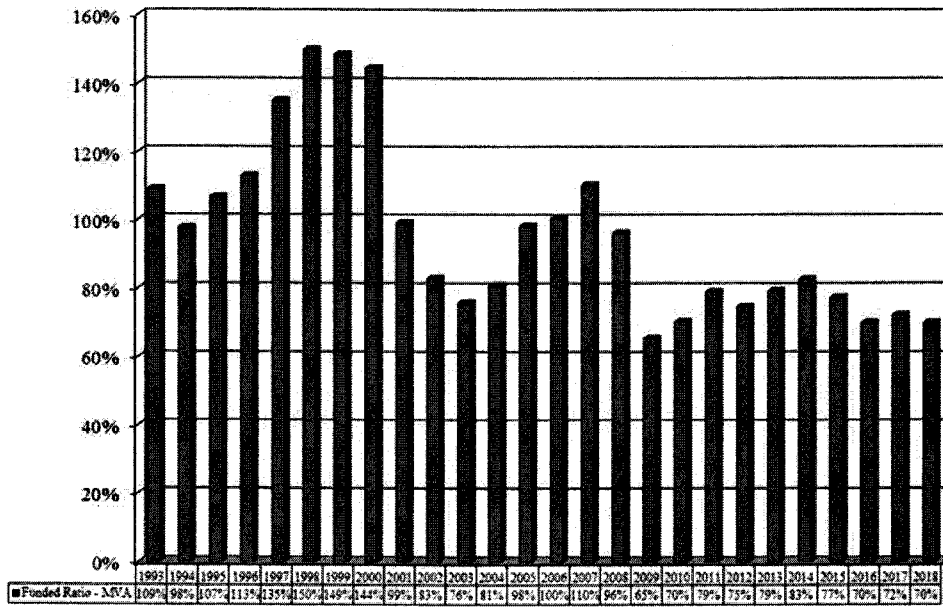


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FUNDED RATIO - MISCELLANEOUS



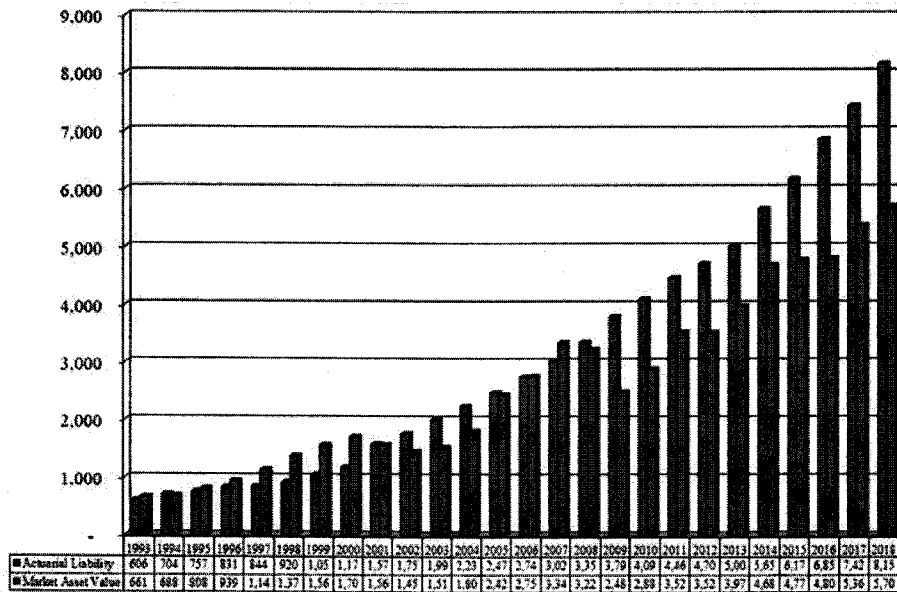
6/30/17 & 6/30/18 funded status estimated.



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FUNDED STATUS (MILLIONS) - MISCELLANEOUS



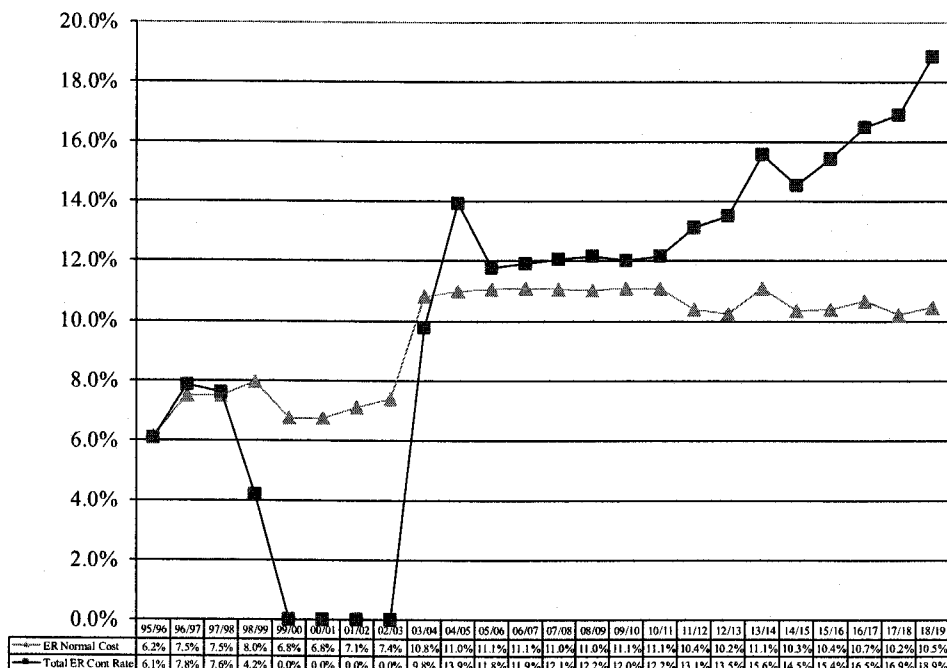
6/30/17 & 6/30/18 funded status estimated.



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CONTRIBUTION RATES - MISCELLANEOUS



December 13, 2017



CONTRIBUTION RATES - MISCELLANEOUS

	<u>6/30/15</u> <u>2017/2018</u>	<u>6/30/16</u> <u>2018/2019</u>
■ Total Normal Cost	17.7%	18.0%
■ Employee Normal Cost	7.6%	7.5%
■ Employer Normal Cost	10.2%	10.5%
■ Amortization Bases	<u>6.7%</u>	<u>8.4%</u>
■ Total Employer Contribution Rate	16.9%	18.9%
■ Amortization Period	Multiple	Multiple
■ What Happened from 6/30/15 to 6/30/16:		
● 2017/18 Rate		16.9%
● Asset Method Change (4 th Year)		0.7%
● 6/30/14 Assumption Change (3 rd Year)		0.6%
● 6/30/14 (Gains)/Losses (3 rd Year)		(0.6%)
● 6/30/15 (Gains)/Losses (2 nd Year)		0.5%
● 6/30/16 Discount Rate change (1 st Year)		0.5%
● 6/30/16 (Gains)/Losses (1 st Year)		<u>0.3%</u>
● 2018/19 Rate		18.9%



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CONTRIBUTION PROJECTIONS - MISCELLANEOUS

■ **Market Value Investment Return:**

- June 30, 2016 0.6%³
- June 30, 2017 11.2%⁴

- Future returns based on stochastic analysis using 1,000 trials

<u>Single Year Returns at⁵</u>	<u>25th Percentile</u>	<u>50th Percentile</u>	<u>75th Percentile</u>
● 7.0% Investment Mix	0.1%	7.0%	14.8%
● 6.0% Investment Mix	0.8%	6.0%	11.4%

- Assumes investment returns will, generally be 6.5% (as compared to 7.0%) over the next 10 years and higher beyond that.

- No Other: Gains/Losses, Method/Assumption Changes, Benefit Improvements
- Excludes Employer Paid Member Contributions (EPMC)
- Includes Classic Tier 2 Members (2.0%@60)

³ Based on CalPERS 6/30/16 CAFR.

⁴ Based on CalPERS press release on 7/14/17, preliminary investment return of 11.2%.

⁵ Nth percentile means N percentage of our trials result in returns lower than the indicated rates.



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CONTRIBUTION PROJECTIONS - MISCELLANEOUS

■ **New hire assumptions:**

- Assumes 50% of 2013 new hires will be Classic Tier 2 Members and 50% will be New Members with PEPRA benefits
- Assumes Classic Members will decrease from 50% to 0% of new hires over 20 years



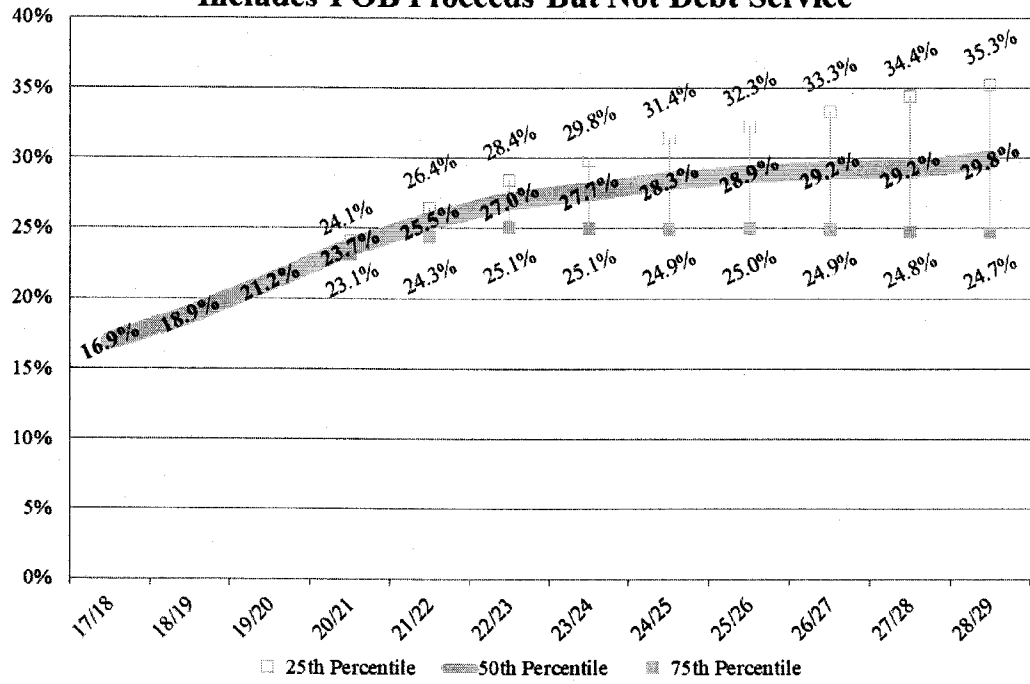
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CONTRIBUTION PROJECTIONS - MISCELLANEOUS

**Discount Rate Reduced from 7.5% to 7% over 3 Years
Includes POB Proceeds But Not Debt Service**

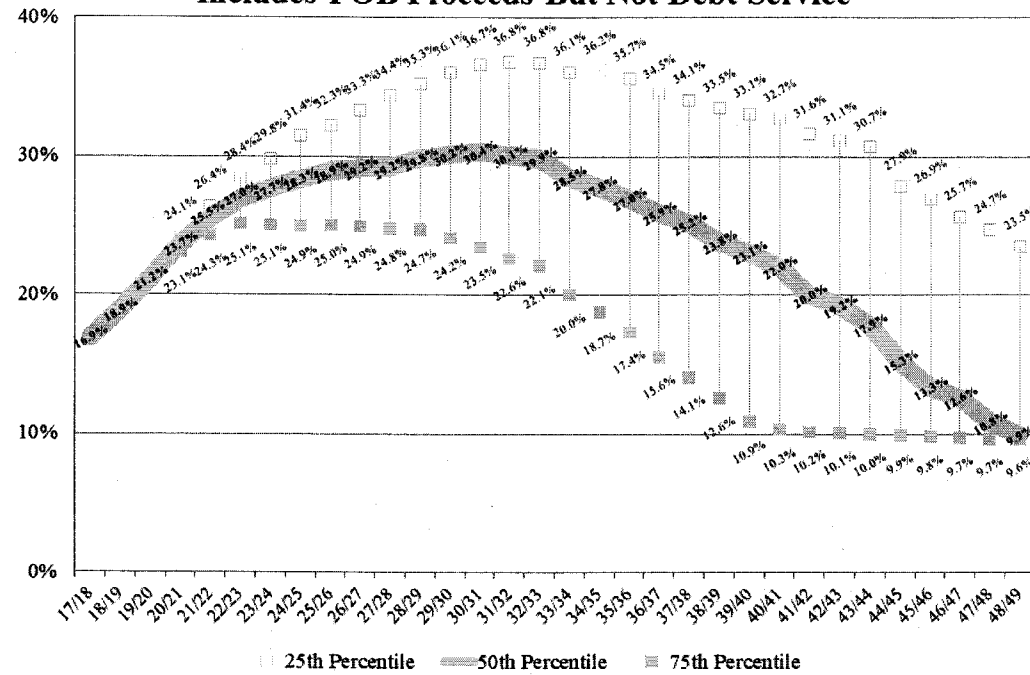


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CONTRIBUTION PROJECTIONS - MISCELLANEOUS

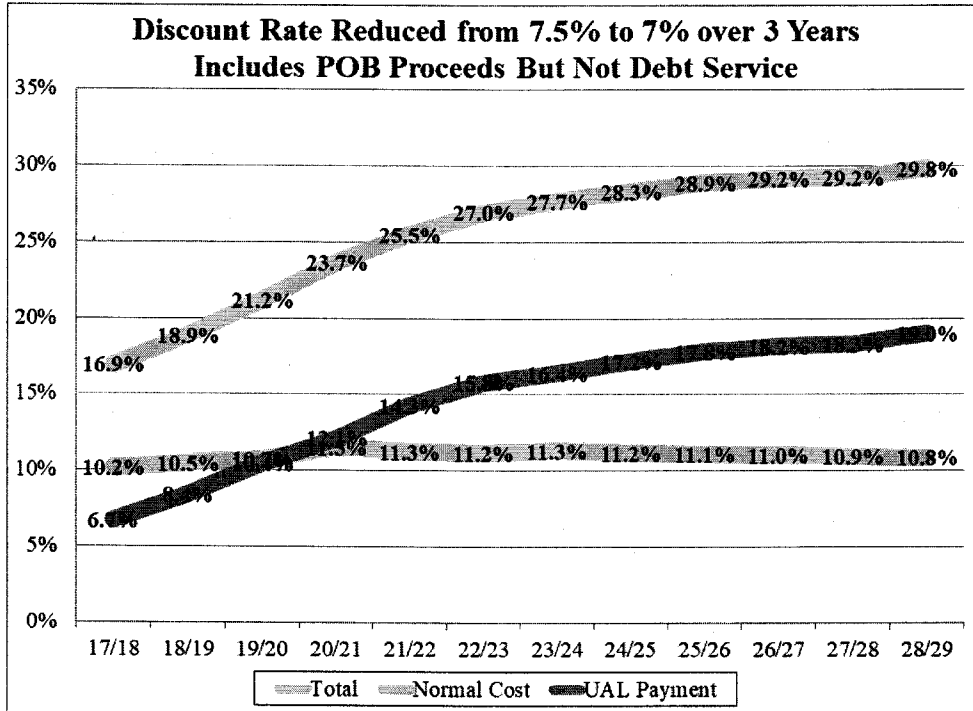
**Discount Rate Reduced from 7.5% to 7% over 3 Years
Includes POB Proceeds But Not Debt Service**



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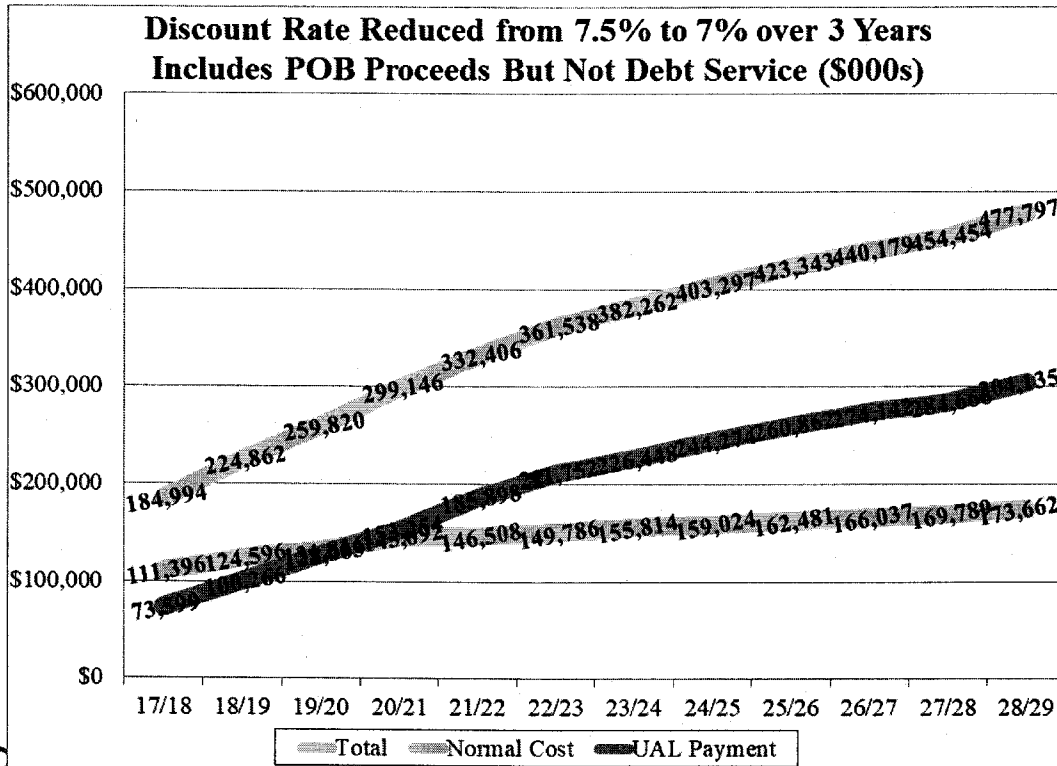
CONTRIBUTION PROJECTIONS - MISCELLANEOUS



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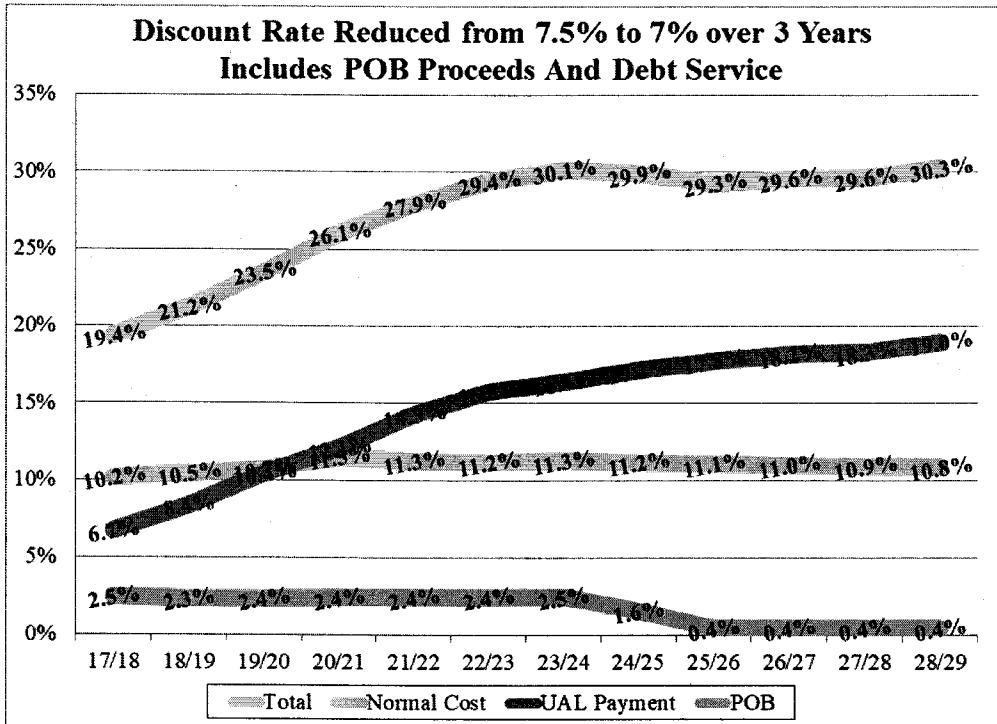
CONTRIBUTION PROJECTIONS - MISCELLANEOUS



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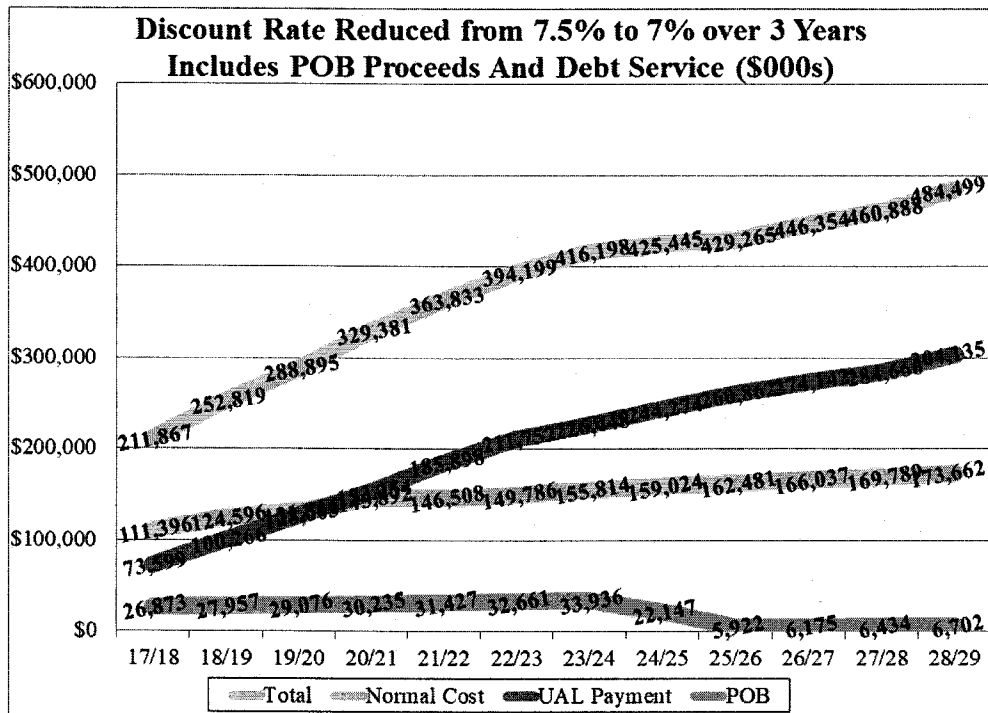
CONTRIBUTION PROJECTIONS - MISCELLANEOUS



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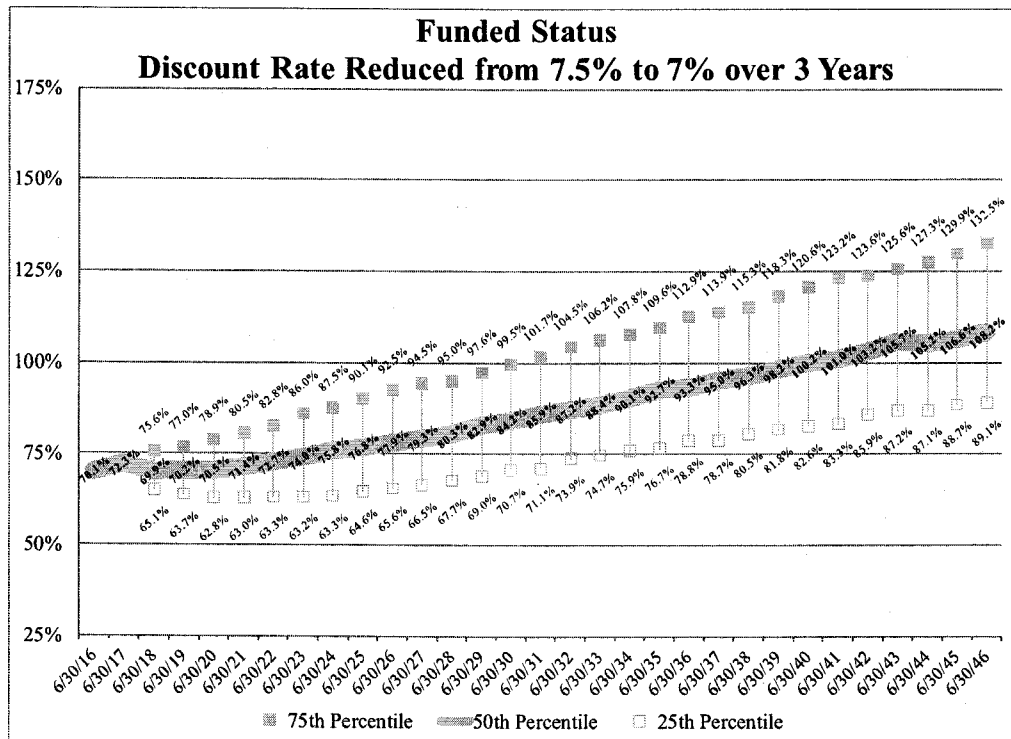
CONTRIBUTION PROJECTIONS - MISCELLANEOUS



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FUNDED STATUS - MISCELLANEOUS



December 13, 2017



FUNDED STATUS - MISCELLANEOUS

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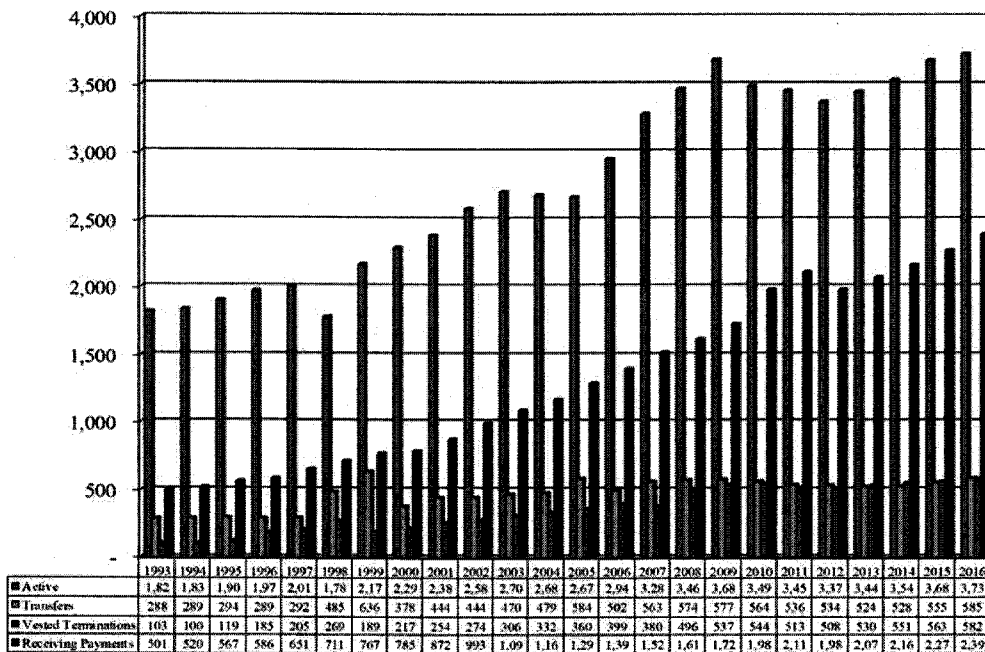
SUMMARY OF DEMOGRAPHIC INFORMATION - SAFETY

	1996	2006	2015	2016
Actives				
■ Counts	1,976	2,947	3,680	3,731
■ Average				
• Age	39	39	39	39
• County Service	9	9	11	11
• PERSable Wages	\$44,800	\$64,300	\$86,800	\$86,800
■ Total PERSable Wages (millions)	101.0	208.7	349.1	370.2
Receiving Payments				
■ Counts				
• Service		791	1,500	1,574
• Disability		477	567	592
• Beneficiaries		130	208	225
• Total	586	1,398	2,275	2,391
■ Average Annual County Provided Benefit ⁶				
• Service		\$31,900	\$52,600	\$53,300
• Disability		21,200	27,500	28,300
• Service Retirements in last 5 years		34,500	54,200	55,400

⁶ Average County provided pensions are based on County service & County benefit formula, and are not representative of benefits for long service employees.

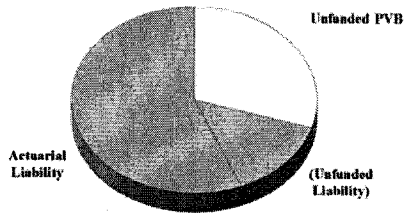


MEMBERS INCLUDED IN VALUATION - SAFETY

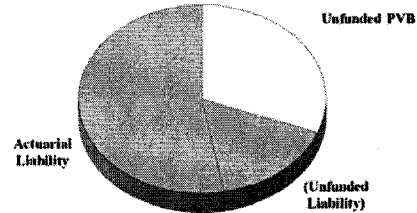


FUNDED RATIO - SAFETY

Present Value of Benefits
June 30, 2015



Present Value of Benefits
June 30, 2016



June 30, 2015		June 30, 2016
\$ 1,383,900,000	Active AAL	\$ 1,540,300,000
1,398,400,000	Retiree AAL	1,500,500,000
<u>63,700,000</u>	Inactive AAL	<u>69,500,000</u>
2,846,000,000	Total AAL	3,110,300,000
<u>2,140,600,000</u>	Market Asset Value	<u>2,152,000,000</u>
(705,400,000)	(Unfunded Liability)	(958,300,000)

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FUNDED RATIO - SAFETY

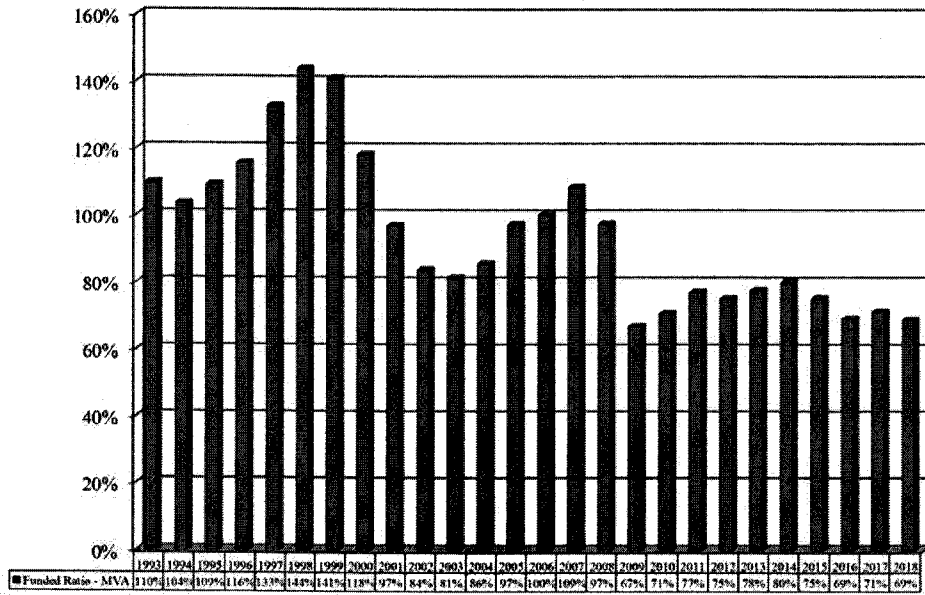
- What happened between 6/30/15 and 6/30/16?
 - Unfunded Liability (Increase)/Decrease ≈ \$(252.9) million
- Gains (losses)
 - Asset gain/(loss) ≈ \$(152.3) million
 - Assumption Change ≈ \$(53.3) million
 - Actuarial gain/(loss) ≈ \$(13.2) million
 - Average Salary \$86,800 → \$86,800
 - Number of Actives 3,680 → 3,731
 - Number of Inactives 1,118 → 1,167
 - Number of Retirees 2,275 → 2,391
 - Other gain/(loss) ≈ \$(34.1) million
 - Contributions
 - Other (expected)

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FUNDED RATIO - SAFETY



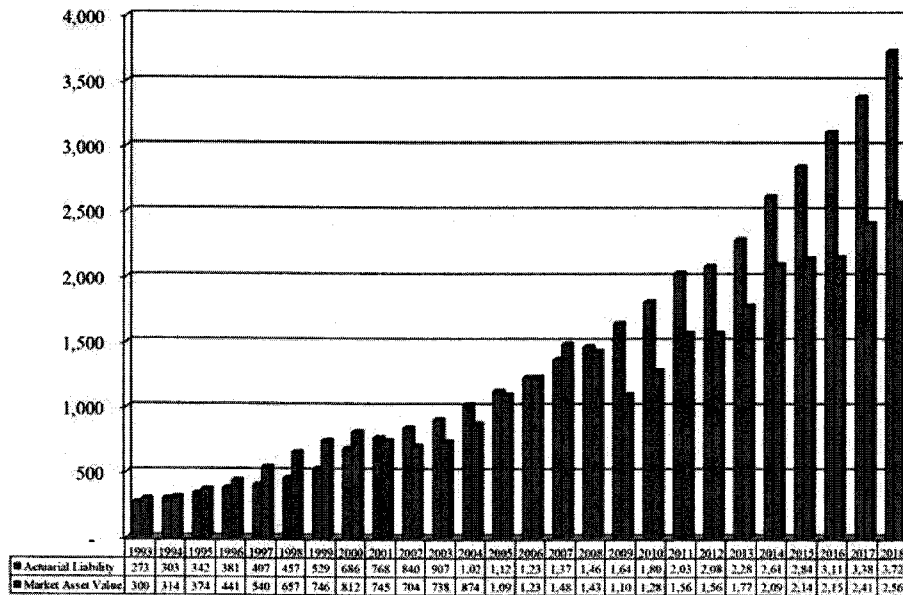
6/30/17 & 6/30/18 funded status estimated.



