



California Public Employees' Retirement System

Final Actuarial Review Report for the Period
March 1, 2016 through October 31, 2020

December 2020



110 West Berry Street
Suite 1300
Fort Wayne, IN 46802

December 1, 2020

Board of Administration
California Public Employees' Retirement System
P.O. Box 942701
Sacramento, CA 94229-2701

Members of the Board:

As provided in Contract 2015-8123, we have reviewed valuations prepared by the CalPERS professional actuarial staff in order to certify that such work satisfies applicable standards of the actuarial profession. In the following pages, we present a summary of findings from the actuarial reviews we've completed as a part of Contract 2015-8123, along with commentary on how issues were resolved and what issues remain outstanding.

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

This report was prepared for the Board and professional staff of CalPERS for their use in evaluating the preparation of actuarial valuations by the System. Use of this report for any