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FUNDED STATUS (MILLIONS) - SAFETY



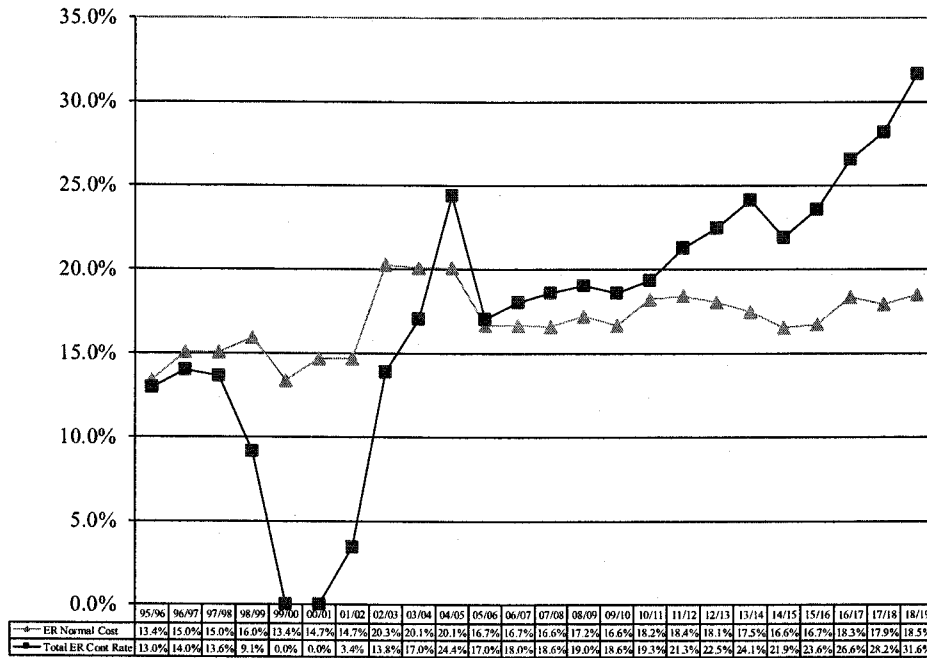
6/30/17 & 6/30/18 funded status estimated.



December 13, 2017



CONTRIBUTION RATES - SAFETY



December 13, 2017



CONTRIBUTION RATES - SAFETY

	6/30/15 2017/2018	6/30/16 2018/2019
■ Total Normal Cost	27.1%	27.7%
■ Employee Normal Cost	9.2%	9.2%
■ Employer Normal Cost	17.9%	18.5%
■ Amortization Bases	<u>10.2%</u>	<u>13.2%</u>
■ Total Employer Contribution Rate	28.2%	31.6%
■ Amortization Period	Multiple	Multiple
■ What Happened from 6/30/15 to 6/30/16:		
● 2017/18 Rate	28.2%	
● Payroll > Expected	(0.3%)	
● Asset Method Change (4 th Year)	1.4%	
● 6/30/14 Assumption Change (3 rd Year)	1.0%	
● 6/30/14 (Gains)/Losses (3 rd Year)	(0.8%)	
● 6/30/15 (Gains)/Losses (2 nd Year)	0.7%	
● 6/30/16 Discount Rate change (1 st Year)	1.1%	
● 6/30/16 (Gains)/Losses (1 st Year)	<u>0.3%</u>	
● 2018/19 Rate	31.6%	



December 13, 2017



CONTRIBUTION PROJECTIONS - SAFETY

- **Market Value Investment Return:**
 - June 30, 2016 0.6%⁷
 - June 30, 2017 11.2%⁸
 - Future returns based on stochastic analysis using 1,000 trials

<u>Single Year Returns at⁹</u>	<u>25th Percentile</u>	<u>50th Percentile</u>	<u>75th Percentile</u>
● 7.0% Investment Mix	0.1%	7.0%	14.8%
● 6.0% Investment Mix	0.8%	6.0%	11.4%

 - Assumes investment returns will, generally be 6.5% (as compared to 7.0%) over the next 10 years and higher beyond that.
- No Other: Gains/Losses, Method/Assumption Changes, Benefit Improvements
- Excludes Employer Paid Member Contributions (EPMC)
- Includes Classic Tier Members (2%@50)

⁷ Based on CalPERS 6/30/16 CAFR.

⁸ Based on CalPERS press release on 7/14/17, preliminary investment return of 11.2%.

⁹ Nth percentile means N percentage of our trials result in returns lower than the indicated rates.



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CONTRIBUTION PROJECTIONS - SAFETY

- **New hire assumptions:**
 - Assumes 50% of 2013 new hires will be Classic Members (2%@50) and 50% will be New Members with PEPRAs benefits
 - Assumes Classic Members will decrease from 50% to 0% of new hires over 10 years

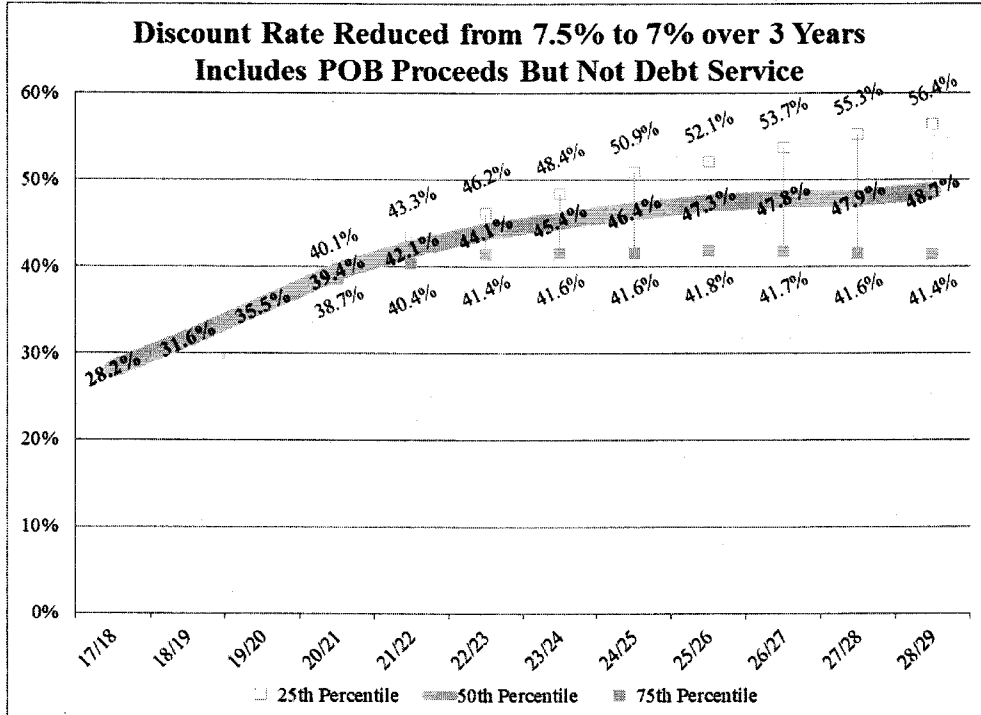


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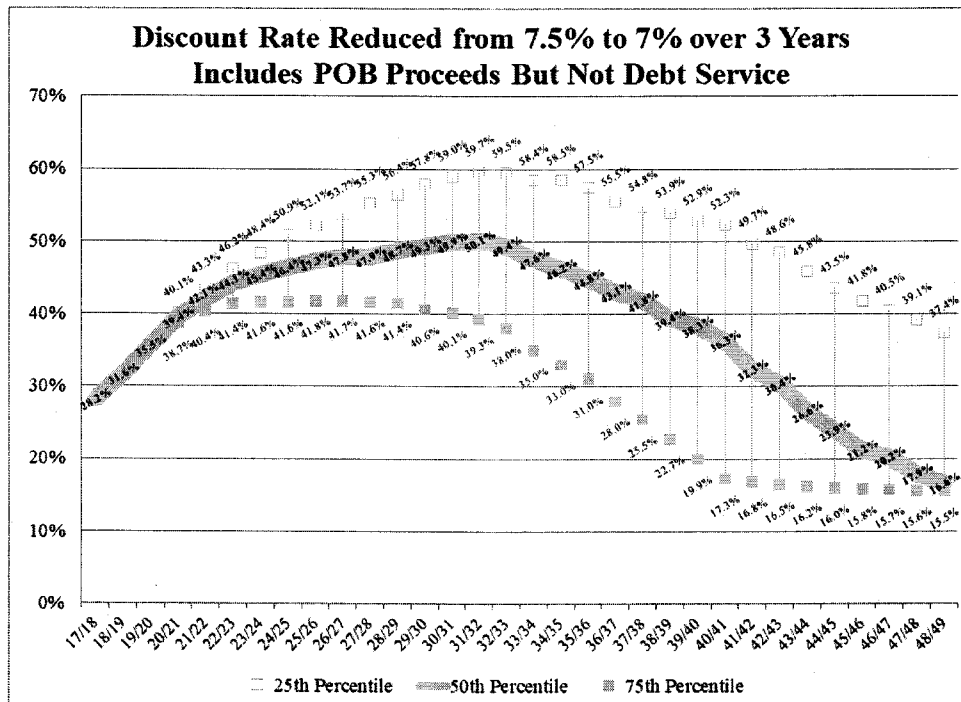
CONTRIBUTION PROJECTIONS - SAFETY



December 13, 2017



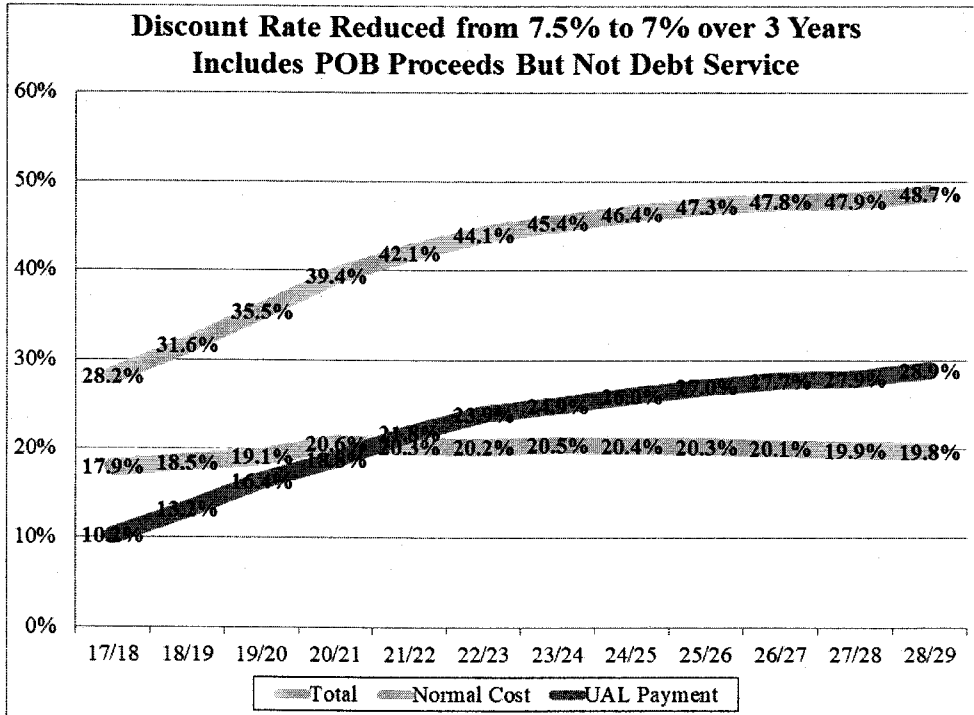
CONTRIBUTION PROJECTIONS - SAFETY



December 13, 2017



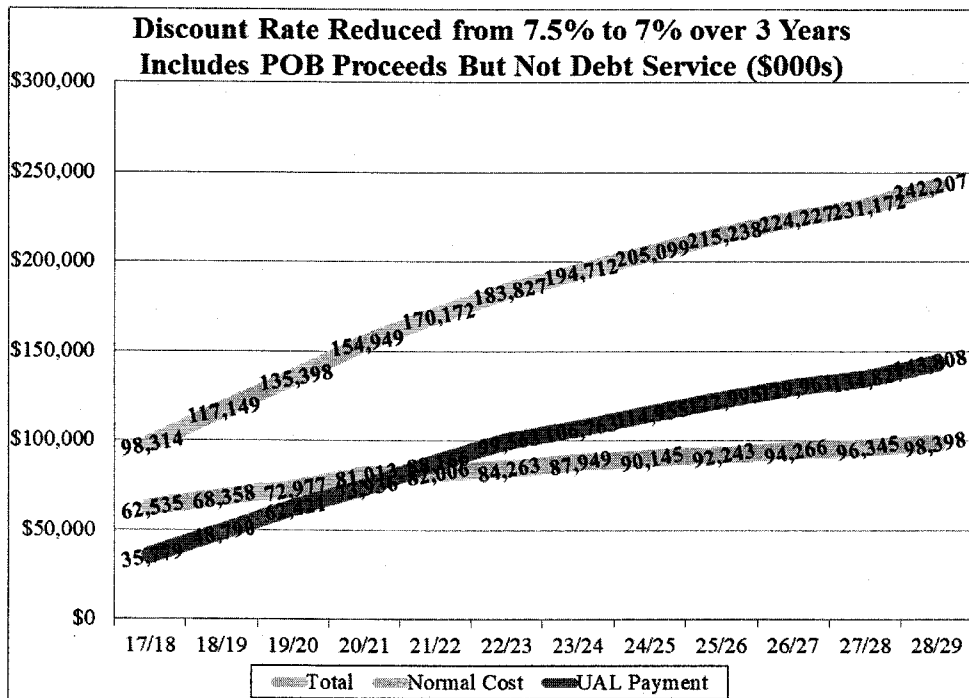
CONTRIBUTION PROJECTIONS - SAFETY



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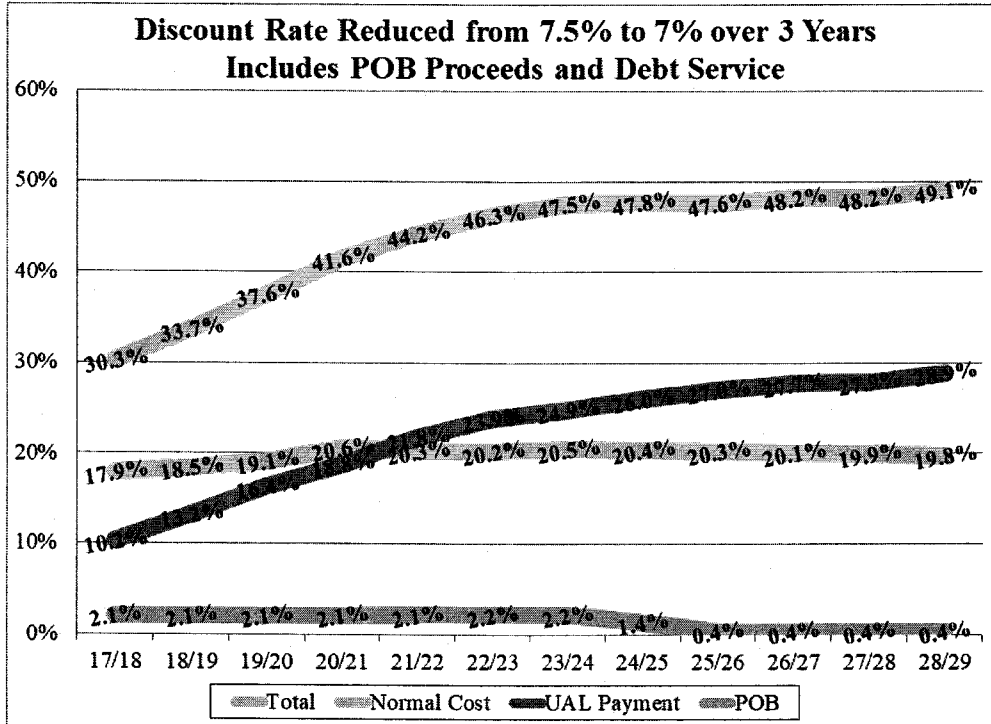
CONTRIBUTION PROJECTIONS - SAFETY



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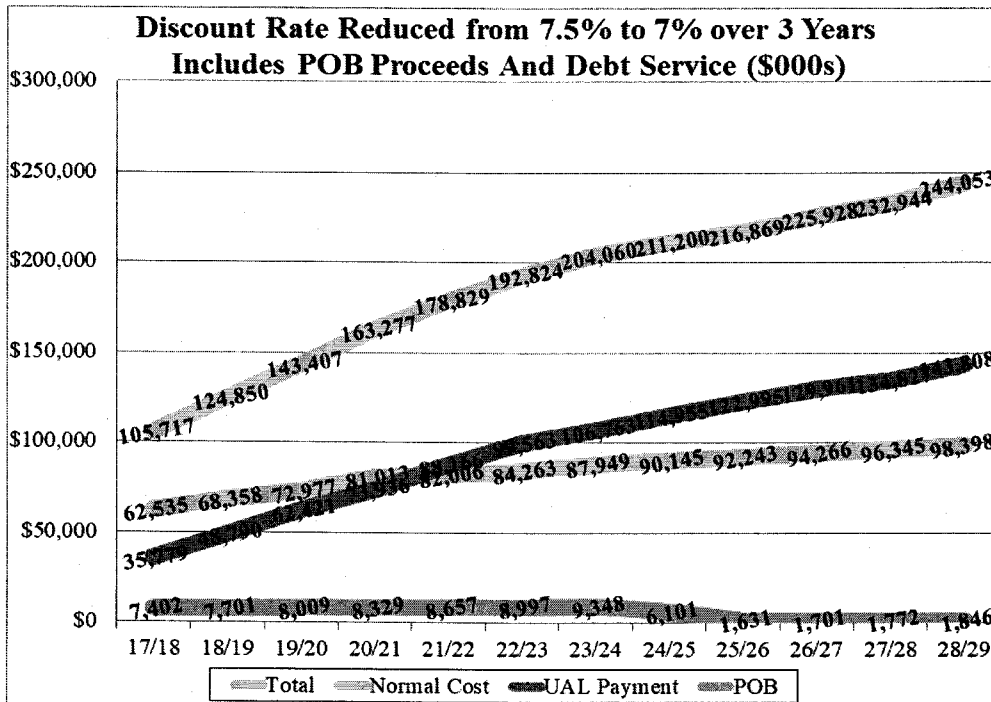
CONTRIBUTION PROJECTIONS - SAFETY



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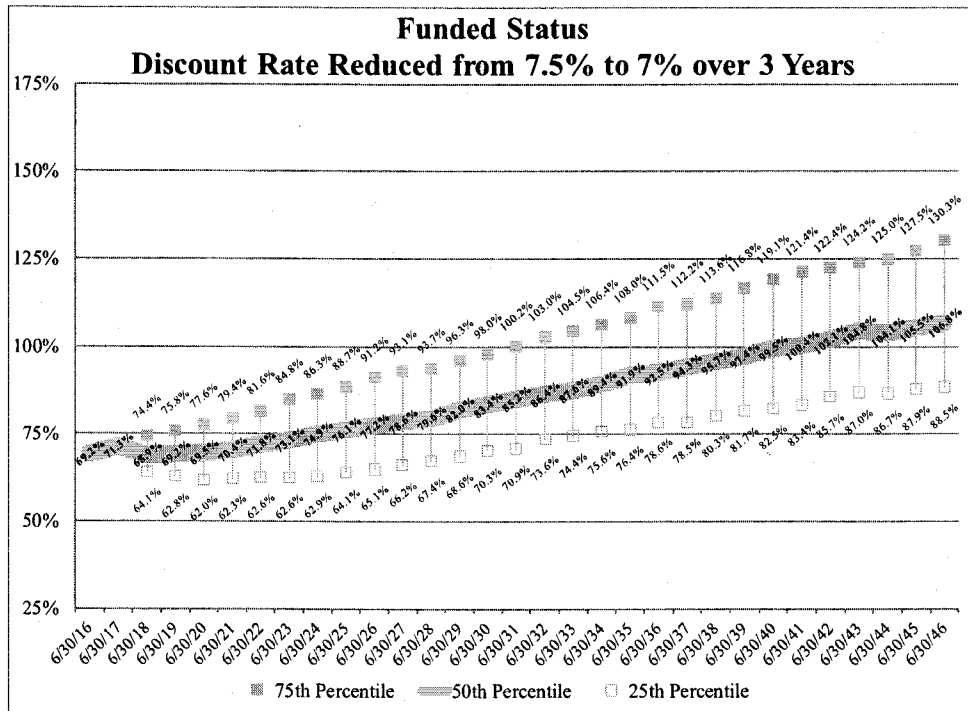
CONTRIBUTION PROJECTIONS - SAFETY



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FUNDED STATUS – SAFETY



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COUNTY RATES COMPARED TO OTHER AGENCIES

Projected 2024/25 Contribution Rates From CalPERS¹⁰

Counties		
Percentile	Miscellaneous	Safety
10th	24.0%	40.7%
25th	26.2	42.2
50th	28.7	48.1
75th	32.4	54.5
90th	36.4	58.4
County ¹¹	26.7	42.9

¹⁰ CalPERS projected rates adjusted for 6/30/17 actual investment return and PEPRA.

¹¹ Projected County rates from CalPERS data. Bartel Associates 2024/25 projected rates (28.3% for Miscellaneous & 46.4% for Safety) are higher due to lower expected investment returns and CalPERS Risk Mitigation strategy.



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POB (MILLIONS) BOND PROCEEDS BALANCE

	<u>Safety</u>	<u>Misc.</u>	<u>Total</u>
■ POB @ 2/16/05	\$ 85.7	\$ 311.2	\$ 396.9
·			
·			
·			
■ Balance @ 6/30/17	89.7	325.6	415.3
■ Earning 7/1/17 - 2/15/18 ¹²	2.3	8.4	10.7
■ Amortization payment through 2/15/18 ¹³	<u>(3.6)</u>	<u>(13.1)</u>	<u>(16.7)</u>
■ Balance @ 2/15/18	88.4	320.9	409.3

¹² Based on CalPERS 5.1% actual return from 7/1/17 through 10/31/17 and assumed return from 11/1/17 to 2/15/2018.

¹³ Based on a 26 year closed amortization



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POB (MILLIONS) BOND PROCEEDS BALANCE

	<u>Payments</u>			<u>Balance</u>
	<u>Principal</u>	<u>Interest</u>	<u>Total</u>	
■ 2/17/05	n/a	n/a	n/a	\$400.0
■ 8/15/05	n/a	\$9.4	\$9.4	400.0
·				
·				
·				
■ 2/15/2017	\$18.0	7.5	25.5	286.5
■ 8/15/2017	0.0	7.1	7.1	286.5
■ 2/15/2018	20.2	7.1	27.2	266.4



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POB (MILLIONS)

■	Net Estimated Gains through February 15, 2018:	
	A. CalPERS Estimated Balance	\$ 409.3
	B. Bond Proceeds Balance	266.4
	C. Cash Flow Savings/(Deficit)	
	[Payments that would have been paid to CalPERS less POB debt service]	<u>(50.1)</u>
	D. Net [(A) – (B) + (C)]	92.4
■	Net Estimated Gains through February 15, 2018:	
	E. CalPERS Investment Earnings	\$320.5
	F. POB Interest Payments	225.0
	G. Cost of Issuance	<u>3.1</u>
	H. Net [(E) – (F) – (G)]	92.4
■	Above estimates based on market rate of return.	



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NET FUNDED RATIO (MILLIONS)

	Safety			
	<u>6/30/15</u>	<u>6/30/16</u>	<u>Proj. 6/30/17</u>	<u>Proj. 6/30/18¹⁴</u>
(1) AAL	\$2,846	\$3,110	\$3,380	\$3,728
(2) MVA	<u>2,141</u>	<u>2,152</u>	<u>2,410</u>	<u>2,567</u>
(3) UAAL [(1) - (2)]	705	958	970	1,161
(4) Funding Ratio [(2)/(1)]	75.2%	69.2%	71.3%	68.9%
(5) POB Balance	\$69	\$66	\$62	\$58
(6) Net MVA [(2) - (5)]	2,072	2,086	2,348	2,509
(7) Net Funding Ratio [(6)/(1)]	72.8%	67.1%	69.5%	67.3%

¹⁴ Projected 6/30/18 MVA based on assumed returns for 2017/18.



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NET FUNDED RATIO (MILLIONS)

	Miscellaneous			
	<u>6/30/15</u>	<u>6/30/16</u>	<u>Proj. 6/30/17</u>	<u>Proj. 6/30/18¹⁵</u>
(1) AAL	\$6,174	\$6,850	\$7,425	\$8,155
(2) MVA	<u>4,775</u>	<u>4,800</u>	<u>5,367</u>	<u>5,702</u>
(3) UAAL [(1) - (2)]	1,399	2,050	2,058	2,453
(4) Funding Ratio [(2)/(1)]	77.3%	70.1%	72.3%	69.9%
(5) POB Balance	\$251	\$239	\$225	\$209
(6) Net MVA [(2) - (5)]	4,524	4,561	5,142	5,493
(7) Net Funding Ratio [(6)/(1)]	73.3%	66.6%	69.3%	67.4%

¹⁵ Projected 6/30/18 MVA based on assumed returns for 2017/18.



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NET FUNDED RATIO (MILLIONS)

	Total			
	<u>6/30/15</u>	<u>6/30/16</u>	<u>Proj. 6/30/17</u>	<u>Proj. 6/30/18¹⁶</u>
(1) AAL	\$9,020	\$9,960	\$10,805	\$11,883
(2) MVA	<u>6,916</u>	<u>6,952</u>	<u>7,777</u>	<u>8,268</u>
(3) UAAL [(1) - (2)]	2,104	3,008	3,028	3,615
(4) Funding Ratio [(2)/(1)]	76.7%	69.8%	72.0%	69.6%
(5) POB Balance	\$320	\$305	\$287	\$266
(6) Net MVA [(2) - (5)]	46,596	46,647	47,490	48,002
(7) Net Funding Ratio [(6)/(1)]	73.1%	66.7%	69.3%	67.3%

¹⁶ Projected 6/30/18 MVA based on assumed returns for 2017/18.



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PEPRA COST SHARING

- Target of 50% of total normal cost for everyone
- *New members* must pay greater of 50% of total normal cost or bargained amount if higher
- Employer cannot pay any part of *new member* required employee contributions
- Employer may impose Classic employees pay 50% of total normal cost (limited to 8% Miscellaneous, 12% Safety) if not agreed through collective bargaining by 1/1/18
- Miscellaneous Plan:

	<u>Classic Members</u>		<u>New Members</u>
	Tier 1	Tier 2	PEPRA
	<u>3% @ 60 FAE1</u>	<u>2% @ 60 FAE3</u>	<u>2% @ 62 FAE3</u>
● Employer Normal Cost ¹⁷	11.5%	7.3%	6.86%
● Member Normal Cost	<u>8.0%</u>	<u>7.0%</u>	<u>6.50%</u>
● Total Normal Cost	19.5%	14.3%	13.36%
● 50% Target	9.8%	7.2%	6.68%

¹⁷ Estimated for Tier 1 and Tier 2.



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PEPRA COST SHARING

- Safety Plan:

	<u>Classic Members</u>		<u>New Members</u>
	Tier 1	Tier 2	Tier 1
	<u>3% @ 50 FAE1</u>	<u>2% @ 50 FAE3</u>	<u>2.7% @ 57 FAE1</u>
● Employer Normal Cost ¹⁸	20.3%	15.0%	11.40%
● Member Normal Cost	<u>9.0%</u>	<u>9.0%</u>	<u>11.25%</u>
● Total Normal Cost	29.3%	24.0%	22.65%
● 50% Target	14.7%	12.0%	11.33%

¹⁸ Estimated for Tier 1 and Tier 2.



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PAYING DOWN THE UNFUNDED LIABILITY & RATE STABILIZATION

- Where do you get the money from?
- How do you use the money?



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WHERE DO YOU GET THE MONEY FROM?

- POB:
 - Usually thought of as interest arbitrage between expected earnings and rate paid on POB
 - No guaranteed savings
 - Including paying off CalPERS Side Fund
 - PEPPRA prevents contributions from dropping below normal cost
 - Savings offset when investment return is good
 - GFOA White Paper
- Borrow from General Fund
 - Excess Reserves?
 - Pay GF back like a loan
 - Payments should come from all funds



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WHERE DO YOU GET THE MONEY FROM?

- One time payments
 - Council resolution to use a portion of one time money, e.g.
 - 1/3 to one time projects
 - 1/3 to replenish reserves and
 - 1/3 to pay down unfunded liability



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HOW DO YOU USE THE MONEY?

- Make payments directly to CalPERS:
 - Treat as contribution gain:
 - CalPERS default
 - Very modest short term contribution impact
 - Apply to all bases in proportion:
 - Lowers payment
 - Does not shorten amortization period
 - Request shorter amortization period (Fresh Start):
 - Higher short term payments
 - Less interest and lower long term payments
 - PEPPRA prevents contributions from dropping below normal cost
 - Savings offset when investment return is good



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HOW DO YOU USE THE MONEY?

- Make payments directly to CalPERS (continued):
 - Target specific amortization bases:
 - Paying off shorter amortization bases, larger contribution savings over shorter period:
 - e.g. 10 year base gets 12.5¢ for \$1
 - Less interest savings compared to paying off longer amortization bases
 - Paying off longer amortization bases, smaller contribution savings over longer period:
 - e.g. 25 year base gets 6.6¢ for \$1
 - More interest savings compared to paying off shorter amortization bases



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HOW DO YOU USE THE MONEY?

- Internal Service Fund
 - Typically used for rate stabilization
 - Restricted investments:
 - Likely low (0.5%-1.0%) investment returns
 - Short term/high quality, designed for preservation of principal
 - Assets can be used by Council for other purposes
 - Does not reduce Unfunded Liability



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IRREVOCABLE SUPPLEMENTAL (§115) PENSION TRUST

- > 100 trusts established
 - PARS, PFM & Keenan
- Investments significantly less restricted than County investment funds:
 - Likely higher (4% - 6%) but more volatile investment returns
- Trust Assets:
 - Can't be used by Council for other purposes
 - Can only be used to:
 - Reimburse County for CalPERS contributions
 - Make payments directly to CalPERS
 - Will not reduce Net Pension Liability:
 - County total net financial position will be the same



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IRREVOCABLE SUPPLEMENTAL (§115) PENSION TRUST

- Consider:
 - How much can you put into Trust?
 - Initial seed money?
 - Additional amounts in future years?
 - When do you take money out?
 - Target budget rate?
 - Year target budget rate kicks in?
 - Before or after CalPERS rate exceeds budgeted rate?



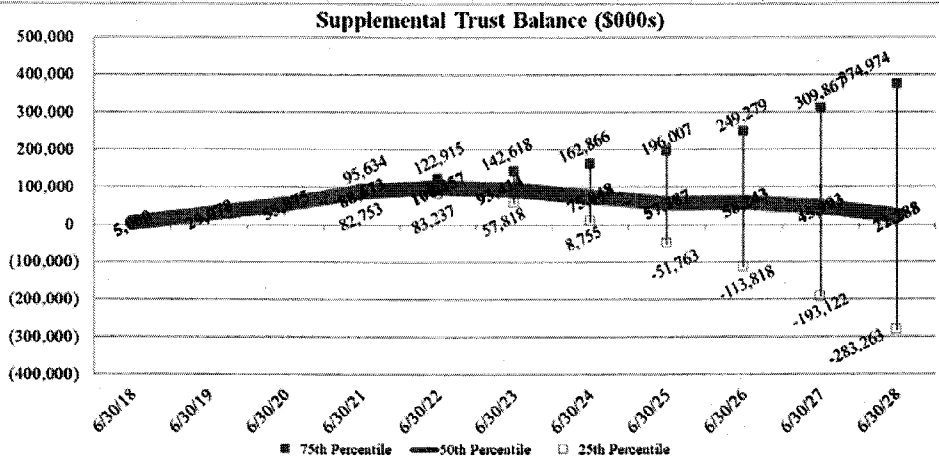
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IRREVOCABLE SUPPLEMENTAL (§115) PENSION TRUST

	Miscellaneous Plan Rate Stabilization Fund Balance										
	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29
Initial 6/30/18 Fund Balance (\$000)	5,000										
Stabilization Fund - Rate of Return	5.0%										
Target Rate	28.5%										
(A) Add'l Contribution \$ (\$000)	-										
(B) Add'l Contribution - % of pay	-										
(A) + (B) as % of Pay	-										
Budget - CalPERS Rate	-										
Contribute at Target Rate?	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y

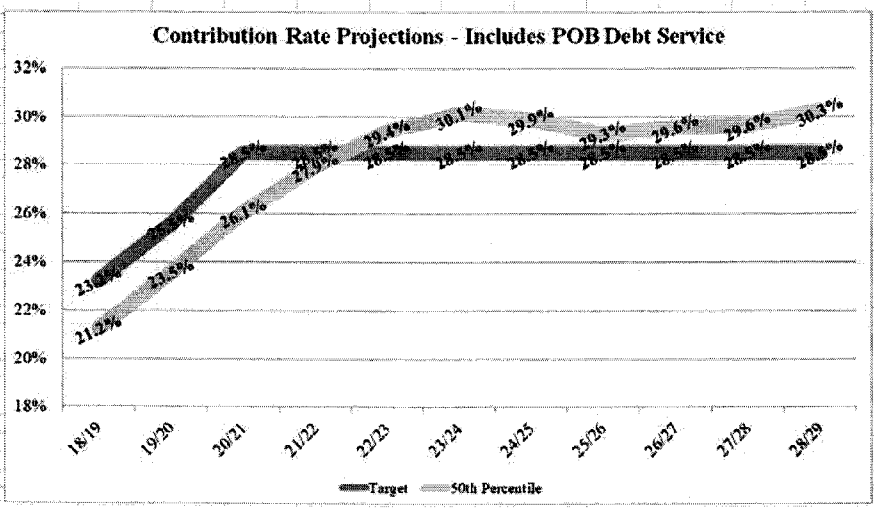


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IRREVOCABLE SUPPLEMENTAL (§115) PENSION TRUST

	Miscellaneous Plan Rate Stabilization Fund Balance										
	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29
Initial 6/30/18 Fund Balance (\$000)	5,000										
Stabilization Fund - Rate of Return	5.0%										
Target Rate	28.5%										
(A) Add'l Contribution \$ (\$000)	-										
(B) Add'l Contribution - % of pay	-										
(A) + (B) as % of Pay	-										
Budget - CalPERS Rate	-										
Contribute at Target Rate?	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y

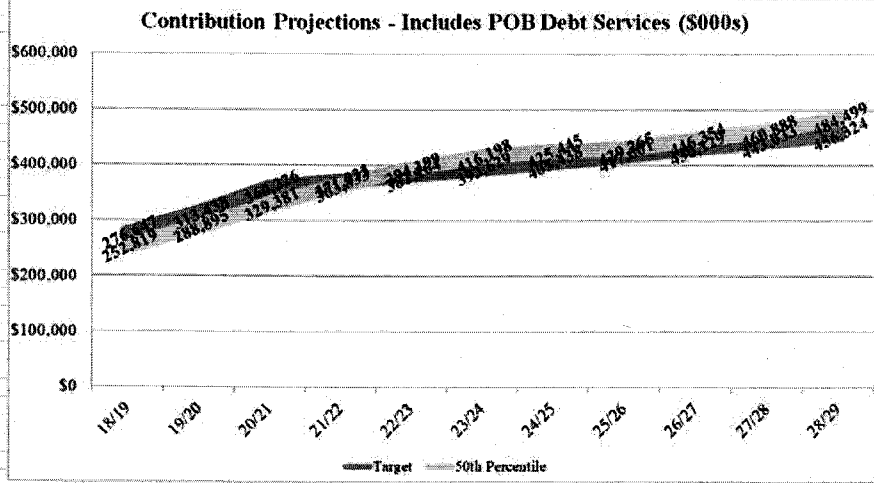


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IRREVOCABLE SUPPLEMENTAL (\$115) PENSION TRUST

Initial 6/30/18 Fund Balance (\$000)	5,000	Miscellaneous Plan Rate Stabilization Fund Balance										Calculate
Stabilization Fund - Rate of Return	5.0%											
Target Rate	28.5%	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29
(A) Add'l Contribution \$ (\$000)												
(B) Add'l Contribution - % of pay	2.0%	2.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(A) + (B) as % of Pay	2.0%	2.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Budget - CalPERS Rate	23.2%	25.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%	28.5%
Contribute at Target Rate?	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y



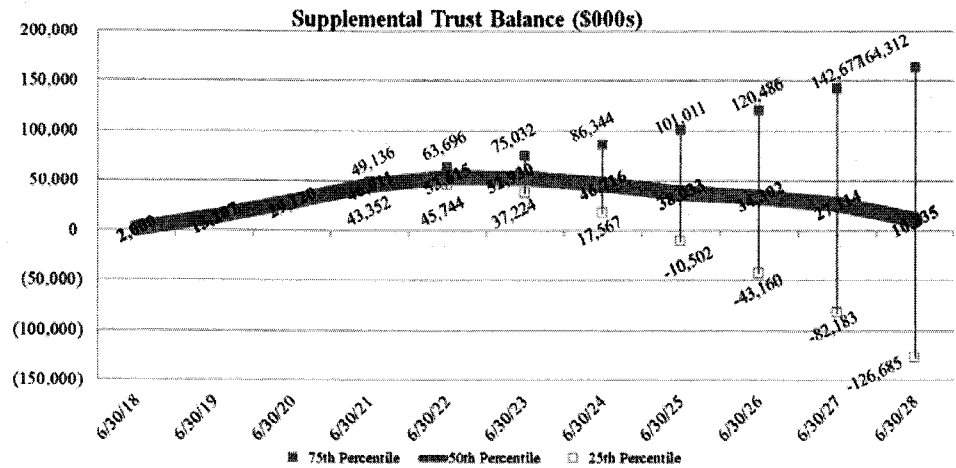
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IRREVOCABLE SUPPLEMENTAL (\$115) PENSION TRUST

Initial 6/30/18 Fund Balance (\$000)	2,000	Safety Plan Rate Stabilization Fund Balance										Calculate
Stabilization Fund - Rate of Return	8.0%											
Target Rate	45.5%	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29
(A) Add'l Contribution \$ (\$000)												
(B) Add'l Contribution - % of pay	3.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(A) + (B) as % of Pay	3.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Budget - CalPERS Rate	36.7%	41.6%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%
Contribute at Target Rate?	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y



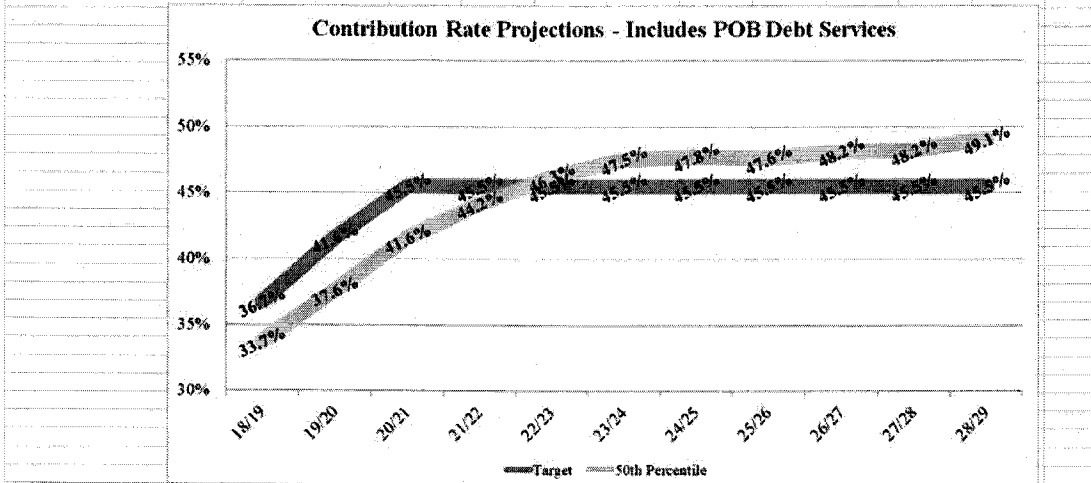
(B)

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IRREVOCABLE SUPPLEMENTAL (\$115) PENSION TRUST

Initial 6/30/18 Fund Balance (\$000)	2,000	Safety Plan Rate Stabilization Fund Balance										Calculate
Stabilization Fund - Rate of Return	5.0%											
Target Rate	45.5%											
		18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29
(A) Add'l Contribution \$ (\$000)												
(B) Add'l Contribution - % of pay		3.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(A) + (B) as % of Pay		3.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Budget - CalPERS Rate		36.7%	41.6%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%
Contribute at Target Rate?		N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y

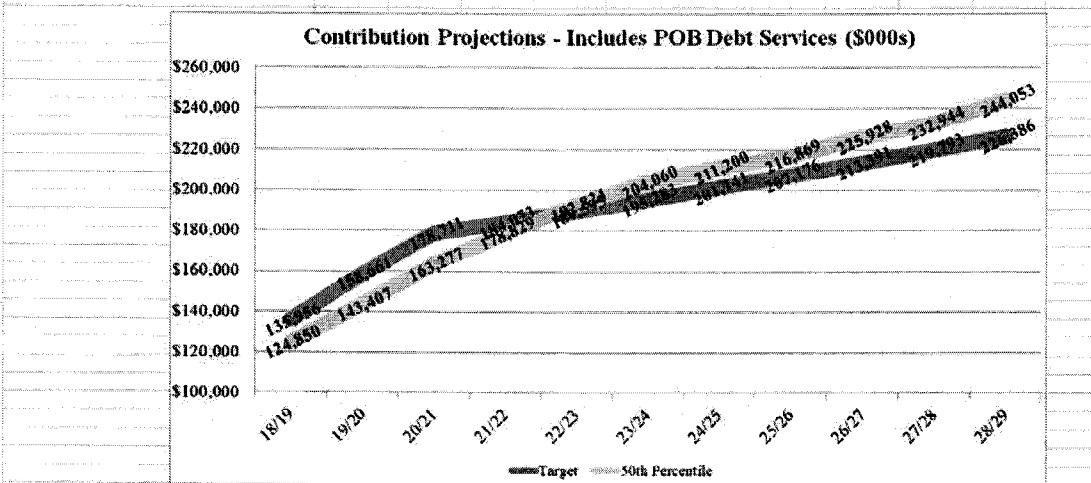


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IRREVOCABLE SUPPLEMENTAL (\$115) PENSION TRUST

Initial 6/30/18 Fund Balance (\$000)	2,000	Safety Plan Rate Stabilization Fund Balance										Calculate
Stabilization Fund - Rate of Return	5.0%											
Target Rate	45.5%											
		18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29
(A) Add'l Contribution \$ (\$000)												
(B) Add'l Contribution - % of pay		3.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(A) + (B) as % of Pay		3.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Budget - CalPERS Rate		36.7%	41.6%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%	45.5%
Contribute at Target Rate?		N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y



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California Public Employees' Retirement System
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July 2017

MISCELLANEOUS PLAN OF THE COUNTY OF RIVERSIDE (CalPERS ID: 5982690295)
Annual Valuation Report as of June 30, 2016

Dear Employer,

As an attachment to this letter, you will find a copy of the June 30, 2016 actuarial valuation report of your pension plan. Your 2016 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 31, 2017.

Required Contributions

The exhibit below displays the minimum required employer contributions and the Employee PEPRA Rate for Fiscal Year 2018-19 along with estimates of the required contributions for Fiscal Years 2019-20 and 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
2018-19	10.458%	\$100,265,926	6.50%
<i>Projected Results</i>			
2019-20	11.0%	\$130,703,000	TBD
2020-21	12.1%	\$157,438,000	TBD

The actual investment return for Fiscal Year 2016-17 was not known at the time this report was prepared. The projections above assume the investment return for that year would be 7.375 percent. ***If the actual investment return for Fiscal year 2016-17 differs from 7.375 percent, the actual contribution requirements for the projected years will differ from those shown above.***

Moreover, the projected results for Fiscal Years 2019-20 and 2020-21 also 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 2019-20 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. Actual contributions for Fiscal Year 2018-19 and all future years will be collected on that basis. 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 on page 21 also contains estimated employer contributions in future years under a variety of investment return scenarios.

Changes since the Prior Year's Valuation

On December 21, 2016, the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three year phase-in beginning with the June 30, 2016 actuarial valuations. The minimum employer contributions for Fiscal Year 2018-19 determined in this valuation were calculated using a discount rate of 7.375 percent. The projected employer contributions on Page 5 are calculated assuming that the discount rate will be lowered to 7.25 percent next year and to 7.00 percent the following year as adopted by the Board.

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 addresses 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 have been modified to 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 a number of 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 31 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, 2016**

**for the
MISCELLANEOUS PLAN
of the
COUNTY OF RIVERSIDE**

(CalPERS ID: 5982690295)

(Rate Plan ID: 62)

**REQUIRED CONTRIBUTIONS
FOR FISCAL YEAR
July 1, 2018 – June 30, 2019**

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ACTUARIAL CERTIFICATION

To the best of our knowledge, this report is complete and accurate and contains sufficient information to disclose, fully and fairly, the funded condition of the MISCELLANEOUS PLAN OF THE COUNTY OF RIVERSIDE. This valuation is based on the member and financial data as of June 30, 2016 provided by the various CalPERS databases and the benefits under this plan with CalPERS as of the date this report was produced. It is our opinion that the valuation has been performed in accordance with generally accepted actuarial principles, in accordance with standards of practice prescribed by the Actuarial Standards Board, and that the assumptions and methods are internally consistent and reasonable for this plan, as prescribed by the CalPERS Board of Administration according to provisions set forth in the California Public Employees' Retirement Law.

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



KURT SCHNEIDER, ASA, FCA, MAAA
Senior Pension Actuary, CalPERS

HIGHLIGHTS AND EXECUTIVE SUMMARY

- **INTRODUCTION**
- **PURPOSE OF THE REPORT**
- **REQUIRED CONTRIBUTIONS**
- **PLAN'S FUNDED STATUS**
- **PROJECTED EMPLOYER CONTRIBUTIONS**
- **COST**
- **CHANGES SINCE THE PRIOR YEAR'S VALUATION**
- **SUBSEQUENT EVENTS**

Introduction

This report presents the results of the June 30, 2016 actuarial valuation of the MISCELLANEOUS PLAN OF THE COUNTY OF RIVERSIDE of the California Public Employees' Retirement System (CalPERS). This actuarial valuation sets the required employer contributions for Fiscal Year 2018-19.

Purpose of the Report

The actuarial valuation was prepared by the CalPERS Actuarial Office using data as of June 30, 2016. The purpose of the report is to:

- Set forth the assets and accrued liabilities of this plan as of June 30, 2016;
- Determine the required employer contributions for the fiscal year July 1, 2018 through June 30, 2019;
- Provide actuarial information as of June 30, 2016 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 15.

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	2018-19
Employer Normal Cost Rate	10.458%
<i>Plus Either</i>	
1) Monthly Employer Dollar UAL Payment	\$ 8,355,494
<i>Or</i>	
2) Annual UAL Prepayment Option	\$ 96,761,319
Required PEPRA Member Contribution Rate	6.50%
<p><i>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).</i></p> <p><i>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.</i></p> <p><i>§20572 of the Public Employees' Retirement Law assesses interest at an annual rate of 10 percent if a contracting agency fails to remit the required contributions when due.</i></p> <p><i>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.</i></p>	

	Fiscal Year	Fiscal Year
	2017-18	2018-19
Normal Cost Contribution as a Percentage of Payroll		
Total Normal Cost	17.750%	17.970%
Employee Contribution ¹	7.558%	7.512%
Employer Normal Cost	10.192%	10.458%
Projected Annual Payroll for Contribution Year	\$ 1,092,970,840	\$ 1,191,395,234
Estimated Employer Contributions Based On Projected Payroll		
Total Normal Cost	\$ 194,002,323	\$ 214,093,722
Employee Contribution ¹	82,606,736	89,497,610
Employer Normal Cost	111,395,587	124,596,112
Unfunded Liability Contribution	73,598,564	100,265,926
% of Projected Payroll (illustrative only)	6.734%	8.416%
Estimated Total Employer Contribution	\$ 184,994,151	\$ 224,862,038
% of Projected Payroll (illustrative only)	16.926%	18.874%

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.

Plan's Funded Status

	June 30, 2015	June 30, 2016
1. Present Value of Projected Benefits	\$ 7,524,167,159	\$ 8,349,752,530
2. Entry Age Normal Accrued Liability	6,174,498,346	6,850,143,825
3. Market Value of Assets (MVA)	\$ 4,775,099,013	\$ 4,799,576,566
4. Unfunded Accrued Liability (UAL) [(2) – (3)]	\$ 1,399,399,333	\$ 2,050,567,259
5. Funded Ratio [(3) / (2)]	77.3%	70.1%

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 PEPRAs or other lower cost benefit tiers.

Fiscal Year	Required Contribution	Projected Future Employer Contributions (Assumes 7.375% Return for Fiscal Year 2016-17)					
	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Normal Cost %	10.458%	11.0%	12.1%	12.1%	12.1%	12.1%	12.1%
UAL Payment	100,265,926	130,703,000	157,438,000	188,567,000	214,804,000	230,893,000	244,471,000
<i>Total as a % of Payroll*</i>	<i>18.9%</i>	<i>21.6%</i>	<i>24.5%</i>	<i>26.5%</i>	<i>28.1%</i>	<i>28.8%</i>	<i>29.3%</i>
<i>Projected Payroll</i>	<i>1,191,395,234</i>	<i>1,227,137,090</i>	<i>1,263,951,203</i>	<i>1,301,869,739</i>	<i>1,340,925,831</i>	<i>1,381,153,606</i>	<i>1,422,588,214</i>

*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 unanticipated 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 changes in the discount rate for the next two valuations in combination with the 5-year phase-in ramp, the increases in the required contributions are expected to continue for seven years from Fiscal Year 2018-19 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 will be expressed as a dollar amount and will be invoiced on a monthly basis. There will 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, 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 7.0 percent over the 20 years ending June 30, 2016, yet individual fiscal year returns have ranged from -24 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.

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 valuations. The minimum employer contributions for Fiscal Year 2018-19 determined in this valuation were calculated using a discount rate of 7.375 percent. The projected employer contributions on Page 5 are calculated assuming that the discount rate will be lowered to 7.25 percent next year and 7.00 percent the following 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.

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 three year discount rate schedule. A comprehensive analysis of all actuarial assumptions and methods including the discount rate will be conducted in 2017.

Subsequent Events

The contribution requirements determined in this actuarial valuation report are based on demographic and financial information as of June 30, 2016. Changes in the value of assets subsequent to that date are not reflected. Declines in asset values will increase the required contribution, while investment returns above the assumed rate of return will decrease the actuarial cost of the plan.

This actuarial valuation report reflects statutory changes, regulatory changes and CalPERS Board actions through January 2017. Any subsequent changes or actions are not reflected.

ASSETS

- **RECONCILIATION OF THE MARKET VALUE OF ASSETS**
- **ASSET ALLOCATION**
- **CALPERS HISTORY OF INVESTMENT RETURNS**

Reconciliation of the Market Value of Assets

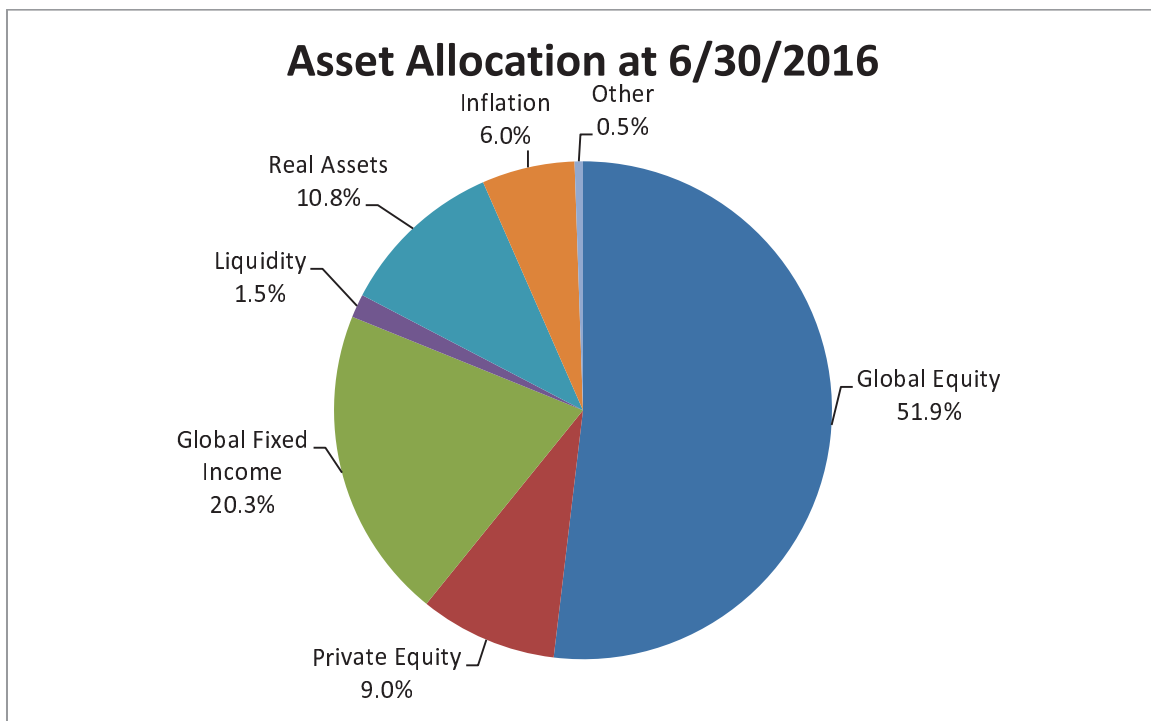
1.	Market Value of Assets as of 6/30/15 including Receivables	\$	4,775,099,013
2.	Change in Receivables for Service Buybacks		(1,556,100)
3.	Employer Contributions		158,768,801
4.	Employee Contributions		81,228,656
5.	Benefit Payments to Retirees and Beneficiaries		(229,477,949)
6.	Refunds		(6,872,276)
7.	Lump Sum Payments		0
8.	Transfers and Miscellaneous Adjustments		3,775,137
9.	Net Investment Return		18,611,284
10.	Market Value of Assets as of 6/30/16 including Receivables	\$	<u>4,799,576,566</u>

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 February 19, 2014, 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.

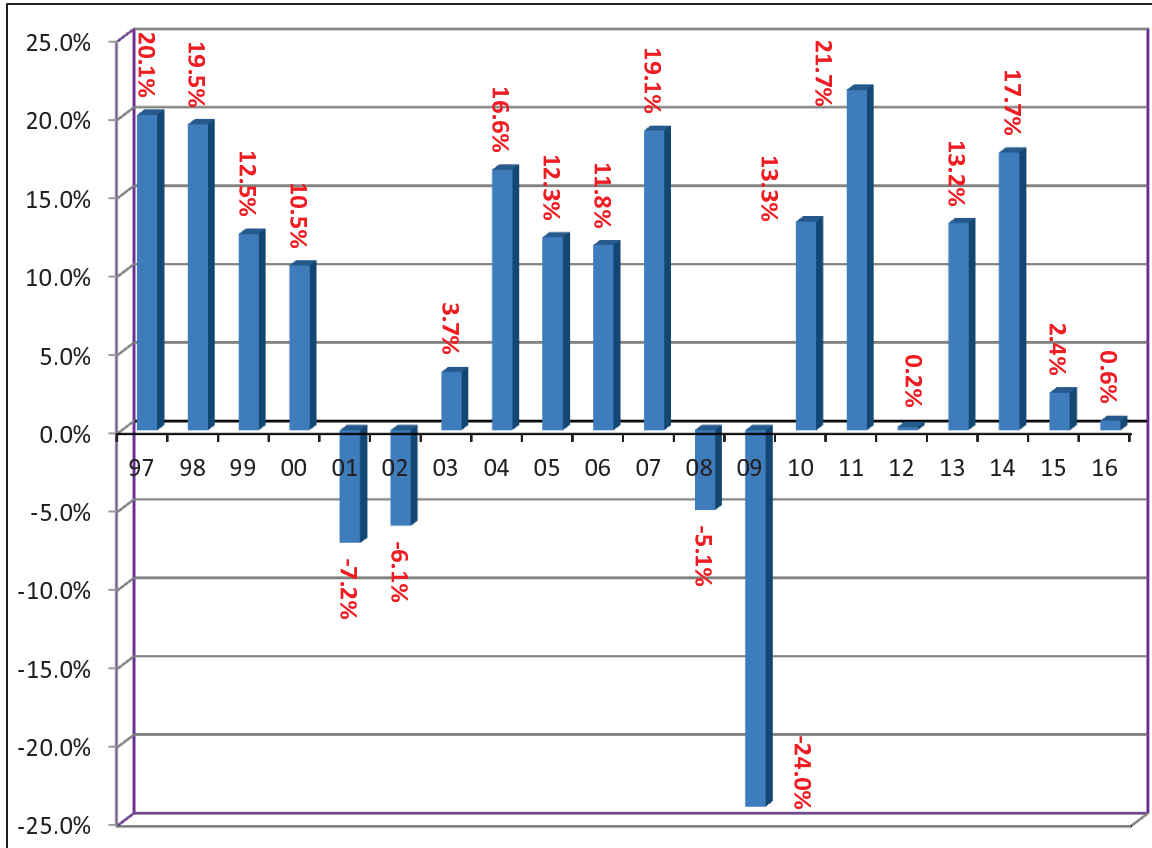
The asset allocation and market value of assets shown below reflect the values of the Public Employees' Retirement Fund (PERF) in its entirety as of June 30, 2016. The assets for COUNTY OF RIVERSIDE MISCELLANEOUS PLAN are part of the PERF and are invested accordingly.

(A) Asset Class	(B) Market Value (\$ Billion)	(C) Policy Target Allocation
Public Equity	153.1	51.0%
Private Equity	26.4	10.0%
Global Fixed Income	59.9	20.0%
Liquidity	4.5	1.0%
Real Assets	31.8	12.0%
Inflation Sensitive Assets	17.8	6.0%
Other	1.6	0.0%
Total Fund	\$295.1	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, 2016, (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 11.8 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	0.6%	6.6%	5.0%	7.0%	8.2%
Volatility	-	8.1%	14.0%	11.8%	10.1%

LIABILITIES AND CONTRIBUTIONS

- **DEVELOPMENT OF ACCRUED AND UNFUNDED LIABILITIES**
- **(GAIN) / LOSS ANALYSIS 06/30/15 - 06/30/16**
- **SCHEDULE OF AMORTIZATION BASES**
- **30-YEAR AMORTIZATION SCHEDULES AND ALTERNATIVES**
- **RECONCILIATION OF REQUIRED EMPLOYER CONTRIBUTIONS**
- **EMPLOYER CONTRIBUTION HISTORY**
- **FUNDING HISTORY**

Development of Accrued and Unfunded Liabilities

	June 30, 2015	June 30, 2016
1. Present Value of Projected Benefits		
a) Active Members	\$ 4,509,394,644	5,059,825,245
b) Transferred Members	181,059,733	193,790,565
c) Terminated Members	132,798,509	148,161,924
d) Members and Beneficiaries Receiving Payments	2,700,914,273	2,947,974,796
e) Total	\$ 7,524,167,159	8,349,752,530
2. Present Value of Future Employer Normal Costs	\$ 743,278,038	837,714,835
3. Present Value of Future Employee Contributions	\$ 606,390,775	661,893,870
4. Entry Age Normal Accrued Liability		
a) Active Members [(1a) - (2) - (3)]	\$ 3,159,725,831	3,560,216,540
b) Transferred Members (1b)	181,059,733	193,790,565
c) Terminated Members (1c)	132,798,509	148,161,924
d) Members and Beneficiaries Receiving Payments (1d)	2,700,914,273	2,947,974,796
e) Total	\$ 6,174,498,346	6,850,143,825
5. Market Value of Assets (MVA)	\$ 4,775,099,013	4,799,576,566
6. Unfunded Accrued Liability (UAL) [(4e) - (5)]	\$ 1,399,399,333	2,050,567,259
7. Funded Ratio [(5) / (4e)]	77.3%	70.1%

(Gain)/Loss Analysis 6/30/15 – 6/30/16

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 6/30/15	\$ 1,399,399,333
b) Expected Payment on the UAL during 2015-16	55,426,365
c) Interest through 6/30/16 $ [.075 \times (1a) - ((1.075)^{1/2} - 1) \times (1b)]$	102,914,037
d) Expected UAL before all other changes $ [(1a) - (1b) + (1c)]$	1,446,887,005
e) Change due to plan changes	0
f) Change due to assumption change	111,923,783
g) Expected UAL after all other changes $ [(1d) + (1e) + (1f)]$	1,558,810,788
h) Actual UAL as of 6/30/16	<u>2,050,567,259</u>
i) Total (Gain)/Loss for 2015-16 $ [(1h) - (1g)]$	\$ 491,756,471
2. Contribution (Gain)/Loss for the Year	
a) Expected Contribution (Employer and Employee)	\$ 236,818,934
b) Interest on Expected Contributions	8,720,163
c) Actual Contributions	239,997,457
d) Interest on Actual Contributions	8,837,203
e) Expected Contributions with Interest $ [(2a) + (2b)]$	245,539,097
f) Actual Contributions with Interest $ [(2c) + (2d)]$	<u>248,834,660</u>
g) Contribution (Gain)/Loss $ [(2e) - (2f)]$	\$ (3,295,563)
3. Asset (Gain)/Loss for the Year	
a) Market Value of Assets as of 6/30/15	\$ 4,775,099,013
b) Prior Fiscal Year Receivables	(15,948,327)
c) Current Fiscal Year Receivables	14,392,227
d) Contributions Received	239,997,457
e) Benefits and Refunds Paid	(236,350,225)
f) Transfers and Miscellaneous Adjustments	3,775,137
g) Expected Int. $ [.075 \times (3a + 3b) + ((1.075)^{1/2} - 1) \times ((3d) + (3e) + (3f))]$	357,209,608
h) Expected Assets as of 6/30/16 $ [(3a) + (3b) + (3c) + (3d) + (3e) + (3f) + (3g)]$	5,138,174,890
i) Market Value of Assets as of 6/30/16	<u>4,799,576,566</u>
j) Asset (Gain)/Loss $ [(3h) - (3i)]$	\$ 338,598,324
4. Liability (Gain)/Loss for the Year	
a) Total (Gain)/Loss (1i)	\$ 491,756,471
b) Contribution (Gain)/Loss (2g)	(3,295,563)
c) Asset (Gain)/Loss (3j)	<u>338,598,324</u>
d) Liability (Gain)/Loss $ [(4a) - (4b) - (4c)]$	\$ 156,453,710

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, 2016.
- The required employer contributions determined by the valuation are for the fiscal year beginning two years after the valuation date: Fiscal Year 2018-19.

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. The Normal Cost Rate for each of the two fiscal years is assumed to be the same as the rate determined by the current valuation. All expected dollar amounts are determined by multiplying the rate by the expected payroll for the applicable fiscal year, based on payroll as of the valuation date.

Reason for Base	Date Established	Amortization Period	Expected Payment		Balance		Expected Payment		Balance		Scheduled Payment for	
			2016-17	2016-17	6/30/16	6/30/17	2017-18	2017-18	6/30/18	6/30/18	2018-19	2018-19
FS 30-YEAR AMORTIZATION	06/30/08	22	\$(10,286,548)	\$(695,777)	\$(10,324,204)	\$(10,324,204)	\$(716,650)	\$(10,343,007)	\$(728,364)			
GOLDEN HANDSHAKE	06/30/09	13	\$32,281,376	\$2,959,219	\$31,595,728	\$31,595,728	\$3,047,995	\$30,767,523	\$3,109,916			
ASSUMPTION CHANGE	06/30/09	13	\$82,296,605	\$7,544,092	\$80,548,647	\$80,548,647	\$7,770,414	\$78,437,259	\$7,928,273			
SPECIAL (GAIN)/LOSS	06/30/09	23	\$117,222,451	\$7,747,752	\$117,839,238	\$117,839,238	\$7,980,184	\$118,260,663	\$8,107,384			
GOLDEN HANDSHAKE	06/30/10	14	\$1,144,844	\$100,279	\$1,125,365	\$1,125,365	\$103,287	\$1,101,333	\$105,337			
SPECIAL (GAIN)/LOSS	06/30/10	24	\$82,425,126	\$5,331,161	\$82,979,728	\$82,979,728	\$5,491,096	\$83,409,505	\$5,576,437			
GOLDEN HANDSHAKE	06/30/11	15	\$32,073,225	\$2,694,511	\$31,646,522	\$31,646,522	\$2,775,346	\$31,104,586	\$2,829,144			
ASSUMPTION CHANGE	06/30/11	15	\$100,392,773	\$8,434,120	\$99,057,144	\$99,057,144	\$8,687,143	\$97,360,825	\$8,855,535			
SPECIAL (GAIN)/LOSS	06/30/11	25	\$(45,476,320)	\$(2,882,208)	\$(45,843,600)	\$(45,843,600)	\$(2,968,675)	\$(46,148,367)	\$(3,013,654)			
PAYMENT (GAIN)/LOSS	06/30/12	26	\$(69,409,090)	\$(4,315,871)	\$(70,055,822)	\$(70,055,822)	\$(4,445,348)	\$(70,616,085)	\$(4,510,997)			
(GAIN)/LOSS	06/30/12	26	\$219,830,305	\$13,669,093	\$221,878,615	\$221,878,615	\$14,079,166	\$223,653,062	\$14,287,089			
(GAIN)/LOSS	06/30/13	27	\$595,040,402	\$16,258,399	\$622,077,368	\$622,077,368	\$25,119,227	\$641,926,552	\$33,996,766			
ASSUMPTION CHANGE	06/30/14	18	\$347,018,758	\$6,609,905	\$365,762,082	\$365,762,082	\$13,616,404	\$378,627,457	\$20,805,253			
(GAIN)/LOSS	06/30/14	28	\$(448,997,227)	\$(6,315,162)	\$(475,566,881)	\$(475,566,881)	\$(13,009,233)	\$(497,159,523)	\$(19,795,137)			
(GAIN)/LOSS	06/30/15	29	\$411,330,321	\$10,359,395	\$430,931,329	\$430,931,329	\$6,068,208	\$456,424,522	\$12,301,581			
ASSUMPTION CHANGE	06/30/16	20	\$111,923,783	\$(5,581,331)	\$125,961,644	\$125,961,644	\$(5,748,771)	\$141,208,301	\$2,661,593			
(GAIN)/LOSS	06/30/16	30	\$491,756,475	\$7,046,115	\$520,722,196	\$520,722,196	\$0	\$559,125,458	\$7,749,770			
TOTAL			\$2,050,567,259	\$68,963,692	\$2,130,335,100	\$2,130,335,100	\$67,849,793	\$2,217,140,064	\$100,265,926			

30-Year 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 3 percent per year. **The schedules do not reflect the impact of adopted discount rate changes that will become effective beyond June 30, 2016. 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. For purposes of this display, total payments include any negative payments. Therefore, the amount of estimated savings may be understated to the extent that negative payments appear in the current schedule.

30-Year Amortization Schedule and Alternatives

Date	<u>Current Amortization Schedule*</u>		<u>Alternate Schedules</u>			
	Balance	Payment	20 Year Amortization		15 Year Amortization	
			Balance	Payment	Balance	Payment
6/30/2018	2,217,140,064	100,265,926	2,217,140,064	165,736,743	2,217,140,064	201,661,831
6/30/2019	2,276,756,677	129,433,895	2,208,914,567	170,708,846	2,171,688,305	207,711,686
6/30/2020	2,310,545,609	151,244,913	2,194,930,251	175,830,111	2,116,615,503	213,943,037
6/30/2021	2,324,225,482	173,880,172	2,174,607,840	181,105,014	2,051,024,037	220,361,328
6/30/2022	2,315,459,158	190,814,658	2,147,320,695	186,538,165	1,973,944,446	226,972,168
6/30/2023	2,288,498,478	196,539,098	2,112,391,189	192,134,310	1,884,329,956	233,781,333
6/30/2024	2,253,617,675	202,435,271	2,069,086,800	197,898,339	1,781,050,610	240,794,773
6/30/2025	2,210,054,685	208,508,330	2,016,615,915	203,835,289	1,662,886,953	248,018,616
6/30/2026	2,156,985,906	214,763,578	1,954,123,321	209,950,348	1,528,523,241	255,459,174
6/30/2027	2,093,521,496	221,206,485	1,880,685,358	216,248,858	1,376,540,157	263,122,950
6/30/2028	2,018,700,322	227,842,682	1,795,304,708	222,736,324	1,205,406,970	271,016,638
6/30/2029	1,931,484,536	234,677,961	1,696,904,800	229,418,414	1,013,473,121	279,147,137
6/30/2030	1,830,753,737	241,718,302	1,584,323,789	236,300,966	798,959,171	287,521,551
6/30/2031	1,715,298,707	232,759,894	1,456,308,097	243,389,995	559,947,090	296,147,198
6/30/2032	1,600,611,740	229,093,424	1,311,505,460	250,691,695	294,369,808	305,031,614
6/30/2033	1,481,265,877	206,957,241	1,148,457,468	258,212,446		
6/30/2034	1,376,056,191	197,766,109	965,591,541	265,958,819		
6/30/2035	1,272,611,316	187,837,248	761,212,312	273,937,584		
6/30/2036	1,171,825,861	177,134,663	533,492,366	282,155,711		
6/30/2037	1,074,697,700	177,781,585	280,462,294	290,620,383		
6/30/2038	969,735,984	178,307,897				
6/30/2039	856,487,967	183,657,135				
6/30/2040	729,344,925	190,562,470				
6/30/2041	585,669,645	163,504,830				
6/30/2042	459,435,955	153,210,265				
6/30/2043	334,559,956	147,258,227				
6/30/2044	206,641,968	96,515,837				
6/30/2045	121,870,261	64,311,897				
6/30/2046	64,216,977	49,534,390				
6/30/2047	17,624,498	18,262,841				
Totals		5,147,787,224		4,453,408,360		3,750,691,034
Interest Paid		2,930,647,160		2,236,268,296		1,533,550,970
Estimated Savings				694,378,864		1,397,096,190

* This schedule does not reflect the impact of adopted discount rate changes that will become effective beyond June 30, 2016. For Projected Employer Contributions, please see Page 5.

Reconciliation of Required Employer Contributions

Normal Cost (% of Payroll)

1. For Period 7/1/17 – 6/30/18	
a) Employer Normal Cost	10.192%
b) Employee Contribution	7.558%
c) Total Normal Cost	17.750%
2. Changes since the prior year annual valuation	
a) Effect of changes in demographics results	(0.277%)
b) Effect of plan changes	0.000%
c) Effect of changes in assumptions	0.497%
d) Net effect of the changes above [sum of (a) through (c)]	0.220%
3. For Period 7/1/18 – 6/30/19	
a) Employer Normal Cost	10.458%
b) Employee Contribution	7.512%
c) Total Normal Cost	17.970%
Employer Normal Cost Change [(3a) – (1a)]	0.266%
Employee Contribution Change [(3b) – (1b)]	(0.046%)

Unfunded Liability Contribution (\$)

1. For Period 7/1/17 – 6/30/18	73,598,564
2. Changes since the prior year annual valuation	
a) Effect of (gain)/loss during prior year ¹	7,749,770
b) Effect of plan changes	0
c) Effect of changes in assumptions ²	2,661,593
d) Changes to prior year amortization payments ³	16,255,999
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)]	26,667,362
3. For Period 7/1/18 – 6/30/19 [(1)+(2g)]	100,265,926

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 7/1/17 – 6/30/18 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	Required By Valuation	
		Unfunded Rate	Unfunded Liability Payment (\$)
2013 - 14	11.099%	3.902%	N/A
2014 - 15	10.341%	4.186%	N/A
2015 - 16	10.376%	5.053%	N/A
2016 - 17	10.650%	5.826%	N/A
2017 - 18	10.192%	N/A	73,598,564
2018 - 19	10.458%	N/A	100,265,926

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	\$ 4,461,553,672	\$ 3,525,640,733	\$ 935,912,939	79.0%	\$ 812,362,628
06/30/12	4,708,881,750	3,520,189,846	1,188,691,904	74.8%	836,418,298
06/30/13	5,008,806,968	3,974,442,195	1,034,364,773	79.3%	856,593,282
06/30/14	5,656,121,103	4,682,894,962	973,226,141	82.8%	897,506,714
06/30/15	6,174,498,346	4,775,099,013	1,399,399,333	77.3%	1,000,223,148
06/30/16	6,850,143,825	4,799,576,566	2,050,567,259	70.1%	1,090,295,411

RISK ANALYSIS

- **ANALYSIS OF FUTURE INVESTMENT RETURN SCENARIOS**
- **ANALYSIS OF DISCOUNT RATE SENSITIVITY**
- **VOLATILITY RATIOS**
- **HYPOTHETICAL TERMINATION LIABILITY**

Analysis of Future Investment Return Scenarios

Analysis was performed to determine the effects of various future investment returns on required employer contributions. The projections below provide a range of results based on five investment return scenarios assumed to occur during the next four fiscal years (2016-17, 2017-18, 2018-19 and 2019-20). 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 7.375 percent for fiscal year 2016-17. For fiscal years 2017-18, 2018-19, and 2019-20 each scenario assumes an alternate fixed annual return. The fixed return assumptions for the five scenarios are -3.0 percent, 3.0 percent, 7.0 percent (7.25 percent for 2017-18), 11.0 percent and 17.0 percent.

The alternate investment returns were chosen based on stochastic analysis of possible future investment returns over the four year period ending June 30, 2020. Using the expected returns and volatility of the asset classes in which the funds are invested, we produced ten thousand stochastic outcomes for this period. We then selected annual returns that approximate the 5th, 25th, 50th, 75th, and 95th percentiles for these outcomes. For example, of all of the 4-year outcomes generated in the stochastic analysis, approximately 25 percent of them had an average annual return of 3.0 percent or less.

Required contributions outside of this range are also possible. In particular, while it is unlikely that investment returns will average less than -3.0 percent or greater than 17.0 percent over this four year period, the possibility of a single investment return less than -3.0 percent or greater than 17.0 percent in any given year is much greater.

Assumed Annual Return From 2017-18 through 2019-20	Projected Employer Contributions			
	2019-20	2020-21	2021-22	2022-23
(3.0%)				
Normal Cost	11.0%	12.1%	12.1%	12.1%
UAL Contribution	\$130,703,000	\$165,500,000	\$212,873,000	\$263,905,000
3.0%				
Normal Cost	11.0%	12.1%	12.1%	12.1%
UAL Contribution	\$130,703,000	\$160,780,000	\$198,721,000	\$235,587,000
Assumed Discount Rate				
Normal Cost	11.0%	12.1%	12.1%	12.1%
UAL Contribution	\$130,703,000	\$157,438,000	\$188,567,000	\$214,804,000
11.0%				
Normal Cost	11.0%	12.1%	12.3%	12.6%
UAL Contribution	\$130,703,000	\$154,489,000	\$179,069,000	\$195,290,000
17.0%				
Normal Cost	11.0%	12.1%	12.8%	13.6%
UAL Contribution	\$130,703,000	\$149,770,000	\$164,068,000	\$164,684,000

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 Years 2019-20 and 2020-21.

The projected normal cost percentages do not reflect that the normal cost will decline over time as new employees are hired into PEPR or other lower cost benefit tiers.

Analysis of Discount Rate Sensitivity

Shown below are various valuation results as of June 30, 2016 assuming alternate discount rates. Results are shown using the current discount rate of 7.375 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" in the "Risk Analysis" section.

Sensitivity Analysis				
As of June 30, 2016	Plan's Normal Cost	Accrued Liability	Unfunded Accrued Liability	Funded Status
7.375% (current discount rate)	17.970%	\$6,850,143,825	\$2,050,567,259	70.1%
6.0%	24.776%	\$8,287,798,835	\$3,488,222,269	57.9%
7.0%	19.567%	\$7,203,165,556	\$2,403,588,990	66.6%
8.0%	15.655%	\$6,317,050,002	\$1,517,473,436	76.0%

Volatility Ratios

The actuarial calculations supplied in this communication are based on a number of 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 (7.375 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, 2016	
1. Market Value of Assets without Receivables	\$	4,785,184,339
2. Payroll		1,090,295,411
3. Asset Volatility Ratio (AVR) [(1) / (2)]		4.4
4. Accrued Liability (7.375% discount rate)	\$	6,850,143,825
5. Liability Volatility Ratio (LVR) [(4) / (2)]		6.3
6. Accrued Liability (7.00% discount rate)		7,203,165,556
7. Projected Liability Volatility Ratio [(6) / (2)]		6.6

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, 2016. The plan liability on a termination basis is calculated differently compared to 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%
\$4,799,576,566	\$12,940,831,458	37.1%	\$8,141,254,892	\$10,856,100,363	44.2%	\$6,056,523,797

¹ The hypothetical liabilities calculated above include a 7 percent mortality 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 1.75 percent on June 30, 2016, and was 2.75 percent on January 31, 2017.

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

PLAN'S MAJOR BENEFIT PROVISIONS

Plan's Major Benefit Options

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

Benefit Provision	Contract Package					
	Active Misc	Active Misc	Active Misc	Active Misc	Inactive Misc	Inactive Misc
Benefit Formula Social Security Coverage Full/Modified	2.0% @ 62 Yes Full	2.0% @ 60 Yes Modified	3.0% @ 60 Yes Modified	3.0% @ 60 Yes Modified	2.0% @ 55 No Full	2.0% @ 55 Yes Modified
Employee Contribution Rate	6.50%	7.00%	8.00%	8.00%		
Final Average Compensation Period	Three Year	Three Year	One Year	One Year	One Year	One Year
Sick Leave Credit	No	No	No	No	No	No
Non-Industrial Disability	Standard	Standard	Standard	Standard	Standard	Standard
Industrial Disability	No	No	No	No	No	No
Pre-Retirement Death Benefits Optional Settlement 2W 1959 Survivor Benefit Level Special Alternate (firefighters)	No No No No No	No No No No No	No No No No No	No No No No No	No No Indexed No No	No No No No No
Post-Retirement Death Benefits Lump Sum Survivor Allowance (PRSA)	\$500 Yes	\$500 Yes	\$500 Yes	\$500 Yes	\$500 Yes	\$500 Yes
COLA	2%	2%	2%	2%	2%	2%

Plan's Major Benefit Options

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

Benefit Provision	Contract Package			
	Inactive Misc	Inactive Misc	Receiving Misc	Receiving Misc
Benefit Formula Social Security Coverage Full/Modified	3.0% @ 60 No Full	3.0% @ 60 No Full		
Employee Contribution Rate	One Year	One Year		
Final Average Compensation Period	No	No		
Sick Leave Credit	Standard	Standard		
Non-Industrial Disability	No	No		
Industrial Disability	No	No		
Pre-Retirement Death Benefits Optional Settlement 2W	No Indexed	No Indexed		
1959 Survivor Benefit Level Special Alternate (firefighters)	No No	No No		
Post-Retirement Death Benefits Lump Sum	\$500 Yes	\$500 Yes	\$500 Yes	\$500 Yes
Survivor Allowance (PRSA)	2%	2%	2%	2%
COLA				

APPENDICES

- **APPENDIX A – ACTUARIAL METHODS AND ASSUMPTIONS**
- **APPENDIX B – PRINCIPAL PLAN PROVISIONS**
- **APPENDIX C – PARTICIPANT DATA**
- **APPENDIX D – DEVELOPMENT OF PEPRA MEMBER CONTRIBUTION RATES**
- **APPENDIX E – GLOSSARY OF ACTUARIAL TERMS**

APPENDIX A

ACTUARIAL METHODS AND ASSUMPTIONS

- **ACTUARIAL DATA**
- **ACTUARIAL METHODS**
- **ACTUARIAL ASSUMPTIONS**
- **MISCELLANEOUS**

Actuarial Data

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

Actuarial Methods

Actuarial Cost Method

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

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

Amortization of Unfunded Actuarial Accrued Liability

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

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

Exceptions for Inconsistencies:

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

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

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

Exceptions for Inactive Plans:

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

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

Asset Valuation Method

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

PEPRA Normal Cost Rate Methodology

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

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

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

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

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

Actuarial Assumptions

In 2014, CalPERS completed a 2-year asset liability management study incorporating actuarial assumptions and strategic asset allocation. On February 19, 2014, the CalPERS Board of Administration adopted relatively modest changes to the asset allocation that reduced the expected volatility of returns. The adopted asset allocation was expected to have a long-term blended return that continued to support a discount rate assumption of 7.5 percent at that time. The Board also approved several changes to the demographic assumptions that more closely aligned with actual experience. The most significant of these is mortality improvement to acknowledge the greater life expectancies we are seeing in our membership and expected continued improvements. These new actuarial assumptions were first used in the June 30, 2014 valuation to set the Fiscal Year 2016-17 contribution for public agency employers.

On December 21, 2016, the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three year phase-in beginning with the June 30, 2016 actuarial valuations. The minimum employer contributions for Fiscal Year 2018-19 determined in this valuation were calculated using a discount rate of 7.375 percent. The projected employer contributions on Page 5 are calculated assuming that the discount rate will be lowered to 7.25 percent next year and 7.00 percent the following year as adopted by the Board. The decision to reduce the discount rate was primarily based on reduced capital market assumptions provided by external investment consultants and CalPERS investment staff. The specific decision adopted by the Board reflected recommendations from CalPERS staff and additional input from employer and employee stakeholder groups. Based on the investment allocation adopted by the Board and capital market assumptions, the reduced discount rate schedule provides a more realistic assumption for the long term investment return of the fund.

Notwithstanding the Board's decision to phase into a 7.0 percent discount rate, subsequent analysis of the expected investment return of CalPERS assets or changes to the investment allocation may result in a change to this three year discount rate schedule. A comprehensive analysis of all actuarial assumptions and methods including the discount rate will be conducted in 2017.

For more details and additional rationale for the selection of the actuarial assumptions, please refer to the CalPERS Experience Study and Review of Actuarial Assumptions report from January 2014 that can be found on the CalPERS website under: "Forms and Publications". Click on "View All" and search for Experience Study.

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

Economic Assumptions

Discount Rate

The prescribed discount rate assumption adopted by the Board on December 21, 2016 is 7.375 percent compounded annually (net of investment and administrative expenses) as of 6/30/2016.

The Board also prescribed that the assumed discount rate will reduce to 7.25 percent compounded annually (net of expenses) as of 6/30/2017, and 7.0 percent compounded annually (net of expenses) as of 6/30/2018. These further changes to the discount rate assumption are not reflected in the determination of required contributions determined in this report for Fiscal Year 2018-19.

Termination Liability Discount Rate

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

The hypothetical termination liabilities in this report are calculated using an observed range of market interest rates. This range is based on the lowest and highest 20-year Treasury bond observed during an approximate 2-year period centered around the valuation date. The 20-year Treasury bond has a similar duration to most plan liabilities and serves as a good proxy for the termination discount rate. The 20-year Treasury yield was 1.75 percent on June 30, 2016.

Salary Growth

Annual increases vary by category, entry age, and duration of service. A sample of assumed increases are shown below.

Public Agency Miscellaneous

<u>Duration of Service</u>	<u>(Entry Age 20)</u>	<u>(Entry Age 30)</u>	<u>(Entry Age 40)</u>
0	0.1220	0.1160	0.1020
1	0.0990	0.0940	0.0830
2	0.0860	0.0810	0.0710
3	0.0770	0.0720	0.0630
4	0.0700	0.0650	0.0570
5	0.0640	0.0600	0.0520
10	0.0460	0.0430	0.0390
15	0.0420	0.0400	0.0360
20	0.0390	0.0380	0.0340
25	0.0370	0.0360	0.0330
30	0.0350	0.0340	0.0320

Public Agency Fire

<u>Duration of Service</u>	<u>(Entry Age 20)</u>	<u>(Entry Age 30)</u>	<u>(Entry Age 40)</u>
0	0.2000	0.1980	0.1680
1	0.1490	0.1460	0.1250
2	0.1200	0.1160	0.0990
3	0.0980	0.0940	0.0810
4	0.0820	0.0780	0.0670
5	0.0690	0.0640	0.0550
10	0.0470	0.0460	0.0420
15	0.0440	0.0420	0.0390
20	0.0420	0.0390	0.0360
25	0.0400	0.0370	0.0340
30	0.0380	0.0360	0.0340

Public Agency Police

<u>Duration of Service</u>	<u>(Entry Age 20)</u>	<u>(Entry Age 30)</u>	<u>(Entry Age 40)</u>
0	0.1500	0.1470	0.1310
1	0.1160	0.1120	0.1010
2	0.0950	0.0920	0.0830
3	0.0810	0.0780	0.0700
4	0.0700	0.0670	0.0600
5	0.0610	0.0580	0.0520
10	0.0450	0.0430	0.0370
15	0.0450	0.0430	0.0370
20	0.0450	0.0430	0.0370
25	0.0450	0.0430	0.0370
30	0.0450	0.0430	0.0370

Salary Growth (continued)

Public Agency County Peace Officers			
<u>Duration of Service</u>	<u>(Entry Age 20)</u>	<u>(Entry Age 30)</u>	<u>(Entry Age 40)</u>
0	0.1770	0.1670	0.1500
1	0.1340	0.1260	0.1140
2	0.1080	0.1030	0.0940
3	0.0900	0.0860	0.0790
4	0.0760	0.0730	0.0670
5	0.0650	0.0620	0.0580
10	0.0470	0.0450	0.0410
15	0.0460	0.0450	0.0390
20	0.0460	0.0450	0.0380
25	0.0460	0.0450	0.0380
30	0.0460	0.0440	0.0380

Schools			
<u>Duration of Service</u>	<u>(Entry Age 20)</u>	<u>(Entry Age 30)</u>	<u>(Entry Age 40)</u>
0	0.0900	0.0880	0.0820
1	0.0780	0.0750	0.0700
2	0.0700	0.0680	0.0630
3	0.0650	0.0630	0.0580
4	0.0610	0.0590	0.0540
5	0.0580	0.0560	0.0510
10	0.0460	0.0450	0.0410
15	0.0420	0.0410	0.0380
20	0.0390	0.0380	0.0350
25	0.0370	0.0350	0.0330
30	0.0350	0.0330	0.0310

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

Overall Payroll Growth

3.00 percent compounded annually (used in projecting the payroll over which the unfunded liability is amortized). This assumption is used for all plans with active members.

Inflation

2.75 percent compounded annually.

Non-valued Potential Additional Liabilities

The potential liability loss for a cost-of-living increase exceeding the 2.75 percent inflation assumption, and any potential liability loss from future member service purchases are not reflected in the valuation.

Miscellaneous Loading Factors

Credit for Unused Sick Leave

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

Conversion of Employer Paid Member Contributions (EPMC)

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

Norris Decision (Best Factors)

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

Termination Liability

The termination liabilities include a 7 percent contingency load. This load is for unforeseen improvements in mortality.

Demographic Assumptions

Pre-Retirement Mortality

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

Age	Non-Industrial Death (Not Job-Related)		Industrial Death (Job-Related)
	Male	Female	Male and Female
20	0.00031	0.00020	0.00003
25	0.00040	0.00023	0.00007
30	0.00049	0.00025	0.00010
35	0.00057	0.00035	0.00012
40	0.00075	0.00050	0.00013
45	0.00106	0.00071	0.00014
50	0.00155	0.00100	0.00015
55	0.00228	0.00138	0.00016
60	0.00308	0.00182	0.00017
65	0.00400	0.00257	0.00018
70	0.00524	0.00367	0.00019
75	0.00713	0.00526	0.00020
80	0.00990	0.00814	0.00021

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

Post-Retirement Mortality

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

Age	Healthy Recipients		Non-Industrially Disabled (Not Job-Related)		Industrially Disabled (Job-Related)	
	Male	Female	Male	Female	Male	Female
50	0.00501	0.00466	0.01680	0.01158	0.00501	0.00466
55	0.00599	0.00416	0.01973	0.01149	0.00599	0.00416
60	0.00710	0.00436	0.02289	0.01235	0.00754	0.00518
65	0.00829	0.00588	0.02451	0.01607	0.01122	0.00838
70	0.01305	0.00993	0.02875	0.02211	0.01635	0.01395
75	0.02205	0.01722	0.03990	0.03037	0.02834	0.02319
80	0.03899	0.02902	0.06083	0.04725	0.04899	0.03910
85	0.06969	0.05243	0.09731	0.07762	0.07679	0.06251
90	0.12974	0.09887	0.14804	0.12890	0.12974	0.09887
95	0.22444	0.18489	0.22444	0.21746	0.22444	0.18489
100	0.32536	0.30017	0.32536	0.30017	0.32536	0.30017
105	0.58527	0.56093	0.58527	0.56093	0.58527	0.56093
110	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

The post-retirement mortality rates above include 20 years of projected on-going mortality improvement using Scale BB published by the Society of Actuaries.

Marital Status

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

Member Category	Percent Married
Miscellaneous Member	85%
Local Police	90%
Local Fire	90%
Other Local Safety	90%
School Police	90%

Age of Spouse

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

Terminated Members

It is assumed that terminated members refund immediately if non-vested. Terminated members who are vested are assumed to follow the same service retirement pattern as active members but with a load to reflect the expected higher rates of retirement, especially at lower ages. The following table shows the load factors that are applied to the service retirement assumption for active members to obtain the service retirement pattern for separated vested members:

Age	Load Factor Miscellaneous	Load Factor Safety
50	190%	310%
51	110%	190%
52	110%	105%
53 through 54	100%	105%
55	100%	140%
56 and above	100% (no change)	100% (no change)

Termination with Refund

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

Public Agency Miscellaneous

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

Public Agency Safety

Duration of Service	Fire	Police	County Peace Officer
0	0.0710	0.1013	0.0997
1	0.0554	0.0636	0.0782
2	0.0398	0.0271	0.0566
3	0.0242	0.0258	0.0437
4	0.0218	0.0245	0.0414
5	0.0029	0.0086	0.0145
10	0.0009	0.0053	0.0089
15	0.0006	0.0027	0.0045
20	0.0005	0.0017	0.0020
25	0.0003	0.0012	0.0009
30	0.0003	0.0009	0.0006
35	0.0003	0.0009	0.0006

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

Schools

Duration of Service	Entry Age 20	Entry Age 25	Entry Age 30	Entry Age 35	Entry Age 40	Entry Age 45
0	0.1730	0.1627	0.1525	0.1422	0.1319	0.1217
1	0.1585	0.1482	0.1379	0.1277	0.1174	0.1071
2	0.1440	0.1336	0.1234	0.1131	0.1028	0.0926
3	0.1295	0.1192	0.1089	0.0987	0.0884	0.0781
4	0.1149	0.1046	0.0944	0.0841	0.0738	0.0636
5	0.0278	0.0249	0.0221	0.0192	0.0164	0.0135
10	0.0172	0.0147	0.0122	0.0098	0.0074	0.0049
15	0.0115	0.0094	0.0074	0.0053	0.0032	0.0011
20	0.0073	0.0055	0.0038	0.0020	0.0002	0.0002
25	0.0037	0.0023	0.0010	0.0002	0.0002	0.0002
30	0.0015	0.0003	0.0002	0.0002	0.0002	0.0002
35	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002

Termination with Vested Benefits

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

Public Agency Miscellaneous

Duration of Service	Entry Age 20	Entry Age 25	Entry Age 30	Entry Age 35	Entry Age 40
5	0.0656	0.0597	0.0537	0.0477	0.0418
10	0.0530	0.0466	0.0403	0.0339	0.0000
15	0.0443	0.0373	0.0305	0.0000	0.0000
20	0.0333	0.0261	0.0000	0.0000	0.0000
25	0.0212	0.0000	0.0000	0.0000	0.0000
30	0.0000	0.0000	0.0000	0.0000	0.0000
35	0.0000	0.0000	0.0000	0.0000	0.0000

Public Agency Safety

Duration of Service	Fire	Police	County Peace Officer
5	0.0162	0.0163	0.0265
10	0.0061	0.0126	0.0204
15	0.0058	0.0082	0.0130
20	0.0053	0.0065	0.0074
25	0.0047	0.0058	0.0043
30	0.0045	0.0056	0.0030
35	0.0000	0.0000	0.0000

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

Schools

Duration of Service	Entry Age 20	Entry Age 25	Entry Age 30	Entry Age 35	Entry Age 40
5	0.0816	0.0733	0.0649	0.0566	0.0482
10	0.0629	0.0540	0.0450	0.0359	0.0000
15	0.0537	0.0440	0.0344	0.0000	0.0000
20	0.0420	0.0317	0.0000	0.0000	0.0000
25	0.0291	0.0000	0.0000	0.0000	0.0000
30	0.0000	0.0000	0.0000	0.0000	0.0000
35	0.0000	0.0000	0.0000	0.0000	0.0000

Non-Industrial (Not Job-Related) Disability

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

Age	Miscellaneous		Fire	Police	County Peace Officer	Schools	
	Male	Female	Male and Female	Male and Female	Male and Female	Male	Female
20	0.0002	0.0001	0.0001	0.0001	0.0001	0.0003	0.0003
25	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
30	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002
35	0.0005	0.0008	0.0001	0.0003	0.0004	0.0005	0.0004
40	0.0012	0.0016	0.0001	0.0004	0.0007	0.0015	0.0010
45	0.0019	0.0022	0.0002	0.0005	0.0013	0.0030	0.0019
50	0.0021	0.0023	0.0005	0.0008	0.0018	0.0039	0.0024
55	0.0022	0.0018	0.0010	0.0013	0.0010	0.0036	0.0021
60	0.0022	0.0014	0.0015	0.0020	0.0006	0.0031	0.0014

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

Industrial (Job-Related) Disability

Rates vary by age and category.

Age	Fire	Police	County Peace Officer
20	0.0001	0.0000	0.0004
25	0.0003	0.0017	0.0013
30	0.0007	0.0048	0.0025
35	0.0016	0.0079	0.0037
40	0.0030	0.0110	0.0051
45	0.0053	0.0141	0.0067
50	0.0277	0.0185	0.0092
55	0.0409	0.0479	0.0151
60	0.0583	0.0602	0.0174

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

Service Retirement

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

Service Retirement

Public Agency Miscellaneous 1.5% @ 65

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

Public Agency Miscellaneous 2% @ 60

Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.010	0.013	0.015	0.018	0.019	0.021
51	0.009	0.011	0.014	0.016	0.017	0.019
52	0.011	0.014	0.017	0.020	0.022	0.024
53	0.010	0.012	0.015	0.017	0.020	0.021
54	0.015	0.019	0.023	0.025	0.029	0.031
55	0.022	0.029	0.035	0.040	0.045	0.049
56	0.018	0.024	0.028	0.033	0.036	0.040
57	0.024	0.032	0.038	0.043	0.049	0.053
58	0.027	0.036	0.043	0.049	0.055	0.061
59	0.033	0.044	0.054	0.061	0.068	0.076
60	0.056	0.077	0.092	0.105	0.117	0.130
61	0.071	0.097	0.118	0.134	0.149	0.166
62	0.117	0.164	0.198	0.224	0.250	0.280
63	0.122	0.171	0.207	0.234	0.261	0.292
64	0.114	0.159	0.193	0.218	0.244	0.271
65	0.150	0.209	0.255	0.287	0.321	0.358
66	0.114	0.158	0.192	0.217	0.243	0.270
67	0.141	0.196	0.238	0.270	0.301	0.337
68	0.103	0.143	0.174	0.196	0.219	0.245
69	0.109	0.153	0.185	0.209	0.234	0.261
70	0.117	0.162	0.197	0.222	0.248	0.277

Service Retirement

Public Agency Miscellaneous 2% @ 55

Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.014	0.018	0.021	0.025	0.027	0.031
51	0.012	0.014	0.017	0.020	0.021	0.025
52	0.013	0.017	0.019	0.023	0.025	0.028
53	0.015	0.020	0.023	0.027	0.030	0.034
54	0.026	0.033	0.038	0.045	0.051	0.059
55	0.048	0.061	0.074	0.088	0.100	0.117
56	0.042	0.053	0.063	0.075	0.085	0.100
57	0.044	0.056	0.067	0.081	0.091	0.107
58	0.049	0.062	0.074	0.089	0.100	0.118
59	0.057	0.072	0.086	0.103	0.118	0.138
60	0.067	0.086	0.103	0.123	0.139	0.164
61	0.081	0.103	0.124	0.148	0.168	0.199
62	0.116	0.147	0.178	0.214	0.243	0.288
63	0.114	0.144	0.174	0.208	0.237	0.281
64	0.108	0.138	0.166	0.199	0.227	0.268
65	0.155	0.197	0.238	0.285	0.325	0.386
66	0.132	0.168	0.203	0.243	0.276	0.328
67	0.122	0.155	0.189	0.225	0.256	0.304
68	0.111	0.141	0.170	0.204	0.232	0.274
69	0.114	0.144	0.174	0.209	0.238	0.282
70	0.130	0.165	0.200	0.240	0.272	0.323

Public Agency Miscellaneous 2.5% @ 55

Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.004	0.009	0.019	0.029	0.049	0.094
51	0.004	0.009	0.019	0.029	0.049	0.094
52	0.004	0.009	0.020	0.030	0.050	0.095
53	0.008	0.014	0.025	0.036	0.058	0.104
54	0.024	0.034	0.050	0.066	0.091	0.142
55	0.066	0.088	0.115	0.142	0.179	0.241
56	0.042	0.057	0.078	0.098	0.128	0.184
57	0.041	0.057	0.077	0.097	0.128	0.183
58	0.045	0.061	0.083	0.104	0.136	0.192
59	0.055	0.074	0.098	0.123	0.157	0.216
60	0.066	0.088	0.115	0.142	0.179	0.241
61	0.072	0.095	0.124	0.153	0.191	0.255
62	0.099	0.130	0.166	0.202	0.248	0.319
63	0.092	0.121	0.155	0.189	0.233	0.302
64	0.091	0.119	0.153	0.187	0.231	0.299
65	0.122	0.160	0.202	0.245	0.297	0.374
66	0.138	0.179	0.226	0.272	0.329	0.411
67	0.114	0.149	0.189	0.229	0.279	0.354
68	0.100	0.131	0.168	0.204	0.250	0.322
69	0.114	0.149	0.189	0.229	0.279	0.354
70	0.127	0.165	0.209	0.253	0.306	0.385

Service Retirement

Public Agency Miscellaneous 2.7% @ 55

Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.004	0.009	0.014	0.035	0.055	0.095
51	0.002	0.006	0.011	0.030	0.050	0.090
52	0.006	0.012	0.017	0.038	0.059	0.099
53	0.010	0.017	0.024	0.046	0.068	0.110
54	0.032	0.044	0.057	0.085	0.113	0.160
55	0.076	0.101	0.125	0.165	0.205	0.265
56	0.055	0.074	0.093	0.127	0.160	0.214
57	0.050	0.068	0.086	0.118	0.151	0.204
58	0.055	0.074	0.093	0.127	0.161	0.215
59	0.061	0.082	0.102	0.138	0.174	0.229
60	0.069	0.093	0.116	0.154	0.192	0.250
61	0.086	0.113	0.141	0.183	0.225	0.288
62	0.105	0.138	0.171	0.218	0.266	0.334
63	0.103	0.135	0.167	0.215	0.262	0.329
64	0.109	0.143	0.177	0.226	0.275	0.344
65	0.134	0.174	0.215	0.270	0.326	0.401
66	0.147	0.191	0.235	0.294	0.354	0.433
67	0.121	0.158	0.196	0.248	0.300	0.372
68	0.113	0.147	0.182	0.232	0.282	0.352
69	0.117	0.153	0.189	0.240	0.291	0.362
70	0.141	0.183	0.226	0.283	0.341	0.418

Public Agency Miscellaneous 3% @ 60

Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.012	0.018	0.024	0.039	0.040	0.091
51	0.009	0.014	0.019	0.034	0.034	0.084
52	0.014	0.020	0.026	0.043	0.044	0.096
53	0.016	0.023	0.031	0.048	0.050	0.102
54	0.026	0.036	0.045	0.065	0.070	0.125
55	0.043	0.057	0.072	0.096	0.105	0.165
56	0.042	0.056	0.070	0.094	0.103	0.162
57	0.049	0.065	0.082	0.108	0.119	0.180
58	0.057	0.076	0.094	0.122	0.136	0.199
59	0.076	0.100	0.123	0.157	0.175	0.244
60	0.114	0.148	0.182	0.226	0.255	0.334
61	0.095	0.123	0.152	0.190	0.214	0.288
62	0.133	0.172	0.211	0.260	0.294	0.378
63	0.129	0.166	0.204	0.252	0.285	0.368
64	0.143	0.185	0.226	0.278	0.315	0.401
65	0.202	0.260	0.318	0.386	0.439	0.542
66	0.177	0.228	0.279	0.340	0.386	0.482
67	0.151	0.194	0.238	0.292	0.331	0.420
68	0.139	0.179	0.220	0.270	0.306	0.391
69	0.190	0.245	0.299	0.364	0.414	0.513
70	0.140	0.182	0.223	0.274	0.310	0.396

Service Retirement

Public Agency Miscellaneous 2% @ 62						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.000	0.000	0.000	0.000	0.000	0.000
51	0.000	0.000	0.000	0.000	0.000	0.000
52	0.010	0.013	0.016	0.019	0.022	0.024
53	0.013	0.017	0.020	0.024	0.027	0.031
54	0.021	0.027	0.033	0.039	0.045	0.050
55	0.044	0.056	0.068	0.080	0.092	0.104
56	0.030	0.039	0.047	0.055	0.063	0.072
57	0.036	0.046	0.056	0.066	0.076	0.086
58	0.046	0.059	0.072	0.085	0.097	0.110
59	0.058	0.074	0.089	0.105	0.121	0.137
60	0.062	0.078	0.095	0.112	0.129	0.146
61	0.062	0.079	0.096	0.113	0.129	0.146
62	0.097	0.123	0.150	0.176	0.202	0.229
63	0.089	0.113	0.137	0.162	0.186	0.210
64	0.094	0.120	0.145	0.171	0.197	0.222
65	0.129	0.164	0.199	0.234	0.269	0.304
66	0.105	0.133	0.162	0.190	0.219	0.247
67	0.105	0.133	0.162	0.190	0.219	0.247
68	0.105	0.133	0.162	0.190	0.219	0.247
69	0.105	0.133	0.162	0.190	0.219	0.247
70	0.125	0.160	0.194	0.228	0.262	0.296

Service Retirement

Public Agency Fire 1/2 @ 55 and 2% @ 55			
Age	Rate	Age	Rate
50	0.0159	56	0.1108
51	0.0000	57	0.0000
52	0.0344	58	0.0950
53	0.0199	59	0.0441
54	0.0413	60	1.00000
55	0.0751		

Public Agency Police 1/2 @ 55 and 2% @ 55			
Age	Rate	Age	Rate
50	0.0255	56	0.0692
51	0.0000	57	0.0511
52	0.0164	58	0.0724
53	0.0272	59	0.0704
54	0.0095	60	1.0000
55	0.1667		

Service Retirement

Public Agency Police 2% @ 50						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.005	0.005	0.005	0.005	0.017	0.089
51	0.005	0.005	0.005	0.005	0.017	0.087
52	0.018	0.018	0.018	0.018	0.042	0.132
53	0.044	0.044	0.044	0.044	0.090	0.217
54	0.065	0.065	0.065	0.065	0.126	0.283
55	0.086	0.086	0.086	0.086	0.166	0.354
56	0.067	0.067	0.067	0.067	0.130	0.289
57	0.066	0.066	0.066	0.066	0.129	0.288
58	0.066	0.066	0.066	0.066	0.129	0.288
59	0.139	0.139	0.139	0.139	0.176	0.312
60	0.123	0.123	0.123	0.123	0.153	0.278
61	0.110	0.110	0.110	0.110	0.138	0.256
62	0.130	0.130	0.130	0.130	0.162	0.291
63	0.130	0.130	0.130	0.130	0.162	0.291
64	0.130	0.130	0.130	0.130	0.162	0.291
65	1.000	1.000	1.000	1.000	1.000	1.000

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

Service Retirement

Public Agency Fire 2% @ 50						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.009	0.009	0.009	0.009	0.013	0.020
51	0.013	0.013	0.013	0.013	0.020	0.029
52	0.018	0.018	0.018	0.018	0.028	0.042
53	0.052	0.052	0.052	0.052	0.079	0.119
54	0.067	0.067	0.067	0.067	0.103	0.154
55	0.089	0.089	0.089	0.089	0.136	0.204
56	0.083	0.083	0.083	0.083	0.127	0.190
57	0.082	0.082	0.082	0.082	0.126	0.189
58	0.088	0.088	0.088	0.088	0.136	0.204
59	0.074	0.074	0.074	0.074	0.113	0.170
60	0.100	0.100	0.100	0.100	0.154	0.230
61	0.072	0.072	0.072	0.072	0.110	0.165
62	0.099	0.099	0.099	0.099	0.152	0.228
63	0.114	0.114	0.114	0.114	0.175	0.262
64	0.114	0.114	0.114	0.114	0.175	0.262
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 3% @ 55						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.004	0.004	0.004	0.004	0.015	0.086
51	0.014	0.014	0.014	0.014	0.034	0.114
52	0.026	0.026	0.026	0.026	0.060	0.154
53	0.038	0.038	0.038	0.038	0.083	0.188
54	0.071	0.071	0.071	0.071	0.151	0.292
55	0.061	0.061	0.061	0.061	0.131	0.261
56	0.072	0.072	0.072	0.072	0.153	0.295
57	0.065	0.065	0.065	0.065	0.140	0.273
58	0.066	0.066	0.066	0.066	0.142	0.277
59	0.118	0.118	0.118	0.118	0.247	0.437
60	0.065	0.065	0.065	0.065	0.138	0.272
61	0.084	0.084	0.084	0.084	0.178	0.332
62	0.108	0.108	0.108	0.108	0.226	0.405
63	0.084	0.084	0.084	0.084	0.178	0.332
64	0.084	0.084	0.084	0.084	0.178	0.332
65	1.000	1.000	1.000	1.000	1.000	1.000

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

Service Retirement

Public Agency Fire 3% @ 55						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.001	0.001	0.001	0.006	0.016	0.069
51	0.002	0.002	0.002	0.006	0.018	0.071
52	0.012	0.012	0.012	0.021	0.040	0.098
53	0.032	0.032	0.032	0.049	0.085	0.149
54	0.057	0.057	0.057	0.087	0.144	0.217
55	0.073	0.073	0.073	0.109	0.179	0.259
56	0.064	0.064	0.064	0.097	0.161	0.238
57	0.063	0.063	0.063	0.095	0.157	0.233
58	0.065	0.065	0.065	0.099	0.163	0.241
59	0.088	0.088	0.088	0.131	0.213	0.299
60	0.105	0.105	0.105	0.155	0.251	0.344
61	0.118	0.118	0.118	0.175	0.282	0.380
62	0.087	0.087	0.087	0.128	0.210	0.295
63	0.067	0.067	0.067	0.100	0.165	0.243
64	0.067	0.067	0.067	0.100	0.165	0.243
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 3% @ 50						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.050	0.050	0.050	0.099	0.240	0.314
51	0.034	0.034	0.034	0.072	0.198	0.260
52	0.033	0.033	0.033	0.071	0.198	0.259
53	0.039	0.039	0.039	0.080	0.212	0.277
54	0.045	0.045	0.045	0.092	0.229	0.300
55	0.052	0.052	0.052	0.105	0.248	0.323
56	0.042	0.042	0.042	0.087	0.221	0.289
57	0.043	0.043	0.043	0.088	0.223	0.292
58	0.054	0.054	0.054	0.109	0.255	0.333
59	0.054	0.054	0.054	0.108	0.253	0.330
60	0.060	0.060	0.060	0.121	0.272	0.355
61	0.048	0.048	0.048	0.098	0.238	0.311
62	0.061	0.061	0.061	0.122	0.274	0.357
63	0.057	0.057	0.057	0.115	0.263	0.343
64	0.069	0.069	0.069	0.137	0.296	0.385
65	1.000	1.000	1.000	1.000	1.000	1.000

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

Service Retirement

Public Agency Fire 3% @ 50						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.020	0.020	0.020	0.040	0.130	0.192
51	0.008	0.008	0.008	0.023	0.107	0.164
52	0.023	0.023	0.023	0.043	0.136	0.198
53	0.023	0.023	0.023	0.043	0.135	0.198
54	0.027	0.027	0.027	0.048	0.143	0.207
55	0.043	0.043	0.043	0.070	0.174	0.244
56	0.053	0.053	0.053	0.085	0.196	0.269
57	0.054	0.054	0.054	0.086	0.197	0.271
58	0.052	0.052	0.052	0.084	0.193	0.268
59	0.075	0.075	0.075	0.116	0.239	0.321
60	0.065	0.065	0.065	0.102	0.219	0.298
61	0.076	0.076	0.076	0.117	0.241	0.324
62	0.068	0.068	0.068	0.106	0.224	0.304
63	0.027	0.027	0.027	0.049	0.143	0.208
64	0.094	0.094	0.094	0.143	0.277	0.366
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 2% @ 57						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.011	0.011	0.011	0.011	0.020	0.036
51	0.009	0.009	0.009	0.009	0.016	0.028
52	0.018	0.018	0.018	0.018	0.034	0.060
53	0.037	0.037	0.037	0.037	0.067	0.119
54	0.049	0.049	0.049	0.049	0.089	0.159
55	0.063	0.063	0.063	0.063	0.115	0.205
56	0.045	0.045	0.045	0.045	0.082	0.146
57	0.064	0.064	0.064	0.064	0.117	0.209
58	0.047	0.047	0.047	0.047	0.086	0.154
59	0.105	0.105	0.105	0.105	0.130	0.191
60	0.105	0.105	0.105	0.105	0.129	0.188
61	0.105	0.105	0.105	0.105	0.129	0.188
62	0.105	0.105	0.105	0.105	0.129	0.188
63	0.105	0.105	0.105	0.105	0.129	0.188
64	0.105	0.105	0.105	0.105	0.129	0.188
65	1.000	1.000	1.000	1.000	1.000	1.000

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

Service Retirement

Public Agency Fire 2% @ 57						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.005	0.005	0.005	0.005	0.008	0.012
51	0.006	0.006	0.006	0.006	0.009	0.013
52	0.012	0.012	0.012	0.012	0.019	0.028
53	0.033	0.033	0.033	0.033	0.050	0.075
54	0.045	0.045	0.045	0.045	0.069	0.103
55	0.061	0.061	0.061	0.061	0.094	0.140
56	0.055	0.055	0.055	0.055	0.084	0.126
57	0.081	0.081	0.081	0.081	0.125	0.187
58	0.059	0.059	0.059	0.059	0.091	0.137
59	0.055	0.055	0.055	0.055	0.084	0.126
60	0.085	0.085	0.085	0.085	0.131	0.196
61	0.085	0.085	0.085	0.085	0.131	0.196
62	0.085	0.085	0.085	0.085	0.131	0.196
63	0.085	0.085	0.085	0.085	0.131	0.196
64	0.085	0.085	0.085	0.085	0.131	0.196
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 2.5% @ 57						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.014	0.014	0.014	0.014	0.025	0.045
51	0.012	0.012	0.012	0.012	0.021	0.038
52	0.025	0.025	0.025	0.025	0.046	0.081
53	0.047	0.047	0.047	0.047	0.086	0.154
54	0.063	0.063	0.063	0.063	0.115	0.205
55	0.076	0.076	0.076	0.076	0.140	0.249
56	0.054	0.054	0.054	0.054	0.099	0.177
57	0.071	0.071	0.071	0.071	0.130	0.232
58	0.057	0.057	0.057	0.057	0.103	0.184
59	0.126	0.126	0.126	0.126	0.156	0.229
60	0.126	0.126	0.126	0.126	0.155	0.226
61	0.126	0.126	0.126	0.126	0.155	0.226
62	0.126	0.126	0.126	0.126	0.155	0.226
63	0.126	0.126	0.126	0.126	0.155	0.226
64	0.126	0.126	0.126	0.126	0.155	0.226
65	1.000	1.000	1.000	1.000	1.000	1.000

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

Service Retirement

Public Agency Fire 2.5% @ 57						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.007	0.007	0.007	0.007	0.010	0.015
51	0.008	0.008	0.008	0.008	0.012	0.018
52	0.016	0.016	0.016	0.016	0.025	0.038
53	0.042	0.042	0.042	0.042	0.064	0.096
54	0.057	0.057	0.057	0.057	0.088	0.132
55	0.074	0.074	0.074	0.074	0.114	0.170
56	0.066	0.066	0.066	0.066	0.102	0.153
57	0.090	0.090	0.090	0.090	0.139	0.208
58	0.071	0.071	0.071	0.071	0.110	0.164
59	0.066	0.066	0.066	0.066	0.101	0.151
60	0.102	0.102	0.102	0.102	0.157	0.235
61	0.102	0.102	0.102	0.102	0.157	0.236
62	0.102	0.102	0.102	0.102	0.157	0.236
63	0.102	0.102	0.102	0.102	0.157	0.236
64	0.102	0.102	0.102	0.102	0.157	0.236
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 2.7% @ 57						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.0138	0.0138	0.0138	0.0138	0.0253	0.0451
51	0.0123	0.0123	0.0123	0.0123	0.0226	0.0402
52	0.0249	0.0249	0.0249	0.0249	0.0456	0.0812
53	0.0497	0.0497	0.0497	0.0497	0.0909	0.1621
54	0.0662	0.0662	0.0662	0.0662	0.1211	0.2160
55	0.0854	0.0854	0.0854	0.0854	0.1563	0.2785
56	0.0606	0.0606	0.0606	0.0606	0.1108	0.1975
57	0.0711	0.0711	0.0711	0.0711	0.1300	0.2318
58	0.0628	0.0628	0.0628	0.0628	0.1149	0.2049
59	0.1396	0.1396	0.1396	0.1396	0.1735	0.2544
60	0.1396	0.1396	0.1396	0.1396	0.1719	0.2506
61	0.1396	0.1396	0.1396	0.1396	0.1719	0.2506
62	0.1396	0.1396	0.1396	0.1396	0.1719	0.2506
63	0.1396	0.1396	0.1396	0.1396	0.1719	0.2506
64	0.1396	0.1396	0.1396	0.1396	0.1719	0.2506
65	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

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

Service Retirement

Public Agency Fire 2.7% @ 57						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.0065	0.0065	0.0065	0.0065	0.0101	0.0151
51	0.0081	0.0081	0.0081	0.0081	0.0125	0.0187
52	0.0164	0.0164	0.0164	0.0164	0.0254	0.0380
53	0.0442	0.0442	0.0442	0.0442	0.0680	0.1018
54	0.0606	0.0606	0.0606	0.0606	0.0934	0.1397
55	0.0825	0.0825	0.0825	0.0825	0.1269	0.1900
56	0.0740	0.0740	0.0740	0.0740	0.1140	0.1706
57	0.0901	0.0901	0.0901	0.0901	0.1387	0.2077
58	0.0790	0.0790	0.0790	0.0790	0.1217	0.1821
59	0.0729	0.0729	0.0729	0.0729	0.1123	0.1681
60	0.1135	0.1135	0.1135	0.1135	0.1747	0.2615
61	0.1136	0.1136	0.1136	0.1136	0.1749	0.2618
62	0.1136	0.1136	0.1136	0.1136	0.1749	0.2618
63	0.1136	0.1136	0.1136	0.1136	0.1749	0.2618
64	0.1136	0.1136	0.1136	0.1136	0.1749	0.2618
65	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Service Retirement

Schools 2% @ 55						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.005	0.009	0.013	0.015	0.016	0.018
51	0.005	0.010	0.014	0.017	0.019	0.021
52	0.006	0.012	0.017	0.020	0.022	0.025
53	0.007	0.014	0.019	0.023	0.026	0.029
54	0.012	0.024	0.033	0.039	0.044	0.049
55	0.024	0.048	0.067	0.079	0.088	0.099
56	0.020	0.039	0.055	0.065	0.072	0.081
57	0.021	0.042	0.059	0.070	0.078	0.087
58	0.025	0.050	0.070	0.083	0.092	0.103
59	0.029	0.057	0.080	0.095	0.105	0.118
60	0.037	0.073	0.102	0.121	0.134	0.150
61	0.046	0.090	0.126	0.149	0.166	0.186
62	0.076	0.151	0.212	0.250	0.278	0.311
63	0.069	0.136	0.191	0.225	0.251	0.281
64	0.067	0.133	0.185	0.219	0.244	0.273
65	0.091	0.180	0.251	0.297	0.331	0.370
66	0.072	0.143	0.200	0.237	0.264	0.295
67	0.067	0.132	0.185	0.218	0.243	0.272
68	0.060	0.118	0.165	0.195	0.217	0.243
69	0.067	0.133	0.187	0.220	0.246	0.275
70	0.066	0.131	0.183	0.216	0.241	0.270

Miscellaneous

Internal Revenue Code Section 415

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

Internal Revenue Code Section 401(a)(17)

The limitations on compensation imposed by Internal Revenue Code Section 401(a)(17) are taken into account in this valuation. Each year, the impact of any changes in the compensation limitation since the prior valuation is included and amortized as part of the actuarial gain or loss base. The compensation limit for classic members for the 2016 calendar year is \$265,000.

APPENDIX B

PRINCIPAL PLAN PROVISIONS

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

Service Retirement

Eligibility

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

Benefit

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

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

Miscellaneous Plan Formulas

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

Safety Plan Formulas

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

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

PEPRA Safety Plan Formulas

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

- The *years of service* is the amount credited by CalPERS to a member while he or she is employed in this group (or for other periods that are recognized under the employer's contract with CalPERS). For a member who has earned service with multiple CalPERS employers, the benefit from each employer is calculated separately according to each employer's contract, and then added together for the total allowance. An agency may contract for an optional benefit where any unused sick leave accumulated at the time of retirement will be converted to credited service at a rate of 0.004 years of service for each day of sick leave.
- The *final compensation* is the monthly average of the member's highest 36 or 12 consecutive months' full-time equivalent monthly pay (no matter which CalPERS employer paid this compensation). The standard benefit is 36 months. Employers had the option of providing a final compensation equal to the highest 12 consecutive months for classic plans only. Final compensation must be defined by the highest 36 consecutive months' pay under the 1.5% at 65 formula. PEPRA members have a cap on the annual salary that can be used to calculate final compensation for all new members based on the Social Security contribution and benefit base. For employees that participate in Social Security this cap is \$118,775 for 2016 and for those employees that do not participate in Social Security the cap for 2016 is \$142,530. Adjustments to the caps are permitted annually based on changes to the CPI for all urban consumers.
- Employees must be covered by Social Security with the 1.5% at 65 formula. Social Security is optional for all other benefit formulas. For employees covered by Social Security, the modified formula is the standard benefit. Under this type of formula, the final compensation is offset by \$133.33 (or by one third if the final compensation is less than \$400). Employers may contract for the full benefit with Social Security that will eliminate the offset applicable to the final compensation. For employees not covered by Social Security, the full benefit is paid with

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

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

Vested Deferred Retirement

Eligibility for Deferred Status

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

Eligibility to Start Receiving Benefits

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

Benefit

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

Non-Industrial (Non-Job Related) Disability Retirement

Eligibility

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

Standard Benefit

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

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

Improved Benefit

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

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

Industrial (Job Related) Disability Retirement

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

Eligibility

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

Standard Benefit

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

Increased Benefit (75 percent of Final Compensation)

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

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

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

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

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

Post-Retirement Death Benefit

Standard Lump Sum Payment

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

Improved Lump Sum Payment

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

Form of Payment for Retirement Allowance

Standard Form of Payment

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

Improved Form of Payment (Post-Retirement Survivor Allowance)

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

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

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

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

Pre-Retirement Death Benefits

Basic Death Benefit

This is a standard benefit.

Eligibility

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

Benefit

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

1957 Survivor Benefit

This is a standard benefit.

Eligibility

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

Benefit

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

Optional Settlement 2W Death Benefit

This is an optional benefit.

Eligibility

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

Benefit

The Optional Settlement 2W Death benefit is a monthly allowance equal to the service retirement benefit that the member would have received had the member retired on the date of his or her death and elected Optional Settlement 2W. (A retiree who elects Optional Settlement 2W receives an allowance that has been reduced so that it will continue to be paid after his or her death to a surviving beneficiary.) The allowance is payable as long as the surviving spouse lives, at which time it is continued to any unmarried child(ren) under age 18, if applicable. The total amount paid will be at least equal to the basic death benefit.

Special Death Benefit

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

Eligibility

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

Benefit

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

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

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

Alternate Death Benefit for Local Fire Members

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

Eligibility

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

Benefit

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

Cost-of-Living Adjustments (COLA)

Standard Benefit

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

Improved Benefit

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

Purchasing Power Protection Allowance (PPPA)

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

Employee Contributions

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

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

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

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

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

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

Refund of Employee Contributions

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

1959 Survivor Benefit

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

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

APPENDIX C

PARTICIPANT DATA

- **SUMMARY OF VALUATION DATA**
- **ACTIVE MEMBERS**
- **TRANSFERRED AND TERMINATED MEMBERS**
- **RETIRED MEMBERS AND BENEFICIARIES**

Summary of Valuation Data

	June 30, 2015	June 30, 2016
1. Active Members		
a) Counts	16,891	17,201
b) Average Attained Age	43.89	43.99
c) Average Entry Age to Rate Plan	34.34	34.34
d) Average Years of Service	9.55	9.65
e) Average Annual Covered Pay	\$ 59,216	\$ 63,386
f) Annual Covered Payroll	1,000,223,148	1,090,295,411
g) Projected Annual Payroll for Contribution Year	1,092,970,840	1,191,395,234
h) Present Value of Future Payroll	8,043,545,604	8,856,745,363
2. Transferred Members		
a) Counts	3,779	3,878
b) Average Attained Age	43.61	43.62
c) Average Years of Service	2.57	2.53
d) Average Annual Covered Pay	\$ 78,879	\$ 81,670
3. Terminated Members		
a) Counts	8,162	8,702
b) Average Attained Age	43.82	44.03
c) Average Years of Service	2.18	2.18
d) Average Annual Covered Pay	\$ 42,605	\$ 43,342
4. Retired Members and Beneficiaries		
a) Counts	9,667	10,132
b) Average Attained Age	68.48	68.62
c) Average Annual Benefits	\$ 22,720	\$ 23,495
5. Active to Retired Ratio [(1a) / (4a)]	1.75	1.70

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

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

Active Members

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

Distribution of Active Members by Age and Service

Attained Age	Years of Service at Valuation Date						Total
	0-4	5-9	10-14	15-19	20-25	25+	
15-24	354	4	0	0	0	0	358
25-29	1441	205	14	0	0	0	1,660
30-34	1330	835	243	10	0	0	2,418
35-39	983	752	546	175	9	0	2,465
40-44	696	625	525	406	100	5	2,357
45-49	588	518	481	441	191	101	2,320
50-54	456	461	414	376	199	320	2,226
55-59	327	369	374	357	189	362	1,978
60-64	147	233	217	233	104	135	1,069
65 and over	58	76	93	59	24	40	350
All Ages	6380	4078	2907	2057	816	963	17,201

Distribution of Average Annual Salaries by Age and Service

Attained Age	Years of Service at Valuation Date						Average
	0-4	5-9	10-14	15-19	20-25	25+	
15-24	\$34,072	\$36,426	\$0	\$0	\$0	\$0	\$34,099
25-29	40,826	45,711	47,511	0	0	0	41,486
30-34	46,742	56,253	60,429	64,127	0	0	51,474
35-39	49,933	67,186	69,758	66,603	74,240	0	60,860
40-44	55,710	72,328	73,269	75,938	76,816	77,939	68,455
45-49	57,320	68,547	75,536	80,170	81,939	77,919	70,870
50-54	56,741	69,527	71,343	76,743	80,836	82,406	71,327
55-59	57,619	67,984	68,983	74,780	83,468	86,331	72,523
60-64	64,551	77,807	71,309	77,827	74,143	83,892	75,081
65 and over	72,172	68,284	73,549	75,650	94,016	88,769	75,674
All Ages	\$49,061	\$65,763	\$70,824	\$76,145	\$80,673	\$83,860	\$63,386

Transferred and Terminated Members

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

Attained Age	Years of Service at Valuation Date						Total	Average Salary
	0-4	5-9	10-14	15-19	20-25	25+		
15-24	34	0	0	0	0	0	34	\$55,151
25-29	297	6	0	0	0	0	303	62,516
30-34	500	44	5	0	0	0	549	75,387
35-39	651	66	11	0	0	0	728	83,033
40-44	529	57	18	2	1	0	607	88,537
45-49	466	68	22	9	2	0	567	91,101
50-54	337	88	30	20	4	2	481	79,776
55-59	227	69	27	14	6	0	343	81,942
60-64	121	38	14	5	2	0	180	85,933
65 and over	65	14	6	1	0	0	86	78,161
All Ages	3227	450	133	51	15	2	3,878	81,670

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

Attained Age	Years of Service at Valuation Date						Total	Average Salary
	0-4	5-9	10-14	15-19	20-25	25+		
15-24	99	0	0	0	0	0	99	\$26,723
25-29	704	20	0	0	0	0	724	33,766
30-34	1179	124	3	0	0	0	1,306	39,836
35-39	1217	162	23	3	0	0	1,405	42,267
40-44	1061	165	39	16	1	0	1,282	47,474
45-49	959	163	60	25	7	5	1,219	48,984
50-54	794	134	54	17	8	4	1,011	45,805
55-59	706	94	40	11	0	1	852	42,791
60-64	486	45	17	2	0	0	550	44,825
65 and over	235	14	4	1	0	0	254	42,007
All Ages	7440	921	240	75	16	10	8,702	43,342

Retired Members and Beneficiaries

Distribution of Retirees and Beneficiaries by Age and Retirement Type*

Attained Age	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Total
Under 30	0	0	1	0	0	16	17
30-34	0	1	4	0	0	5	10
35-39	0	7	9	1	1	8	26
40-44	0	7	11	0	1	12	31
45-49	0	30	21	0	1	14	66
50-54	294	57	20	3	0	28	402
55-59	973	57	19	5	0	33	1,087
60-64	1879	71	28	12	0	82	2,072
65-69	2239	77	37	9	0	121	2,483
70-74	1469	56	12	3	0	121	1,661
75-79	826	36	8	4	0	118	992
80-84	493	30	5	4	0	112	644
85 and Over	424	15	0	2	0	200	641
All Ages	8597	444	175	43	3	870	10,132

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

Attained Age	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Average
Under 30	\$0	\$0	\$233	\$0	\$0	\$4,499	\$4,248
30-34	0	647	193	0	0	3,615	1,950
35-39	0	6,347	268	8,405	155	3,092	3,082
40-44	0	7,195	319	0	126	11,005	6,002
45-49	0	10,525	2,563	0	858	10,445	7,828
50-54	20,764	11,522	1,052	19,191	0	11,780	17,835
55-59	25,465	12,596	2,432	8,607	0	12,109	23,904
60-64	30,269	11,134	1,474	7,242	0	14,667	28,473
65-69	28,339	13,314	2,403	13,585	0	14,627	26,765
70-74	25,562	12,831	1,817	17,559	0	18,353	24,421
75-79	21,399	11,666	242	13,245	0	13,601	19,915
80-84	16,423	8,429	1,223	2,840	0	12,558	15,176
85 and Over	14,598	10,384	0	11,165	0	10,558	13,228
All Ages	\$25,674	\$11,596	\$1,646	\$10,640	\$380	\$13,148	\$23,495

Retired Members and Beneficiaries (continued)

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

Years Retired	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Total
Under 5 Yrs	2503	69	48	13	0	319	2,952
5-9	2843	65	25	9	2	247	3,191
10-14	1639	88	31	6	0	135	1,899
15-19	784	110	24	7	1	88	1,014
20-24	445	61	17	3	0	44	570
25-29	222	24	13	3	0	23	285
30 and Over	161	27	17	2	0	14	221
All Years	8597	444	175	43	3	870	10,132

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

Years Retired	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Average
Under 5 Yrs	\$26,777	\$10,346	\$2,008	\$11,272	\$0	\$13,831	\$24,523
5-9	30,211	13,359	1,501	11,408	507	12,961	28,236
10-14	26,464	14,466	3,015	8,487	0	15,286	24,674
15-19	17,653	10,800	1,189	11,730	126	11,310	15,911
20-24	14,682	10,375	1,143	15,265	0	10,104	13,467
25-29	12,358	10,370	597	2,389	0	9,720	11,336
30 and Over	8,168	8,288	291	11,165	0	7,048	7,533
All Years	\$25,674	\$11,596	\$1,646	\$10,640	\$380	\$13,148	\$23,495

* Counts of members do not include alternate payees receiving benefits while the member is still working. Therefore, the total counts may not match information on page 25 of the report. Multiple records may exist for those who have service in more than one coverage group. This does not result in double counting of liabilities.

APPENDIX D

DEVELOPMENT OF PEPRA MEMBER CONTRIBUTION RATES

Development of PEPRAs Members Contribution Rates

The table below shows the determination of the Member contribution rates based on 50 percent of the Total Normal Cost for each respective plan on June 30, 2016.

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

Rate Plan Identifier	Plan	Basis for Current Rate		Rates Effective July 1, 2018			
		Total Normal Cost	Member Rate	Total Normal Cost	Change	Change Needed	Member Rate
26035	Miscellaneous PEPRAs	12.900%	6.500%	13.362%	0.462%	No	6.500%

For a description of the methods used to determine the Total Normal Cost for this purpose, please see the "PEPRAs Normal Cost Rate Methodology" section in Appendix A.

APPENDIX E

GLOSSARY OF ACTUARIAL TERMS

Glossary of Actuarial Terms

Accrued Liability (*also called Actuarial Accrued Liability or Entry Age Normal Accrued Liability*)

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

Actuarial Assumptions

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

Actuarial Methods

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

Actuarial Valuation

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

Amortization Bases

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

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

Amortization Period

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

Classic Member (under PEPRA)

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

Discount Rate Assumption

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

Entry Age

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

Entry Age Normal Cost Method

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

Fresh Start

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

Funded Status

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

GASB 68

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

New Member (under PEPR)

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

Normal Cost

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

Pension Actuary

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

PEPR

The California Public Employees' Pension Reform Act of 2013

Prepayment Contribution

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

Present Value of Benefits (PVB)

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

Unfunded Accrued Liability (UAL)

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



California Public Employees' Retirement System
Actuarial Office
P.O. Box 942701
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www.calpers.ca.gov

July 2017

SAFETY PLAN OF THE COUNTY OF RIVERSIDE (CalPERS ID: 5982690295)
Annual Valuation Report as of June 30, 2016

Dear Employer,

As an attachment to this letter, you will find a copy of the June 30, 2016 actuarial valuation report of your pension plan. Your 2016 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 31, 2017.

Required Contributions

The exhibit below displays the minimum required employer contributions and the Employee PEPRA Rate for Fiscal Year 2018-19 along with estimates of the required contributions for Fiscal Years 2019-20 and 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
2018-19	18.464%	\$48,790,038	11.25%
<i>Projected Results</i>			
2019-20	19.3%	\$63,634,000	TBD
2020-21	21.1%	\$75,825,000	TBD

The actual investment return for Fiscal Year 2016-17 was not known at the time this report was prepared. The projections above assume the investment return for that year would be 7.375 percent. ***If the actual investment return for Fiscal year 2016-17 differs from 7.375 percent, the actual contribution requirements for the projected years will differ from those shown above.***

Moreover, the projected results for Fiscal Years 2019-20 and 2020-21 also 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 2019-20 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. Actual contributions for Fiscal Year 2018-19 and all future years will be collected on that basis. 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 on page 21 also contains estimated employer contributions in future years under a variety of investment return scenarios.

Changes since the Prior Year's Valuation

On December 21, 2016, the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three year phase-in beginning with the June 30, 2016 actuarial valuations. The minimum employer contributions for Fiscal Year 2018-19 determined in this valuation were calculated using a discount rate of 7.375 percent. The projected employer contributions on Page 5 are calculated assuming that the discount rate will be lowered to 7.25 percent next year and to 7.00 percent the following year as adopted by the Board.

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 addresses 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 have been modified to 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 a number of 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 31 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,

A handwritten signature in black ink, appearing to read 'Scott Terando', with a long horizontal flourish extending to the right.

SCOTT TERANDO
Chief Actuary



**ACTUARIAL VALUATION
as of June 30, 2016**

**for the
SAFETY PLAN
of the
COUNTY OF RIVERSIDE**

(CalPERS ID: 5982690295)

(Rate Plan ID: 63)

**REQUIRED CONTRIBUTIONS
FOR FISCAL YEAR
July 1, 2018 – June 30, 2019**

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ACTUARIAL CERTIFICATION

To the best of our knowledge, this report is complete and accurate and contains sufficient information to disclose, fully and fairly, the funded condition of the SAFETY PLAN OF THE COUNTY OF RIVERSIDE. This valuation is based on the member and financial data as of June 30, 2016 provided by the various CalPERS databases and the benefits under this plan with CalPERS as of the date this report was produced. It is our opinion that the valuation has been performed in accordance with generally accepted actuarial principles, in accordance with standards of practice prescribed by the Actuarial Standards Board, and that the assumptions and methods are internally consistent and reasonable for this plan, as prescribed by the CalPERS Board of Administration according to provisions set forth in the California Public Employees' Retirement Law.

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



KURT SCHNEIDER, ASA, FCA, MAAA
Senior Pension Actuary, CalPERS

HIGHLIGHTS AND EXECUTIVE SUMMARY

- **INTRODUCTION**
- **PURPOSE OF THE REPORT**
- **REQUIRED CONTRIBUTIONS**
- **PLAN'S FUNDED STATUS**
- **PROJECTED EMPLOYER CONTRIBUTIONS**
- **COST**
- **CHANGES SINCE THE PRIOR YEAR'S VALUATION**
- **SUBSEQUENT EVENTS**

Introduction

This report presents the results of the June 30, 2016 actuarial valuation of the SAFETY PLAN OF THE COUNTY OF RIVERSIDE of the California Public Employees' Retirement System (CalPERS). This actuarial valuation sets the required employer contributions for Fiscal Year 2018-19.

Purpose of the Report

The actuarial valuation was prepared by the CalPERS Actuarial Office using data as of June 30, 2016. The purpose of the report is to:

- Set forth the assets and accrued liabilities of this plan as of June 30, 2016;
- Determine the required employer contributions for the fiscal year July 1, 2018 through June 30, 2019;
- Provide actuarial information as of June 30, 2016 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 15.

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	2018-19
Employer Normal Cost Rate	18.464%
<i>Plus Either</i>	
1) Monthly Employer Dollar UAL Payment	\$ 4,065,837
<i>Or</i>	
2) Annual UAL Prepayment Option	\$ 47,084,674
Required PEPRAs Member Contribution Rate	11.25%
<p><i>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).</i></p> <p><i>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.</i></p> <p><i>§20572 of the Public Employees' Retirement Law assesses interest at an annual rate of 10 percent if a contracting agency fails to remit the required contributions when due.</i></p> <p><i>For additional detail regarding the determination of the required contribution for PEPRAs members, see Appendix D. Required member contributions for Classic members can be found in Appendix B.</i></p>	

	Fiscal Year	Fiscal Year
	2017-18	2018-19
Normal Cost Contribution as a Percentage of Payroll		
Total Normal Cost	27.082%	27.695%
Employee Contribution ¹	9.170%	9.231%
Employer Normal Cost	17.912%	18.464%
Projected Annual Payroll for Contribution Year	\$ 349,125,325	\$ 370,225,769
Estimated Employer Contributions Based On Projected Payroll		
Total Normal Cost	\$ 94,550,121	\$ 102,534,027
Employee Contribution ¹	32,014,792	34,175,541
Employer Normal Cost	<u>62,535,329</u>	<u>68,358,486</u>
Unfunded Liability Contribution	35,778,888	48,790,038
% of Projected Payroll (illustrative only)	10.248%	13.178%
Estimated Total Employer Contribution	\$ 98,314,217	\$ 117,148,524
% of Projected Payroll (illustrative only)	28.160%	31.642%

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 PEPRAs members, the member contribution rate is based on 50 percent of the normal cost. A development of PEPRAs member contribution rates can be found in Appendix D. Employee cost sharing is not shown in this report.

Plan's Funded Status

	June 30, 2015	June 30, 2016
1. Present Value of Projected Benefits	\$ 3,644,399,800	\$ 3,971,490,903
2. Entry Age Normal Accrued Liability	2,846,014,858	3,110,254,402
3. Market Value of Assets (MVA)	\$ 2,140,637,485	\$ 2,151,981,845
4. Unfunded Accrued Liability (UAL) [(2) - (3)]	\$ 705,377,373	\$ 958,272,557
5. Funded Ratio [(3) / (2)]	75.2%	69.2%

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.

Fiscal Year	Projected Future Employer Contributions (Assumes 7.375% Return for Fiscal Year 2016-17)						
	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Normal Cost %	18.464%	19.3%	21.1%	21.1%	21.1%	21.1%	21.1%
UAL Payment	48,790,038	63,634,000	75,825,000	89,273,000	100,693,000	108,390,000	114,873,000
<i>Total as a % of Payroll*</i>	<i>31.6%</i>	<i>36.0%</i>	<i>40.4%</i>	<i>43.1%</i>	<i>45.2%</i>	<i>46.3%</i>	<i>47.1%</i>
<i>Projected Payroll</i>	<i>370,225,769</i>	<i>381,332,543</i>	<i>392,772,519</i>	<i>404,555,695</i>	<i>416,692,366</i>	<i>429,193,136</i>	<i>442,068,931</i>

*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 unanticipated 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 changes in the discount rate for the next two valuations in combination with the 5-year phase-in ramp, the increases in the required contributions are expected to continue for seven years from Fiscal Year 2018-19 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 will be expressed as a dollar amount and will be invoiced on a monthly basis. There will 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, 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 7.0 percent over the 20 years ending June 30, 2016, yet individual fiscal year returns have ranged from -24 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.

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 valuations. The minimum employer contributions for Fiscal Year 2018-19 determined in this valuation were calculated using a discount rate of 7.375 percent. The projected employer contributions on Page 5 are calculated assuming that the discount rate will be lowered to 7.25 percent next year and 7.00 percent the following 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.

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 three year discount rate schedule. A comprehensive analysis of all actuarial assumptions and methods including the discount rate will be conducted in 2017.

Subsequent Events

The contribution requirements determined in this actuarial valuation report are based on demographic and financial information as of June 30, 2016. Changes in the value of assets subsequent to that date are not reflected. Declines in asset values will increase the required contribution, while investment returns above the assumed rate of return will decrease the actuarial cost of the plan.

This actuarial valuation report reflects statutory changes, regulatory changes and CalPERS Board actions through January 2017. Any subsequent changes or actions are not reflected.

ASSETS

- **RECONCILIATION OF THE MARKET VALUE OF ASSETS**
- **ASSET ALLOCATION**
- **CALPERS HISTORY OF INVESTMENT RETURNS**

Reconciliation of the Market Value of Assets

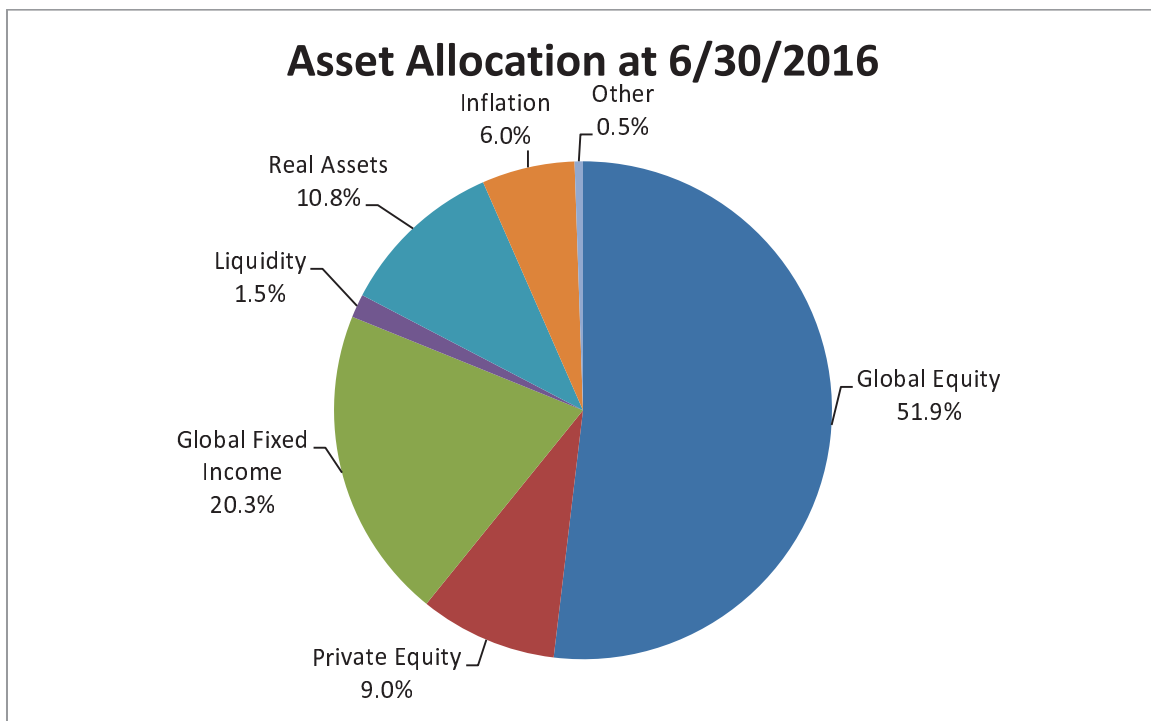
1.	Market Value of Assets as of 6/30/15 including Receivables	\$	2,140,637,485
2.	Change in Receivables for Service Buybacks		(803,125)
3.	Employer Contributions		76,363,138
4.	Employee Contributions		31,405,938
5.	Benefit Payments to Retirees and Beneficiaries		(103,713,670)
6.	Refunds		(1,288,546)
7.	Lump Sum Payments		0
8.	Transfers and Miscellaneous Adjustments		1,456,273
9.	Net Investment Return		7,924,352
10.	Market Value of Assets as of 6/30/16 including Receivables	\$	<u>2,151,981,845</u>

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 February 19, 2014, 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.

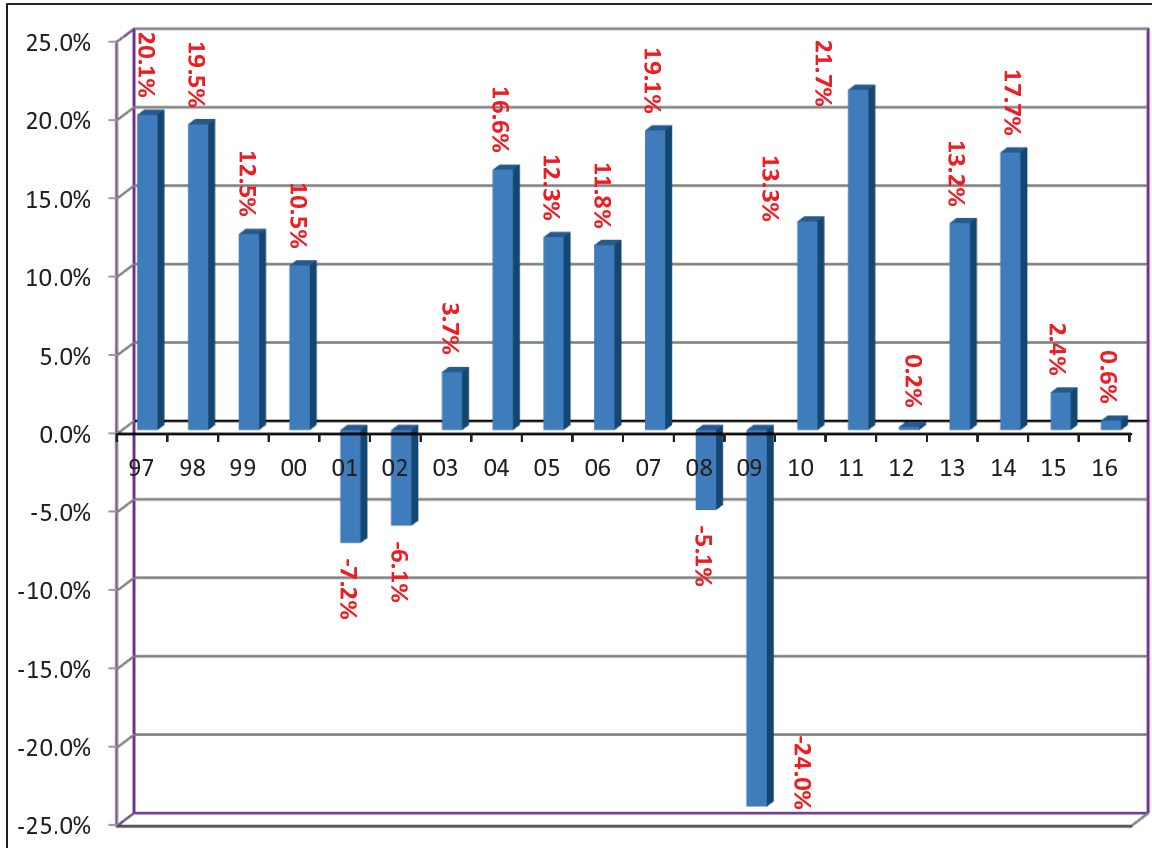
The asset allocation and market value of assets shown below reflect the values of the Public Employees' Retirement Fund (PERF) in its entirety as of June 30, 2016. The assets for COUNTY OF RIVERSIDE SAFETY PLAN are part of the PERF and are invested accordingly.

(A) Asset Class	(B) Market Value (\$ Billion)	(C) Policy Target Allocation
Public Equity	153.1	51.0%
Private Equity	26.4	10.0%
Global Fixed Income	59.9	20.0%
Liquidity	4.5	1.0%
Real Assets	31.8	12.0%
Inflation Sensitive Assets	17.8	6.0%
Other	1.6	0.0%
Total Fund	\$295.1	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, 2016, (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 11.8 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	0.6%	6.6%	5.0%	7.0%	8.2%
Volatility	—	8.1%	14.0%	11.8%	10.1%

LIABILITIES AND CONTRIBUTIONS

- **DEVELOPMENT OF ACCRUED AND UNFUNDED LIABILITIES**
- **(GAIN) / LOSS ANALYSIS 06/30/15 - 06/30/16**
- **SCHEDULE OF AMORTIZATION BASES**
- **30-YEAR AMORTIZATION SCHEDULES AND ALTERNATIVES**
- **RECONCILIATION OF REQUIRED EMPLOYER CONTRIBUTIONS**
- **EMPLOYER CONTRIBUTION HISTORY**
- **FUNDING HISTORY**

Development of Accrued and Unfunded Liabilities

	June 30, 2015	June 30, 2016
1. Present Value of Projected Benefits		
a) Active Members	\$ 2,182,278,634	2,401,428,417
b) Transferred Members	43,426,483	47,466,925
c) Terminated Members	20,299,069	22,073,067
d) Members and Beneficiaries Receiving Payments	1,398,395,614	1,500,522,494
e) Total	\$ 3,644,399,800	3,971,490,903
2. Present Value of Future Employer Normal Costs	\$ 517,739,820	561,551,773
3. Present Value of Future Employee Contributions	\$ 280,645,122	299,684,728
4. Entry Age Normal Accrued Liability		
a) Active Members [(1a) - (2) - (3)]	\$ 1,383,893,692	1,540,191,916
b) Transferred Members (1b)	43,426,483	47,466,925
c) Terminated Members (1c)	20,299,069	22,073,067
d) Members and Beneficiaries Receiving Payments (1d)	1,398,395,614	1,500,522,494
e) Total	\$ 2,846,014,858	3,110,254,402
5. Market Value of Assets (MVA)	\$ 2,140,637,485	2,151,981,845
6. Unfunded Accrued Liability (UAL) [(4e) - (5)]	\$ 705,377,373	958,272,557
7. Funded Ratio [(5) / (4e)]	75.2%	69.2%

(Gain)/Loss Analysis 6/30/15 – 6/30/16

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 6/30/15	\$ 705,377,373
b) Expected Payment on the UAL during 2015-16	18,178,606
c) Interest through 6/30/16 $ [.075 \times (1a) - ((1.075)^{1/2} - 1) \times (1b)]$	52,233,929
d) Expected UAL before all other changes $ [(1a) - (1b) + (1c)]$	739,432,696
e) Change due to plan changes	0
f) Change due to assumption change	53,307,592
g) Expected UAL after all other changes $ [(1d) + (1e) + (1f)]$	792,740,288
h) Actual UAL as of 6/30/16	958,272,557
i) Total (Gain)/Loss for 2015-16 $ [(1h) - (1g)]$	\$ 165,532,269
2. Contribution (Gain)/Loss for the Year	
a) Expected Contribution (Employer and Employee)	\$ 107,791,498
b) Interest on Expected Contributions	3,969,106
c) Actual Contributions	107,769,076
d) Interest on Actual Contributions	3,968,280
e) Expected Contributions with Interest $ [(2a) + (2b)]$	111,760,604
f) Actual Contributions with Interest $ [(2c) + (2d)]$	111,737,356
g) Contribution (Gain)/Loss $ [(2e) - (2f)]$	\$ 23,248
3. Asset (Gain)/Loss for the Year	
a) Market Value of Assets as of 6/30/15	\$ 2,140,637,485
b) Prior Fiscal Year Receivables	(6,913,408)
c) Current Fiscal Year Receivables	6,110,283
d) Contributions Received	107,769,076
e) Benefits and Refunds Paid	(105,002,216)
f) Transfers and Miscellaneous Adjustments	1,456,273
g) Expected Int. $ [.075 \times (3a + 3b) + ((1.075)^{1/2} - 1) \times ((3d) + (3e) + (3f))]$	160,184,810
h) Expected Assets as of 6/30/16 $ [(3a) + (3b) + (3c) + (3d) + (3e) + (3f) + (3g)]$	2,304,242,303
i) Market Value of Assets as of 6/30/16	2,151,981,845
j) Asset (Gain)/Loss $ [(3h) - (3i)]$	\$ 152,260,458
4. Liability (Gain)/Loss for the Year	
a) Total (Gain)/Loss (1i)	\$ 165,532,269
b) Contribution (Gain)/Loss (2g)	23,248
c) Asset (Gain)/Loss (3j)	152,260,458
d) Liability (Gain)/Loss $ [(4a) - (4b) - (4c)]$	\$ 13,248,563

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, 2016.
- The required employer contributions determined by the valuation are for the fiscal year beginning two years after the valuation date: Fiscal Year 2018-19.

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. The Normal Cost Rate for each of the two fiscal years is assumed to be the same as the rate determined by the current valuation. All expected dollar amounts are determined by multiplying the rate by the expected payroll for the applicable fiscal year, based on payroll as of the valuation date.

Reason for Base	Date Established	Amortization Period	Balance 6/30/16	Expected Payment 2016-17	Balance 6/30/17	Expected Payment 2017-18	Balance 6/30/18	Scheduled Payment for 2018-19
FS 30-YEAR AMORTIZATION	06/30/08	22	\$(5,091,099)	\$(344,359)	\$(5,109,736)	\$(354,690)	\$(5,119,043)	\$(360,488)
ASSUMPTION CHANGE	06/30/09	13	\$19,643,496	\$1,800,710	\$19,226,274	\$1,854,731	\$18,722,304	\$1,892,411
SPECIAL (GAIN)/LOSS	06/30/09	23	\$72,047,399	\$4,761,932	\$72,426,490	\$4,904,790	\$72,685,506	\$4,982,970
GOLDEN HANDSHAKE	06/30/10	14	\$12,526,131	\$1,097,187	\$12,313,007	\$1,130,102	\$12,050,058	\$1,152,531
SPECIAL (GAIN)/LOSS	06/30/10	24	\$57,183,092	\$3,698,536	\$57,567,851	\$3,809,492	\$57,866,012	\$3,868,698
ASSUMPTION CHANGE	06/30/11	15	\$44,661,197	\$3,752,042	\$44,067,023	\$3,864,603	\$43,312,390	\$3,939,515
SPECIAL (GAIN)/LOSS	06/30/11	25	\$62,427,624	\$3,956,552	\$62,931,807	\$4,075,249	\$63,350,176	\$4,136,994
PAYMENT (GAIN)/LOSS	06/30/12	26	\$(35,709,258)	\$(2,220,409)	\$(36,041,986)	\$(2,287,021)	\$(36,330,227)	\$(2,320,796)
(GAIN)/LOSS	06/30/12	26	\$(5,096,672)	\$(316,912)	\$(5,144,161)	\$(326,419)	\$(5,185,302)	\$(331,240)
(GAIN)/LOSS	06/30/13	27	\$347,984,589	\$9,508,047	\$363,796,033	\$14,689,933	\$375,404,001	\$19,881,592
ASSUMPTION CHANGE	06/30/14	18	\$187,033,268	\$3,562,551	\$197,135,388	\$7,338,855	\$204,069,461	\$11,213,441
(GAIN)/LOSS	06/30/14	28	\$(188,380,887)	\$(2,649,584)	\$(199,528,428)	\$(5,458,143)	\$(208,587,817)	\$(8,305,231)
(GAIN)/LOSS	06/30/15	29	\$170,203,813	\$2,472,796	\$180,193,986	\$2,537,406	\$190,853,984	\$5,143,908
ASSUMPTION CHANGE	06/30/16	20	\$53,307,592	\$(2,816,214)	\$60,157,242	\$(2,900,701)	\$67,599,600	\$1,274,165
(GAIN)/LOSS	06/30/16	30	\$165,532,272	\$1,536,338	\$176,148,294	\$0	\$189,139,231	\$2,621,568
TOTAL			\$958,272,557	\$27,799,213	\$1,000,139,083	\$32,878,187	\$1,039,830,334	\$48,790,038

30-Year 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 3 percent per year. **The schedules do not reflect the impact of adopted discount rate changes that will become effective beyond June 30, 2016. 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. For purposes of this display, total payments include any negative payments. Therefore, the amount of estimated savings may be understated to the extent that negative payments appear in the current schedule.

30-Year Amortization Schedule and Alternatives

Date	<u>Current Amortization Schedule*</u>		<u>Alternate Schedules</u>			
	Balance	Payment	20 Year Amortization		15 Year Amortization	
			Balance	Payment	Balance	Payment
6/30/2018	1,039,830,334	48,790,038	1,039,830,334	77,729,908	1,039,830,334	94,578,639
6/30/2019	1,065,960,652	63,033,453	1,035,972,607	80,061,805	1,018,513,630	97,415,998
6/30/2020	1,079,258,784	72,814,465	1,029,414,016	82,463,659	992,684,694	100,338,478
6/30/2021	1,083,402,379	82,066,315	1,019,882,881	84,937,569	961,922,544	103,348,632
6/30/2022	1,078,264,623	88,912,986	1,007,085,313	87,485,696	925,772,506	106,449,091
6/30/2023	1,065,653,306	91,580,375	990,703,507	90,110,267	883,743,647	109,642,564
6/30/2024	1,049,347,904	94,327,787	970,393,911	92,813,575	835,306,024	112,931,841
6/30/2025	1,028,993,059	97,157,620	945,785,264	95,597,982	779,887,714	116,319,796
6/30/2026	1,004,204,718	100,072,349	916,476,473	98,465,922	716,871,639	119,809,390
6/30/2027	974,567,938	103,074,520	882,034,345	101,419,900	645,592,146	123,403,672
6/30/2028	939,634,538	106,166,757	841,991,142	104,462,497	565,331,326	127,105,782
6/30/2029	898,920,564	109,351,759	795,841,956	107,596,371	475,315,074	130,918,955
6/30/2030	851,903,577	112,632,312	743,041,886	110,824,263	374,708,840	134,846,524
6/30/2031	798,019,713	113,232,211	683,003,009	114,148,990	262,613,075	138,891,920
6/30/2032	739,540,289	109,232,092	615,091,118	117,573,460	138,058,330	143,058,677
6/30/2033	680,893,003	100,548,028	538,622,224	121,100,664		
6/30/2034	626,919,078	95,521,716	452,858,793	124,733,684		
6/30/2035	574,172,935	90,103,330	357,005,705	128,475,694		
6/30/2036	523,151,398	84,273,873	250,205,909	132,329,965		
6/30/2037	474,407,617	84,567,832	131,535,759	136,299,864		
6/30/2038	421,764,377	84,803,585				
6/30/2039	364,994,408	87,347,692				
6/30/2040	301,401,399	90,658,855				
6/30/2041	229,687,317	73,734,787				
6/30/2042	170,221,362	63,606,376				
6/30/2043	116,865,047	46,857,046				
6/30/2044	76,929,679	38,033,023				
6/30/2045	43,192,698	22,746,450				
6/30/2046	22,807,853	17,880,361				
6/30/2047	5,961,961	6,177,897				
Totals		2,379,305,890		2,088,631,735		1,759,059,959
Interest Paid		1,339,475,556		1,048,801,401		719,229,625
Estimated Savings				290,674,155		620,245,931

* This schedule does not reflect the impact of adopted discount rate changes that will become effective beyond June 30, 2016. For Projected Employer Contributions, please see Page 5.

Reconciliation of Required Employer Contributions

Normal Cost (% of Payroll)

1. For Period 7/1/17 – 6/30/18	
a) Employer Normal Cost	17.912%
b) Employee Contribution	9.170%
c) Total Normal Cost	27.082%
2. Changes since the prior year annual valuation	
a) Effect of changes in demographics results	(0.194%)
b) Effect of plan changes	0.000%
c) Effect of changes in assumptions	0.807%
d) Net effect of the changes above [sum of (a) through (c)]	0.613%
3. For Period 7/1/18 – 6/30/19	
a) Employer Normal Cost	18.464%
b) Employee Contribution	9.231%
c) Total Normal Cost	27.695%
Employer Normal Cost Change [(3a) – (1a)]	0.552%
Employee Contribution Change [(3b) – (1b)]	0.061%

Unfunded Liability Contribution (\$)

1. For Period 7/1/17 – 6/30/18	35,778,888
2. Changes since the prior year annual valuation	
a) Effect of (gain)/loss during prior year ¹	2,621,568
b) Effect of plan changes	0
c) Effect of changes in assumptions ²	1,274,165
d) Changes to prior year amortization payments ³	9,115,417
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)]	13,011,150
3. For Period 7/1/18 – 6/30/19 [(1)+(2g)]	48,790,038

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 7/1/17 – 6/30/18 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	Required By Valuation	
		Unfunded Rate	Unfunded Liability Payment (\$)
2013 - 14	17.504%	5.864%	N/A
2014 - 15	16.564%	5.335%	N/A
2015 - 16	16.729%	6.856%	N/A
2016 - 17	18.321%	8.249%	N/A
2017 - 18	17.912%	N/A	35,778,888
2018 - 19	18.464%	N/A	48,790,038

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	\$ 2,032,001,280	\$ 1,565,799,198	\$ 466,202,082	77.1%	\$ 273,169,605
06/30/12	2,086,406,405	1,567,404,726	519,001,679	75.1%	261,703,717
06/30/13	2,285,586,497	1,776,122,369	509,464,128	77.7%	271,367,032
06/30/14	2,615,686,777	2,098,296,808	517,389,969	80.2%	295,171,068
06/30/15	2,846,014,858	2,140,637,485	705,377,373	75.2%	319,499,129
06/30/16	3,110,254,402	2,151,981,845	958,272,557	69.2%	338,809,025

RISK ANALYSIS

- **ANALYSIS OF FUTURE INVESTMENT RETURN SCENARIOS**
- **ANALYSIS OF DISCOUNT RATE SENSITIVITY**
- **VOLATILITY RATIOS**
- **HYPOTHETICAL TERMINATION LIABILITY**

Analysis of Future Investment Return Scenarios

Analysis was performed to determine the effects of various future investment returns on required employer contributions. The projections below provide a range of results based on five investment return scenarios assumed to occur during the next four fiscal years (2016-17, 2017-18, 2018-19 and 2019-20). 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 7.375 percent for fiscal year 2016-17. For fiscal years 2017-18, 2018-19, and 2019-20 each scenario assumes an alternate fixed annual return. The fixed return assumptions for the five scenarios are -3.0 percent, 3.0 percent, 7.0 percent (7.25 percent for 2017-18), 11.0 percent and 17.0 percent.

The alternate investment returns were chosen based on stochastic analysis of possible future investment returns over the four year period ending June 30, 2020. Using the expected returns and volatility of the asset classes in which the funds are invested, we produced ten thousand stochastic outcomes for this period. We then selected annual returns that approximate the 5th, 25th, 50th, 75th, and 95th percentiles for these outcomes. For example, of all of the 4-year outcomes generated in the stochastic analysis, approximately 25 percent of them had an average annual return of 3.0 percent or less.

Required contributions outside of this range are also possible. In particular, while it is unlikely that investment returns will average less than -3.0 percent or greater than 17.0 percent over this four year period, the possibility of a single investment return less than -3.0 percent or greater than 17.0 percent in any given year is much greater.

Assumed Annual Return From 2017-18 through 2019-20	Projected Employer Contributions			
	2019-20	2020-21	2021-22	2022-23
(3.0%)				
Normal Cost	19.3%	21.1%	21.1%	21.1%
UAL Contribution	\$63,634,000	\$79,455,000	\$100,233,000	\$122,867,000
3.0%				
Normal Cost	19.3%	21.1%	21.1%	21.1%
UAL Contribution	\$63,634,000	\$77,330,000	\$93,851,000	\$110,077,000
Assumed Discount Rate				
Normal Cost	19.3%	21.1%	21.1%	21.1%
UAL Contribution	\$63,634,000	\$75,825,000	\$89,273,000	\$100,693,000
11.0%				
Normal Cost	19.3%	21.1%	21.5%	21.9%
UAL Contribution	\$63,634,000	\$74,497,000	\$85,008,000	\$91,965,000
17.0%				
Normal Cost	19.3%	21.1%	22.4%	23.6%
UAL Contribution	\$63,634,000	\$72,372,000	\$78,278,000	\$78,308,000

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 Years 2019-20 and 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.

Analysis of Discount Rate Sensitivity

Shown below are various valuation results as of June 30, 2016 assuming alternate discount rates. Results are shown using the current discount rate of 7.375 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" in the "Risk Analysis" section.

Sensitivity Analysis				
As of June 30, 2016	Plan's Normal Cost	Accrued Liability	Unfunded Accrued Liability	Funded Status
7.375% (current discount rate)	27.695%	\$3,110,254,402	\$958,272,557	69.2%
6.0%	38.831%	\$3,801,515,117	\$1,649,533,272	56.6%
7.0%	30.302%	\$3,278,881,286	\$1,126,899,441	65.6%
8.0%	23.927%	\$2,857,007,437	\$705,025,592	75.3%

Volatility Ratios

The actuarial calculations supplied in this communication are based on a number of 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 (7.375 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, 2016	
1. Market Value of Assets without Receivables	\$	2,145,871,562
2. Payroll		338,809,025
3. Asset Volatility Ratio (AVR) [(1) / (2)]		6.3
4. Accrued Liability (7.375% discount rate)	\$	3,110,254,402
5. Liability Volatility Ratio (LVR) [(4) / (2)]		9.2
6. Accrued Liability (7.00% discount rate)		3,278,881,286
7. Projected Liability Volatility Ratio [(6) / (2)]		9.7

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, 2016. The plan liability on a termination basis is calculated differently compared to 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%
\$2,151,981,845	\$6,095,365,371	35.3%	\$3,943,383,526	\$5,073,816,646	42.4%	\$2,921,834,801

¹ The hypothetical liabilities calculated above include a 7 percent mortality 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 1.75 percent on June 30, 2016, and was 2.75 percent on January 31, 2017.

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

PLAN'S MAJOR BENEFIT PROVISIONS

Plan's Major Benefit Options

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

Benefit Provision	Contract Package						
	Active Fire	Active Peace	Active Peace	Active Peace	Inactive Fire	Receiving Fire	Receiving Peace
Benefit Formula Social Security Coverage Full/Modified	3.0% @ 50 No Full	3.0% @ 50 No Full	2.7% @ 57 No Full	2.0% @ 50 No Full	2.7% @ 57 No Full	2.7% @ 57 No Full	
Employee Contribution Rate	9.00%	9.00%	10.75%	9.00%	Three Year	Three Year	
Final Average Compensation Period	Three Year	One Year	Three Year	Three Year	Three Year	Three Year	
Sick Leave Credit	No	No	No	No	No	No	
Non-Industrial Disability	Standard	Standard	Standard	Standard	Standard	Standard	
Industrial Disability	Yes	Yes	Yes	Yes	Yes	Yes	
Pre-Retirement Death Benefits Optional Settlement 2W 1959 Survivor Benefit Level Special Alternate (firefighters)	Yes Indexed Yes No	Yes Indexed Yes No	Yes Indexed Yes No	Yes Indexed Yes No	Yes Indexed Yes No	Yes Indexed Yes No	
Post-Retirement Death Benefits Lump Sum Survivor Allowance (PRSA)	\$500 Yes	\$500 Yes	\$500 Yes	\$500 Yes	\$500 Yes	\$500 Yes	\$500 Yes
COLA	2%	2%	2%	2%	2%	2%	2%

APPENDICES

- **APPENDIX A – ACTUARIAL METHODS AND ASSUMPTIONS**
- **APPENDIX B – PRINCIPAL PLAN PROVISIONS**
- **APPENDIX C – PARTICIPANT DATA**
- **APPENDIX D – DEVELOPMENT OF PEPRA MEMBER CONTRIBUTION RATES**
- **APPENDIX E – GLOSSARY OF ACTUARIAL TERMS**

APPENDIX A

ACTUARIAL METHODS AND ASSUMPTIONS

- **ACTUARIAL DATA**
- **ACTUARIAL METHODS**
- **ACTUARIAL ASSUMPTIONS**
- **MISCELLANEOUS**

Actuarial Data

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

Actuarial Methods

Actuarial Cost Method

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

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

Amortization of Unfunded Actuarial Accrued Liability

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

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

Exceptions for Inconsistencies:

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

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

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

Exceptions for Inactive Plans:

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

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

Asset Valuation Method

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

PEPRA Normal Cost Rate Methodology

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

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

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

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

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

Actuarial Assumptions

In 2014, CalPERS completed a 2-year asset liability management study incorporating actuarial assumptions and strategic asset allocation. On February 19, 2014, the CalPERS Board of Administration adopted relatively modest changes to the asset allocation that reduced the expected volatility of returns. The adopted asset allocation was expected to have a long-term blended return that continued to support a discount rate assumption of 7.5 percent at that time. The Board also approved several changes to the demographic assumptions that more closely aligned with actual experience. The most significant of these is mortality improvement to acknowledge the greater life expectancies we are seeing in our membership and expected continued improvements. These new actuarial assumptions were first used in the June 30, 2014 valuation to set the Fiscal Year 2016-17 contribution for public agency employers.

On December 21, 2016, the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three year phase-in beginning with the June 30, 2016 actuarial valuations. The minimum employer contributions for Fiscal Year 2018-19 determined in this valuation were calculated using a discount rate of 7.375 percent. The projected employer contributions on Page 5 are calculated assuming that the discount rate will be lowered to 7.25 percent next year and 7.00 percent the following year as adopted by the Board. The decision to reduce the discount rate was primarily based on reduced capital market assumptions provided by external investment consultants and CalPERS investment staff. The specific decision adopted by the Board reflected recommendations from CalPERS staff and additional input from employer and employee stakeholder groups. Based on the investment allocation adopted by the Board and capital market assumptions, the reduced discount rate schedule provides a more realistic assumption for the long term investment return of the fund.

Notwithstanding the Board's decision to phase into a 7.0 percent discount rate, subsequent analysis of the expected investment return of CalPERS assets or changes to the investment allocation may result in a change to this three year discount rate schedule. A comprehensive analysis of all actuarial assumptions and methods including the discount rate will be conducted in 2017.

For more details and additional rationale for the selection of the actuarial assumptions, please refer to the CalPERS Experience Study and Review of Actuarial Assumptions report from January 2014 that can be found on the CalPERS website under: "Forms and Publications". Click on "View All" and search for Experience Study.

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

Economic Assumptions

Discount Rate

The prescribed discount rate assumption adopted by the Board on December 21, 2016 is 7.375 percent compounded annually (net of investment and administrative expenses) as of 6/30/2016.

The Board also prescribed that the assumed discount rate will reduce to 7.25 percent compounded annually (net of expenses) as of 6/30/2017, and 7.0 percent compounded annually (net of expenses) as of 6/30/2018. These further changes to the discount rate assumption are not reflected in the determination of required contributions determined in this report for Fiscal Year 2018-19.

Termination Liability Discount Rate

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

The hypothetical termination liabilities in this report are calculated using an observed range of market interest rates. This range is based on the lowest and highest 20-year Treasury bond observed during an approximate 2-year period centered around the valuation date. The 20-year Treasury bond has a similar duration to most plan liabilities and serves as a good proxy for the termination discount rate. The 20-year Treasury yield was 1.75 percent on June 30, 2016.

Salary Growth

Annual increases vary by category, entry age, and duration of service. A sample of assumed increases are shown below.

Public Agency Miscellaneous

<u>Duration of Service</u>	<u>(Entry Age 20)</u>	<u>(Entry Age 30)</u>	<u>(Entry Age 40)</u>
0	0.1220	0.1160	0.1020
1	0.0990	0.0940	0.0830
2	0.0860	0.0810	0.0710
3	0.0770	0.0720	0.0630
4	0.0700	0.0650	0.0570
5	0.0640	0.0600	0.0520
10	0.0460	0.0430	0.0390
15	0.0420	0.0400	0.0360
20	0.0390	0.0380	0.0340
25	0.0370	0.0360	0.0330
30	0.0350	0.0340	0.0320

Public Agency Fire

<u>Duration of Service</u>	<u>(Entry Age 20)</u>	<u>(Entry Age 30)</u>	<u>(Entry Age 40)</u>
0	0.2000	0.1980	0.1680
1	0.1490	0.1460	0.1250
2	0.1200	0.1160	0.0990
3	0.0980	0.0940	0.0810
4	0.0820	0.0780	0.0670
5	0.0690	0.0640	0.0550
10	0.0470	0.0460	0.0420
15	0.0440	0.0420	0.0390
20	0.0420	0.0390	0.0360
25	0.0400	0.0370	0.0340
30	0.0380	0.0360	0.0340

Public Agency Police

<u>Duration of Service</u>	<u>(Entry Age 20)</u>	<u>(Entry Age 30)</u>	<u>(Entry Age 40)</u>
0	0.1500	0.1470	0.1310
1	0.1160	0.1120	0.1010
2	0.0950	0.0920	0.0830
3	0.0810	0.0780	0.0700
4	0.0700	0.0670	0.0600
5	0.0610	0.0580	0.0520
10	0.0450	0.0430	0.0370
15	0.0450	0.0430	0.0370
20	0.0450	0.0430	0.0370
25	0.0450	0.0430	0.0370
30	0.0450	0.0430	0.0370

Salary Growth (continued)

Public Agency County Peace Officers			
<u>Duration of Service</u>	<u>(Entry Age 20)</u>	<u>(Entry Age 30)</u>	<u>(Entry Age 40)</u>
0	0.1770	0.1670	0.1500
1	0.1340	0.1260	0.1140
2	0.1080	0.1030	0.0940
3	0.0900	0.0860	0.0790
4	0.0760	0.0730	0.0670
5	0.0650	0.0620	0.0580
10	0.0470	0.0450	0.0410
15	0.0460	0.0450	0.0390
20	0.0460	0.0450	0.0380
25	0.0460	0.0450	0.0380
30	0.0460	0.0440	0.0380

Schools			
<u>Duration of Service</u>	<u>(Entry Age 20)</u>	<u>(Entry Age 30)</u>	<u>(Entry Age 40)</u>
0	0.0900	0.0880	0.0820
1	0.0780	0.0750	0.0700
2	0.0700	0.0680	0.0630
3	0.0650	0.0630	0.0580
4	0.0610	0.0590	0.0540
5	0.0580	0.0560	0.0510
10	0.0460	0.0450	0.0410
15	0.0420	0.0410	0.0380
20	0.0390	0.0380	0.0350
25	0.0370	0.0350	0.0330
30	0.0350	0.0330	0.0310

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

Overall Payroll Growth

3.00 percent compounded annually (used in projecting the payroll over which the unfunded liability is amortized). This assumption is used for all plans with active members.

Inflation

2.75 percent compounded annually.

Non-valued Potential Additional Liabilities

The potential liability loss for a cost-of-living increase exceeding the 2.75 percent inflation assumption, and any potential liability loss from future member service purchases are not reflected in the valuation.

Miscellaneous Loading Factors

Credit for Unused Sick Leave

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

Conversion of Employer Paid Member Contributions (EPMC)

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

Norris Decision (Best Factors)

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

Termination Liability

The termination liabilities include a 7 percent contingency load. This load is for unforeseen improvements in mortality.

Demographic Assumptions

Pre-Retirement Mortality

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

Age	Non-Industrial Death (Not Job-Related)		Industrial Death (Job-Related)
	Male	Female	Male and Female
20	0.00031	0.00020	0.00003
25	0.00040	0.00023	0.00007
30	0.00049	0.00025	0.00010
35	0.00057	0.00035	0.00012
40	0.00075	0.00050	0.00013
45	0.00106	0.00071	0.00014
50	0.00155	0.00100	0.00015
55	0.00228	0.00138	0.00016
60	0.00308	0.00182	0.00017
65	0.00400	0.00257	0.00018
70	0.00524	0.00367	0.00019
75	0.00713	0.00526	0.00020
80	0.00990	0.00814	0.00021

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

Post-Retirement Mortality

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

Age	Healthy Recipients		Non-Industrially Disabled (Not Job-Related)		Industrially Disabled (Job-Related)	
	Male	Female	Male	Female	Male	Female
50	0.00501	0.00466	0.01680	0.01158	0.00501	0.00466
55	0.00599	0.00416	0.01973	0.01149	0.00599	0.00416
60	0.00710	0.00436	0.02289	0.01235	0.00754	0.00518
65	0.00829	0.00588	0.02451	0.01607	0.01122	0.00838
70	0.01305	0.00993	0.02875	0.02211	0.01635	0.01395
75	0.02205	0.01722	0.03990	0.03037	0.02834	0.02319
80	0.03899	0.02902	0.06083	0.04725	0.04899	0.03910
85	0.06969	0.05243	0.09731	0.07762	0.07679	0.06251
90	0.12974	0.09887	0.14804	0.12890	0.12974	0.09887
95	0.22444	0.18489	0.22444	0.21746	0.22444	0.18489
100	0.32536	0.30017	0.32536	0.30017	0.32536	0.30017
105	0.58527	0.56093	0.58527	0.56093	0.58527	0.56093
110	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

The post-retirement mortality rates above include 20 years of projected on-going mortality improvement using Scale BB published by the Society of Actuaries.

Marital Status

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

Member Category	Percent Married
Miscellaneous Member	85%
Local Police	90%
Local Fire	90%
Other Local Safety	90%
School Police	90%

Age of Spouse

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

Terminated Members

It is assumed that terminated members refund immediately if non-vested. Terminated members who are vested are assumed to follow the same service retirement pattern as active members but with a load to reflect the expected higher rates of retirement, especially at lower ages. The following table shows the load factors that are applied to the service retirement assumption for active members to obtain the service retirement pattern for separated vested members:

Age	Load Factor Miscellaneous	Load Factor Safety
50	190%	310%
51	110%	190%
52	110%	105%
53 through 54	100%	105%
55	100%	140%
56 and above	100% (no change)	100% (no change)

Termination with Refund

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

Public Agency Miscellaneous

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

Public Agency Safety

Duration of Service	Fire	Police	County Peace Officer
0	0.0710	0.1013	0.0997
1	0.0554	0.0636	0.0782
2	0.0398	0.0271	0.0566
3	0.0242	0.0258	0.0437
4	0.0218	0.0245	0.0414
5	0.0029	0.0086	0.0145
10	0.0009	0.0053	0.0089
15	0.0006	0.0027	0.0045
20	0.0005	0.0017	0.0020
25	0.0003	0.0012	0.0009
30	0.0003	0.0009	0.0006
35	0.0003	0.0009	0.0006

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

Schools

Duration of Service	Entry Age 20	Entry Age 25	Entry Age 30	Entry Age 35	Entry Age 40	Entry Age 45
0	0.1730	0.1627	0.1525	0.1422	0.1319	0.1217
1	0.1585	0.1482	0.1379	0.1277	0.1174	0.1071
2	0.1440	0.1336	0.1234	0.1131	0.1028	0.0926
3	0.1295	0.1192	0.1089	0.0987	0.0884	0.0781
4	0.1149	0.1046	0.0944	0.0841	0.0738	0.0636
5	0.0278	0.0249	0.0221	0.0192	0.0164	0.0135
10	0.0172	0.0147	0.0122	0.0098	0.0074	0.0049
15	0.0115	0.0094	0.0074	0.0053	0.0032	0.0011
20	0.0073	0.0055	0.0038	0.0020	0.0002	0.0002
25	0.0037	0.0023	0.0010	0.0002	0.0002	0.0002
30	0.0015	0.0003	0.0002	0.0002	0.0002	0.0002
35	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002

Termination with Vested Benefits

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

Public Agency Miscellaneous

Duration of Service	Entry Age 20	Entry Age 25	Entry Age 30	Entry Age 35	Entry Age 40
5	0.0656	0.0597	0.0537	0.0477	0.0418
10	0.0530	0.0466	0.0403	0.0339	0.0000
15	0.0443	0.0373	0.0305	0.0000	0.0000
20	0.0333	0.0261	0.0000	0.0000	0.0000
25	0.0212	0.0000	0.0000	0.0000	0.0000
30	0.0000	0.0000	0.0000	0.0000	0.0000
35	0.0000	0.0000	0.0000	0.0000	0.0000

Public Agency Safety

Duration of Service	Fire	Police	County Peace Officer
5	0.0162	0.0163	0.0265
10	0.0061	0.0126	0.0204
15	0.0058	0.0082	0.0130
20	0.0053	0.0065	0.0074
25	0.0047	0.0058	0.0043
30	0.0045	0.0056	0.0030
35	0.0000	0.0000	0.0000

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

Schools

Duration of Service	Entry Age 20	Entry Age 25	Entry Age 30	Entry Age 35	Entry Age 40
5	0.0816	0.0733	0.0649	0.0566	0.0482
10	0.0629	0.0540	0.0450	0.0359	0.0000
15	0.0537	0.0440	0.0344	0.0000	0.0000
20	0.0420	0.0317	0.0000	0.0000	0.0000
25	0.0291	0.0000	0.0000	0.0000	0.0000
30	0.0000	0.0000	0.0000	0.0000	0.0000
35	0.0000	0.0000	0.0000	0.0000	0.0000

Non-Industrial (Not Job-Related) Disability

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

Age	Miscellaneous		Fire	Police	County Peace Officer	Schools	
	Male	Female	Male and Female	Male and Female	Male and Female	Male	Female
20	0.0002	0.0001	0.0001	0.0001	0.0001	0.0003	0.0003
25	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
30	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002
35	0.0005	0.0008	0.0001	0.0003	0.0004	0.0005	0.0004
40	0.0012	0.0016	0.0001	0.0004	0.0007	0.0015	0.0010
45	0.0019	0.0022	0.0002	0.0005	0.0013	0.0030	0.0019
50	0.0021	0.0023	0.0005	0.0008	0.0018	0.0039	0.0024
55	0.0022	0.0018	0.0010	0.0013	0.0010	0.0036	0.0021
60	0.0022	0.0014	0.0015	0.0020	0.0006	0.0031	0.0014

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

Industrial (Job-Related) Disability

Rates vary by age and category.

Age	Fire	Police	County Peace Officer
20	0.0001	0.0000	0.0004
25	0.0003	0.0017	0.0013
30	0.0007	0.0048	0.0025
35	0.0016	0.0079	0.0037
40	0.0030	0.0110	0.0051
45	0.0053	0.0141	0.0067
50	0.0277	0.0185	0.0092
55	0.0409	0.0479	0.0151
60	0.0583	0.0602	0.0174

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

Service Retirement

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

Service Retirement

Public Agency Miscellaneous 1.5% @ 65

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

Public Agency Miscellaneous 2% @ 60

Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.010	0.013	0.015	0.018	0.019	0.021
51	0.009	0.011	0.014	0.016	0.017	0.019
52	0.011	0.014	0.017	0.020	0.022	0.024
53	0.010	0.012	0.015	0.017	0.020	0.021
54	0.015	0.019	0.023	0.025	0.029	0.031
55	0.022	0.029	0.035	0.040	0.045	0.049
56	0.018	0.024	0.028	0.033	0.036	0.040
57	0.024	0.032	0.038	0.043	0.049	0.053
58	0.027	0.036	0.043	0.049	0.055	0.061
59	0.033	0.044	0.054	0.061	0.068	0.076
60	0.056	0.077	0.092	0.105	0.117	0.130
61	0.071	0.097	0.118	0.134	0.149	0.166
62	0.117	0.164	0.198	0.224	0.250	0.280
63	0.122	0.171	0.207	0.234	0.261	0.292
64	0.114	0.159	0.193	0.218	0.244	0.271
65	0.150	0.209	0.255	0.287	0.321	0.358
66	0.114	0.158	0.192	0.217	0.243	0.270
67	0.141	0.196	0.238	0.270	0.301	0.337
68	0.103	0.143	0.174	0.196	0.219	0.245
69	0.109	0.153	0.185	0.209	0.234	0.261
70	0.117	0.162	0.197	0.222	0.248	0.277

Service Retirement

Public Agency Miscellaneous 2% @ 55

Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.014	0.018	0.021	0.025	0.027	0.031
51	0.012	0.014	0.017	0.020	0.021	0.025
52	0.013	0.017	0.019	0.023	0.025	0.028
53	0.015	0.020	0.023	0.027	0.030	0.034
54	0.026	0.033	0.038	0.045	0.051	0.059
55	0.048	0.061	0.074	0.088	0.100	0.117
56	0.042	0.053	0.063	0.075	0.085	0.100
57	0.044	0.056	0.067	0.081	0.091	0.107
58	0.049	0.062	0.074	0.089	0.100	0.118
59	0.057	0.072	0.086	0.103	0.118	0.138
60	0.067	0.086	0.103	0.123	0.139	0.164
61	0.081	0.103	0.124	0.148	0.168	0.199
62	0.116	0.147	0.178	0.214	0.243	0.288
63	0.114	0.144	0.174	0.208	0.237	0.281
64	0.108	0.138	0.166	0.199	0.227	0.268
65	0.155	0.197	0.238	0.285	0.325	0.386
66	0.132	0.168	0.203	0.243	0.276	0.328
67	0.122	0.155	0.189	0.225	0.256	0.304
68	0.111	0.141	0.170	0.204	0.232	0.274
69	0.114	0.144	0.174	0.209	0.238	0.282
70	0.130	0.165	0.200	0.240	0.272	0.323

Public Agency Miscellaneous 2.5% @ 55

Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.004	0.009	0.019	0.029	0.049	0.094
51	0.004	0.009	0.019	0.029	0.049	0.094
52	0.004	0.009	0.020	0.030	0.050	0.095
53	0.008	0.014	0.025	0.036	0.058	0.104
54	0.024	0.034	0.050	0.066	0.091	0.142
55	0.066	0.088	0.115	0.142	0.179	0.241
56	0.042	0.057	0.078	0.098	0.128	0.184
57	0.041	0.057	0.077	0.097	0.128	0.183
58	0.045	0.061	0.083	0.104	0.136	0.192
59	0.055	0.074	0.098	0.123	0.157	0.216
60	0.066	0.088	0.115	0.142	0.179	0.241
61	0.072	0.095	0.124	0.153	0.191	0.255
62	0.099	0.130	0.166	0.202	0.248	0.319
63	0.092	0.121	0.155	0.189	0.233	0.302
64	0.091	0.119	0.153	0.187	0.231	0.299
65	0.122	0.160	0.202	0.245	0.297	0.374
66	0.138	0.179	0.226	0.272	0.329	0.411
67	0.114	0.149	0.189	0.229	0.279	0.354
68	0.100	0.131	0.168	0.204	0.250	0.322
69	0.114	0.149	0.189	0.229	0.279	0.354
70	0.127	0.165	0.209	0.253	0.306	0.385

Service Retirement

Public Agency Miscellaneous 2.7% @ 55

Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.004	0.009	0.014	0.035	0.055	0.095
51	0.002	0.006	0.011	0.030	0.050	0.090
52	0.006	0.012	0.017	0.038	0.059	0.099
53	0.010	0.017	0.024	0.046	0.068	0.110
54	0.032	0.044	0.057	0.085	0.113	0.160
55	0.076	0.101	0.125	0.165	0.205	0.265
56	0.055	0.074	0.093	0.127	0.160	0.214
57	0.050	0.068	0.086	0.118	0.151	0.204
58	0.055	0.074	0.093	0.127	0.161	0.215
59	0.061	0.082	0.102	0.138	0.174	0.229
60	0.069	0.093	0.116	0.154	0.192	0.250
61	0.086	0.113	0.141	0.183	0.225	0.288
62	0.105	0.138	0.171	0.218	0.266	0.334
63	0.103	0.135	0.167	0.215	0.262	0.329
64	0.109	0.143	0.177	0.226	0.275	0.344
65	0.134	0.174	0.215	0.270	0.326	0.401
66	0.147	0.191	0.235	0.294	0.354	0.433
67	0.121	0.158	0.196	0.248	0.300	0.372
68	0.113	0.147	0.182	0.232	0.282	0.352
69	0.117	0.153	0.189	0.240	0.291	0.362
70	0.141	0.183	0.226	0.283	0.341	0.418

Public Agency Miscellaneous 3% @ 60

Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.012	0.018	0.024	0.039	0.040	0.091
51	0.009	0.014	0.019	0.034	0.034	0.084
52	0.014	0.020	0.026	0.043	0.044	0.096
53	0.016	0.023	0.031	0.048	0.050	0.102
54	0.026	0.036	0.045	0.065	0.070	0.125
55	0.043	0.057	0.072	0.096	0.105	0.165
56	0.042	0.056	0.070	0.094	0.103	0.162
57	0.049	0.065	0.082	0.108	0.119	0.180
58	0.057	0.076	0.094	0.122	0.136	0.199
59	0.076	0.100	0.123	0.157	0.175	0.244
60	0.114	0.148	0.182	0.226	0.255	0.334
61	0.095	0.123	0.152	0.190	0.214	0.288
62	0.133	0.172	0.211	0.260	0.294	0.378
63	0.129	0.166	0.204	0.252	0.285	0.368
64	0.143	0.185	0.226	0.278	0.315	0.401
65	0.202	0.260	0.318	0.386	0.439	0.542
66	0.177	0.228	0.279	0.340	0.386	0.482
67	0.151	0.194	0.238	0.292	0.331	0.420
68	0.139	0.179	0.220	0.270	0.306	0.391
69	0.190	0.245	0.299	0.364	0.414	0.513
70	0.140	0.182	0.223	0.274	0.310	0.396

Service Retirement

Public Agency Miscellaneous 2% @ 62						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.000	0.000	0.000	0.000	0.000	0.000
51	0.000	0.000	0.000	0.000	0.000	0.000
52	0.010	0.013	0.016	0.019	0.022	0.024
53	0.013	0.017	0.020	0.024	0.027	0.031
54	0.021	0.027	0.033	0.039	0.045	0.050
55	0.044	0.056	0.068	0.080	0.092	0.104
56	0.030	0.039	0.047	0.055	0.063	0.072
57	0.036	0.046	0.056	0.066	0.076	0.086
58	0.046	0.059	0.072	0.085	0.097	0.110
59	0.058	0.074	0.089	0.105	0.121	0.137
60	0.062	0.078	0.095	0.112	0.129	0.146
61	0.062	0.079	0.096	0.113	0.129	0.146
62	0.097	0.123	0.150	0.176	0.202	0.229
63	0.089	0.113	0.137	0.162	0.186	0.210
64	0.094	0.120	0.145	0.171	0.197	0.222
65	0.129	0.164	0.199	0.234	0.269	0.304
66	0.105	0.133	0.162	0.190	0.219	0.247
67	0.105	0.133	0.162	0.190	0.219	0.247
68	0.105	0.133	0.162	0.190	0.219	0.247
69	0.105	0.133	0.162	0.190	0.219	0.247
70	0.125	0.160	0.194	0.228	0.262	0.296

Service Retirement

Public Agency Fire ½ @ 55 and 2% @ 55			
Age	Rate	Age	Rate
50	0.0159	56	0.1108
51	0.0000	57	0.0000
52	0.0344	58	0.0950
53	0.0199	59	0.0441
54	0.0413	60	1.00000
55	0.0751		

Public Agency Police ½ @ 55 and 2% @ 55			
Age	Rate	Age	Rate
50	0.0255	56	0.0692
51	0.0000	57	0.0511
52	0.0164	58	0.0724
53	0.0272	59	0.0704
54	0.0095	60	1.0000
55	0.1667		

Service Retirement

Public Agency Police 2% @ 50						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.005	0.005	0.005	0.005	0.017	0.089
51	0.005	0.005	0.005	0.005	0.017	0.087
52	0.018	0.018	0.018	0.018	0.042	0.132
53	0.044	0.044	0.044	0.044	0.090	0.217
54	0.065	0.065	0.065	0.065	0.126	0.283
55	0.086	0.086	0.086	0.086	0.166	0.354
56	0.067	0.067	0.067	0.067	0.130	0.289
57	0.066	0.066	0.066	0.066	0.129	0.288
58	0.066	0.066	0.066	0.066	0.129	0.288
59	0.139	0.139	0.139	0.139	0.176	0.312
60	0.123	0.123	0.123	0.123	0.153	0.278
61	0.110	0.110	0.110	0.110	0.138	0.256
62	0.130	0.130	0.130	0.130	0.162	0.291
63	0.130	0.130	0.130	0.130	0.162	0.291
64	0.130	0.130	0.130	0.130	0.162	0.291
65	1.000	1.000	1.000	1.000	1.000	1.000

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

Service Retirement

Public Agency Fire 2% @ 50						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.009	0.009	0.009	0.009	0.013	0.020
51	0.013	0.013	0.013	0.013	0.020	0.029
52	0.018	0.018	0.018	0.018	0.028	0.042
53	0.052	0.052	0.052	0.052	0.079	0.119
54	0.067	0.067	0.067	0.067	0.103	0.154
55	0.089	0.089	0.089	0.089	0.136	0.204
56	0.083	0.083	0.083	0.083	0.127	0.190
57	0.082	0.082	0.082	0.082	0.126	0.189
58	0.088	0.088	0.088	0.088	0.136	0.204
59	0.074	0.074	0.074	0.074	0.113	0.170
60	0.100	0.100	0.100	0.100	0.154	0.230
61	0.072	0.072	0.072	0.072	0.110	0.165
62	0.099	0.099	0.099	0.099	0.152	0.228
63	0.114	0.114	0.114	0.114	0.175	0.262
64	0.114	0.114	0.114	0.114	0.175	0.262
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 3% @ 55						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.004	0.004	0.004	0.004	0.015	0.086
51	0.014	0.014	0.014	0.014	0.034	0.114
52	0.026	0.026	0.026	0.026	0.060	0.154
53	0.038	0.038	0.038	0.038	0.083	0.188
54	0.071	0.071	0.071	0.071	0.151	0.292
55	0.061	0.061	0.061	0.061	0.131	0.261
56	0.072	0.072	0.072	0.072	0.153	0.295
57	0.065	0.065	0.065	0.065	0.140	0.273
58	0.066	0.066	0.066	0.066	0.142	0.277
59	0.118	0.118	0.118	0.118	0.247	0.437
60	0.065	0.065	0.065	0.065	0.138	0.272
61	0.084	0.084	0.084	0.084	0.178	0.332
62	0.108	0.108	0.108	0.108	0.226	0.405
63	0.084	0.084	0.084	0.084	0.178	0.332
64	0.084	0.084	0.084	0.084	0.178	0.332
65	1.000	1.000	1.000	1.000	1.000	1.000

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

Service Retirement

Public Agency Fire 3% @ 55						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.001	0.001	0.001	0.006	0.016	0.069
51	0.002	0.002	0.002	0.006	0.018	0.071
52	0.012	0.012	0.012	0.021	0.040	0.098
53	0.032	0.032	0.032	0.049	0.085	0.149
54	0.057	0.057	0.057	0.087	0.144	0.217
55	0.073	0.073	0.073	0.109	0.179	0.259
56	0.064	0.064	0.064	0.097	0.161	0.238
57	0.063	0.063	0.063	0.095	0.157	0.233
58	0.065	0.065	0.065	0.099	0.163	0.241
59	0.088	0.088	0.088	0.131	0.213	0.299
60	0.105	0.105	0.105	0.155	0.251	0.344
61	0.118	0.118	0.118	0.175	0.282	0.380
62	0.087	0.087	0.087	0.128	0.210	0.295
63	0.067	0.067	0.067	0.100	0.165	0.243
64	0.067	0.067	0.067	0.100	0.165	0.243
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 3% @ 50						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.050	0.050	0.050	0.099	0.240	0.314
51	0.034	0.034	0.034	0.072	0.198	0.260
52	0.033	0.033	0.033	0.071	0.198	0.259
53	0.039	0.039	0.039	0.080	0.212	0.277
54	0.045	0.045	0.045	0.092	0.229	0.300
55	0.052	0.052	0.052	0.105	0.248	0.323
56	0.042	0.042	0.042	0.087	0.221	0.289
57	0.043	0.043	0.043	0.088	0.223	0.292
58	0.054	0.054	0.054	0.109	0.255	0.333
59	0.054	0.054	0.054	0.108	0.253	0.330
60	0.060	0.060	0.060	0.121	0.272	0.355
61	0.048	0.048	0.048	0.098	0.238	0.311
62	0.061	0.061	0.061	0.122	0.274	0.357
63	0.057	0.057	0.057	0.115	0.263	0.343
64	0.069	0.069	0.069	0.137	0.296	0.385
65	1.000	1.000	1.000	1.000	1.000	1.000

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

Service Retirement

Public Agency Fire 3% @ 50						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.020	0.020	0.020	0.040	0.130	0.192
51	0.008	0.008	0.008	0.023	0.107	0.164
52	0.023	0.023	0.023	0.043	0.136	0.198
53	0.023	0.023	0.023	0.043	0.135	0.198
54	0.027	0.027	0.027	0.048	0.143	0.207
55	0.043	0.043	0.043	0.070	0.174	0.244
56	0.053	0.053	0.053	0.085	0.196	0.269
57	0.054	0.054	0.054	0.086	0.197	0.271
58	0.052	0.052	0.052	0.084	0.193	0.268
59	0.075	0.075	0.075	0.116	0.239	0.321
60	0.065	0.065	0.065	0.102	0.219	0.298
61	0.076	0.076	0.076	0.117	0.241	0.324
62	0.068	0.068	0.068	0.106	0.224	0.304
63	0.027	0.027	0.027	0.049	0.143	0.208
64	0.094	0.094	0.094	0.143	0.277	0.366
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 2% @ 57						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.011	0.011	0.011	0.011	0.020	0.036
51	0.009	0.009	0.009	0.009	0.016	0.028
52	0.018	0.018	0.018	0.018	0.034	0.060
53	0.037	0.037	0.037	0.037	0.067	0.119
54	0.049	0.049	0.049	0.049	0.089	0.159
55	0.063	0.063	0.063	0.063	0.115	0.205
56	0.045	0.045	0.045	0.045	0.082	0.146
57	0.064	0.064	0.064	0.064	0.117	0.209
58	0.047	0.047	0.047	0.047	0.086	0.154
59	0.105	0.105	0.105	0.105	0.130	0.191
60	0.105	0.105	0.105	0.105	0.129	0.188
61	0.105	0.105	0.105	0.105	0.129	0.188
62	0.105	0.105	0.105	0.105	0.129	0.188
63	0.105	0.105	0.105	0.105	0.129	0.188
64	0.105	0.105	0.105	0.105	0.129	0.188
65	1.000	1.000	1.000	1.000	1.000	1.000

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

Service Retirement

Public Agency Fire 2% @ 57						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.005	0.005	0.005	0.005	0.008	0.012
51	0.006	0.006	0.006	0.006	0.009	0.013
52	0.012	0.012	0.012	0.012	0.019	0.028
53	0.033	0.033	0.033	0.033	0.050	0.075
54	0.045	0.045	0.045	0.045	0.069	0.103
55	0.061	0.061	0.061	0.061	0.094	0.140
56	0.055	0.055	0.055	0.055	0.084	0.126
57	0.081	0.081	0.081	0.081	0.125	0.187
58	0.059	0.059	0.059	0.059	0.091	0.137
59	0.055	0.055	0.055	0.055	0.084	0.126
60	0.085	0.085	0.085	0.085	0.131	0.196
61	0.085	0.085	0.085	0.085	0.131	0.196
62	0.085	0.085	0.085	0.085	0.131	0.196
63	0.085	0.085	0.085	0.085	0.131	0.196
64	0.085	0.085	0.085	0.085	0.131	0.196
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 2.5% @ 57						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.014	0.014	0.014	0.014	0.025	0.045
51	0.012	0.012	0.012	0.012	0.021	0.038
52	0.025	0.025	0.025	0.025	0.046	0.081
53	0.047	0.047	0.047	0.047	0.086	0.154
54	0.063	0.063	0.063	0.063	0.115	0.205
55	0.076	0.076	0.076	0.076	0.140	0.249
56	0.054	0.054	0.054	0.054	0.099	0.177
57	0.071	0.071	0.071	0.071	0.130	0.232
58	0.057	0.057	0.057	0.057	0.103	0.184
59	0.126	0.126	0.126	0.126	0.156	0.229
60	0.126	0.126	0.126	0.126	0.155	0.226
61	0.126	0.126	0.126	0.126	0.155	0.226
62	0.126	0.126	0.126	0.126	0.155	0.226
63	0.126	0.126	0.126	0.126	0.155	0.226
64	0.126	0.126	0.126	0.126	0.155	0.226
65	1.000	1.000	1.000	1.000	1.000	1.000

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

Service Retirement

Public Agency Fire 2.5% @ 57						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.007	0.007	0.007	0.007	0.010	0.015
51	0.008	0.008	0.008	0.008	0.012	0.018
52	0.016	0.016	0.016	0.016	0.025	0.038
53	0.042	0.042	0.042	0.042	0.064	0.096
54	0.057	0.057	0.057	0.057	0.088	0.132
55	0.074	0.074	0.074	0.074	0.114	0.170
56	0.066	0.066	0.066	0.066	0.102	0.153
57	0.090	0.090	0.090	0.090	0.139	0.208
58	0.071	0.071	0.071	0.071	0.110	0.164
59	0.066	0.066	0.066	0.066	0.101	0.151
60	0.102	0.102	0.102	0.102	0.157	0.235
61	0.102	0.102	0.102	0.102	0.157	0.236
62	0.102	0.102	0.102	0.102	0.157	0.236
63	0.102	0.102	0.102	0.102	0.157	0.236
64	0.102	0.102	0.102	0.102	0.157	0.236
65	1.000	1.000	1.000	1.000	1.000	1.000

Service Retirement

Public Agency Police 2.7% @ 57						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.0138	0.0138	0.0138	0.0138	0.0253	0.0451
51	0.0123	0.0123	0.0123	0.0123	0.0226	0.0402
52	0.0249	0.0249	0.0249	0.0249	0.0456	0.0812
53	0.0497	0.0497	0.0497	0.0497	0.0909	0.1621
54	0.0662	0.0662	0.0662	0.0662	0.1211	0.2160
55	0.0854	0.0854	0.0854	0.0854	0.1563	0.2785
56	0.0606	0.0606	0.0606	0.0606	0.1108	0.1975
57	0.0711	0.0711	0.0711	0.0711	0.1300	0.2318
58	0.0628	0.0628	0.0628	0.0628	0.1149	0.2049
59	0.1396	0.1396	0.1396	0.1396	0.1735	0.2544
60	0.1396	0.1396	0.1396	0.1396	0.1719	0.2506
61	0.1396	0.1396	0.1396	0.1396	0.1719	0.2506
62	0.1396	0.1396	0.1396	0.1396	0.1719	0.2506
63	0.1396	0.1396	0.1396	0.1396	0.1719	0.2506
64	0.1396	0.1396	0.1396	0.1396	0.1719	0.2506
65	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

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

Service Retirement

Public Agency Fire 2.7% @ 57						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.0065	0.0065	0.0065	0.0065	0.0101	0.0151
51	0.0081	0.0081	0.0081	0.0081	0.0125	0.0187
52	0.0164	0.0164	0.0164	0.0164	0.0254	0.0380
53	0.0442	0.0442	0.0442	0.0442	0.0680	0.1018
54	0.0606	0.0606	0.0606	0.0606	0.0934	0.1397
55	0.0825	0.0825	0.0825	0.0825	0.1269	0.1900
56	0.0740	0.0740	0.0740	0.0740	0.1140	0.1706
57	0.0901	0.0901	0.0901	0.0901	0.1387	0.2077
58	0.0790	0.0790	0.0790	0.0790	0.1217	0.1821
59	0.0729	0.0729	0.0729	0.0729	0.1123	0.1681
60	0.1135	0.1135	0.1135	0.1135	0.1747	0.2615
61	0.1136	0.1136	0.1136	0.1136	0.1749	0.2618
62	0.1136	0.1136	0.1136	0.1136	0.1749	0.2618
63	0.1136	0.1136	0.1136	0.1136	0.1749	0.2618
64	0.1136	0.1136	0.1136	0.1136	0.1749	0.2618
65	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Service Retirement

Schools 2% @ 55						
Age	Duration of Service					
	5 Years	10 Years	15 Years	20 Years	25 Years	30 Years
50	0.005	0.009	0.013	0.015	0.016	0.018
51	0.005	0.010	0.014	0.017	0.019	0.021
52	0.006	0.012	0.017	0.020	0.022	0.025
53	0.007	0.014	0.019	0.023	0.026	0.029
54	0.012	0.024	0.033	0.039	0.044	0.049
55	0.024	0.048	0.067	0.079	0.088	0.099
56	0.020	0.039	0.055	0.065	0.072	0.081
57	0.021	0.042	0.059	0.070	0.078	0.087
58	0.025	0.050	0.070	0.083	0.092	0.103
59	0.029	0.057	0.080	0.095	0.105	0.118
60	0.037	0.073	0.102	0.121	0.134	0.150
61	0.046	0.090	0.126	0.149	0.166	0.186
62	0.076	0.151	0.212	0.250	0.278	0.311
63	0.069	0.136	0.191	0.225	0.251	0.281
64	0.067	0.133	0.185	0.219	0.244	0.273
65	0.091	0.180	0.251	0.297	0.331	0.370
66	0.072	0.143	0.200	0.237	0.264	0.295
67	0.067	0.132	0.185	0.218	0.243	0.272
68	0.060	0.118	0.165	0.195	0.217	0.243
69	0.067	0.133	0.187	0.220	0.246	0.275
70	0.066	0.131	0.183	0.216	0.241	0.270

Miscellaneous

Internal Revenue Code Section 415

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

Internal Revenue Code Section 401(a)(17)

The limitations on compensation imposed by Internal Revenue Code Section 401(a)(17) are taken into account in this valuation. Each year, the impact of any changes in the compensation limitation since the prior valuation is included and amortized as part of the actuarial gain or loss base. The compensation limit for classic members for the 2016 calendar year is \$265,000.

APPENDIX B

PRINCIPAL PLAN PROVISIONS

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

Service Retirement

Eligibility

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

Benefit

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

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

Miscellaneous Plan Formulas

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

Safety Plan Formulas

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

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

PEPRA Safety Plan Formulas

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

- The *years of service* is the amount credited by CalPERS to a member while he or she is employed in this group (or for other periods that are recognized under the employer's contract with CalPERS). For a member who has earned service with multiple CalPERS employers, the benefit from each employer is calculated separately according to each employer's contract, and then added together for the total allowance. An agency may contract for an optional benefit where any unused sick leave accumulated at the time of retirement will be converted to credited service at a rate of 0.004 years of service for each day of sick leave.
- The *final compensation* is the monthly average of the member's highest 36 or 12 consecutive months' full-time equivalent monthly pay (no matter which CalPERS employer paid this compensation). The standard benefit is 36 months. Employers had the option of providing a final compensation equal to the highest 12 consecutive months for classic plans only. Final compensation must be defined by the highest 36 consecutive months' pay under the 1.5% at 65 formula. PEPRA members have a cap on the annual salary that can be used to calculate final compensation for all new members based on the Social Security contribution and benefit base. For employees that participate in Social Security this cap is \$118,775 for 2016 and for those employees that do not participate in Social Security the cap for 2016 is \$142,530. Adjustments to the caps are permitted annually based on changes to the CPI for all urban consumers.
- Employees must be covered by Social Security with the 1.5% at 65 formula. Social Security is optional for all other benefit formulas. For employees covered by Social Security, the modified formula is the standard benefit. Under this type of formula, the final compensation is offset by \$133.33 (or by one third if the final compensation is less than \$400). Employers may contract for the full benefit with Social Security that will eliminate the offset applicable to the final compensation. For employees not covered by Social Security, the full benefit is paid with

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

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

Vested Deferred Retirement

Eligibility for Deferred Status

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

Eligibility to Start Receiving Benefits

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

Benefit

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

Non-Industrial (Non-Job Related) Disability Retirement

Eligibility

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

Standard Benefit

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

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

Improved Benefit

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

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

Industrial (Job Related) Disability Retirement

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

Eligibility

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

Standard Benefit

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

Increased Benefit (75 percent of Final Compensation)

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

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

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

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

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

Post-Retirement Death Benefit

Standard Lump Sum Payment

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

Improved Lump Sum Payment

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

Form of Payment for Retirement Allowance

Standard Form of Payment

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

Improved Form of Payment (Post-Retirement Survivor Allowance)

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

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

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

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

Pre-Retirement Death Benefits

Basic Death Benefit

This is a standard benefit.

Eligibility

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

Benefit

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

1957 Survivor Benefit

This is a standard benefit.

Eligibility

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

Benefit

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

Optional Settlement 2W Death Benefit

This is an optional benefit.

Eligibility

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

Benefit

The Optional Settlement 2W Death benefit is a monthly allowance equal to the service retirement benefit that the member would have received had the member retired on the date of his or her death and elected Optional Settlement 2W. (A retiree who elects Optional Settlement 2W receives an allowance that has been reduced so that it will continue to be paid after his or her death to a surviving beneficiary.) The allowance is payable as long as the surviving spouse lives, at which time it is continued to any unmarried child(ren) under age 18, if applicable. The total amount paid will be at least equal to the basic death benefit.

Special Death Benefit

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

Eligibility

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

Benefit

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

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

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

Alternate Death Benefit for Local Fire Members

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

Eligibility

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

Benefit

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

Cost-of-Living Adjustments (COLA)

Standard Benefit

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

Improved Benefit

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

Purchasing Power Protection Allowance (PPPA)

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

Employee Contributions

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

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

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

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

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

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

Refund of Employee Contributions

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

1959 Survivor Benefit

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

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

APPENDIX C

PARTICIPANT DATA

- **SUMMARY OF VALUATION DATA**
- **ACTIVE MEMBERS**
- **TRANSFERRED AND TERMINATED MEMBERS**
- **RETIRED MEMBERS AND BENEFICIARIES**

Summary of Valuation Data

	June 30, 2015	June 30, 2016
1. Active Members		
a) Counts	3,680	3,731
b) Average Attained Age	39.15	39.41
c) Average Entry Age to Rate Plan	28.59	28.62
d) Average Years of Service	10.56	10.79
e) Average Annual Covered Pay	\$ 86,820	\$ 90,809
f) Annual Covered Payroll	319,499,129	338,809,025
g) Projected Annual Payroll for Contribution Year	349,125,325	370,225,769
h) Present Value of Future Payroll	3,033,019,840	3,208,681,648
2. Transferred Members		
a) Counts	555	585
b) Average Attained Age	42.09	41.63
c) Average Years of Service	3.08	3.06
d) Average Annual Covered Pay	\$ 82,101	\$ 84,364
3. Terminated Members		
a) Counts	563	582
b) Average Attained Age	41.24	41.45
c) Average Years of Service	3.03	3.10
d) Average Annual Covered Pay	\$ 48,238	\$ 49,696
4. Retired Members and Beneficiaries		
a) Counts	2,275	2,391
b) Average Attained Age	62.81	63.05
c) Average Annual Benefits	\$ 44,144	\$ 44,830
5. Active to Retired Ratio [(1a) / (4a)]	1.62	1.56

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

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

Active Members

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

Distribution of Active Members by Age and Service

Attained Age	Years of Service at Valuation Date						Total
	0-4	5-9	10-14	15-19	20-25	25+	
15-24	140	0	0	0	0	0	140
25-29	423	129	7	0	0	0	559
30-34	241	298	98	3	0	0	640
35-39	85	250	261	77	1	0	674
40-44	31	156	206	203	42	0	638
45-49	26	92	102	151	108	84	563
50-54	21	34	63	54	47	98	317
55-59	8	21	41	22	26	25	143
60-64	1	13	8	8	7	9	46
65 and over	1	0	2	0	2	6	11
All Ages	977	993	788	518	233	222	3,731

Distribution of Average Annual Salaries by Age and Service

Attained Age	Years of Service at Valuation Date						Average
	0-4	5-9	10-14	15-19	20-25	25+	
15-24	\$53,148	\$0	\$0	\$0	\$0	\$0	\$53,148
25-29	58,556	78,298	87,770	0	0	0	63,478
30-34	60,972	85,078	95,690	109,399	0	0	77,739
35-39	64,476	89,289	97,748	107,391	117,489	0	91,545
40-44	69,425	89,556	100,179	109,566	121,015	0	100,446
45-49	65,301	93,540	107,552	110,386	125,126	138,044	111,992
50-54	79,997	89,681	99,437	104,061	126,969	133,822	112,602
55-59	102,624	106,615	95,461	95,183	113,887	138,383	108,311
60-64	140,424	110,929	84,834	95,801	114,138	124,958	107,634
65 and over	59,484	0	70,716	0	85,113	131,320	105,369
All Ages	\$60,323	\$87,696	\$99,124	\$108,084	\$122,797	\$135,506	\$90,809

Transferred and Terminated Members

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

Attained Age	Years of Service at Valuation Date						Total	Average Salary
	0-4	5-9	10-14	15-19	20-25	25+		
15-24	11	0	0	0	0	0	11	\$60,011
25-29	43	2	0	0	0	0	45	69,990
30-34	88	16	0	0	0	0	104	79,298
35-39	79	16	4	0	0	0	99	78,965
40-44	91	16	3	0	0	0	110	89,783
45-49	81	19	6	4	1	0	111	92,490
50-54	43	11	4	0	1	0	59	95,943
55-59	26	1	3	0	0	0	30	74,682
60-64	9	3	1	0	0	0	13	96,193
65 and over	3	0	0	0	0	0	3	61,418
All Ages	474	84	21	4	2	0	585	84,364

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

Attained Age	Years of Service at Valuation Date						Total	Average Salary
	0-4	5-9	10-14	15-19	20-25	25+		
15-24	5	0	0	0	0	0	5	\$44,311
25-29	49	7	0	0	0	0	56	47,802
30-34	91	20	2	0	0	0	113	51,605
35-39	85	26	6	0	0	0	117	52,239
40-44	61	17	7	0	0	0	85	48,549
45-49	49	16	10	5	2	2	84	56,786
50-54	56	6	4	1	0	0	67	44,652
55-59	26	3	1	0	0	0	30	40,314
60-64	16	2	1	0	1	0	20	39,094
65 and over	4	0	0	1	0	0	5	40,273
All Ages	442	97	31	7	3	2	582	49,696

Retired Members and Beneficiaries

Distribution of Retirees and Beneficiaries by Age and Retirement Type*

Attained Age	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Total
Under 30	0	1	2	0	3	6	12
30-34	0	1	6	0	0	2	9
35-39	0	3	17	0	1	1	22
40-44	0	5	23	0	1	2	31
45-49	0	7	48	0	2	3	60
50-54	219	3	76	2	5	12	317
55-59	367	4	77	2	5	11	466
60-64	381	6	100	3	4	25	519
65-69	307	4	94	3	1	24	433
70-74	164	1	62	1	1	31	260
75-79	74	0	33	1	1	20	129
80-84	40	0	15	0	1	26	82
85 and Over	22	0	4	0	0	25	51
All Ages	1574	35	557	12	25	188	2,391

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

Attained Age	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Average
Under 30	\$0	\$26,819	\$1,666	\$0	\$14,070	\$7,601	\$9,830
30-34	0	8,192	36,581	0	0	36,139	33,328
35-39	0	7,637	18,416	0	55,179	4,265	17,974
40-44	0	17,229	33,502	0	45,806	9,917	29,753
45-49	0	18,611	27,778	0	31,631	34,274	27,162
50-54	60,086	21,973	30,915	16,570	48,551	34,824	51,319
55-59	57,405	17,482	31,312	9,501	57,450	34,802	52,012
60-64	54,969	9,648	25,947	50,158	43,872	27,754	47,429
65-69	52,430	13,894	28,196	26,638	19,938	36,636	45,684
70-74	47,216	22,963	34,839	19,936	22,115	25,874	41,426
75-79	39,777	0	27,808	45,462	26,140	25,491	34,439
80-84	31,040	0	24,780	0	34,744	23,016	27,396
85 and Over	32,515	0	34,932	0	0	24,214	28,635
All Ages	\$53,310	\$15,618	\$29,146	\$28,994	\$40,595	\$27,310	\$44,830

Retired Members and Beneficiaries (continued)

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

Years Retired	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Total
Under 5 Yrs	490	12	89	3	0	82	676
5-9	523	9	66	2	5	46	651
10-14	351	4	76	5	4	23	463
15-19	121	7	97	1	6	18	250
20-24	61	2	82	0	3	11	159
25-29	21	1	54	1	2	5	84
30 and Over	7	0	93	0	5	3	108
All Years	1574	35	557	12	25	188	2,391

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

Years Retired	Service Retirement	Non-Industrial Disability	Industrial Disability	Non-Industrial Death	Industrial Death	Death After Retirement	Average
Under 5 Yrs	\$55,387	\$18,953	\$34,072	\$31,150	\$0	\$31,464	\$48,924
5-9	58,176	14,767	34,650	48,913	31,540	25,710	52,663
10-14	51,715	9,927	35,817	25,086	35,653	27,017	47,091
15-19	38,931	13,149	29,251	11,287	48,395	25,845	33,628
20-24	41,686	19,061	26,988	0	41,550	19,901	32,312
25-29	36,278	16,406	23,886	19,936	56,746	10,131	26,811
30 and Over	25,301	0	19,925	0	37,213	5,162	20,664
All Years	\$53,310	\$15,618	\$29,146	\$28,994	\$40,595	\$27,310	\$44,830

* Counts of members do not include alternate payees receiving benefits while the member is still working. Therefore, the total counts may not match information on page 25 of the report. Multiple records may exist for those who have service in more than one coverage group. This does not result in double counting of liabilities.

APPENDIX D

DEVELOPMENT OF PEPRA MEMBER CONTRIBUTION RATES

Development of PEPRA Members Contribution Rates

The table below shows the determination of the Member contribution rates based on 50 percent of the Total Normal Cost for each respective plan on June 30, 2016.

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

Rate Plan Identifier	Plan	Basis for Current Rate		Rates Effective July 1, 2018			
		Total Normal Cost	Member Rate	Total Normal Cost	Change	Change Needed	Member Rate
25051	Safety County Peace Officers PEPRA	21.400%	10.750%	22.646%	1.246%	Yes	11.250%
25052	Safety Fire PEPRA	21.400%	10.750%	22.646%	1.246%	Yes	11.250%

For a description of the methods used to determine the Total Normal Cost for this purpose, please see the "PEPRA Normal Cost Rate Methodology" section in Appendix A.

APPENDIX E

GLOSSARY OF ACTUARIAL TERMS

Glossary of Actuarial Terms

Accrued Liability (*also called Actuarial Accrued Liability or Entry Age Normal Accrued Liability*)

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

Actuarial Assumptions

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

Actuarial Methods

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

Actuarial Valuation

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

Amortization Bases

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

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

Amortization Period

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

Classic Member (under PEPRA)

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

Discount Rate Assumption

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

Entry Age

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

Entry Age Normal Cost Method

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

Fresh Start

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

Funded Status

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

GASB 68

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

New Member (under PEPR)

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

Normal Cost

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

Pension Actuary

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

PEPRA

The California Public Employees' Pension Reform Act of 2013

Prepayment Contribution

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

Present Value of Benefits (PVB)

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

Unfunded Accrued Liability (UAL)

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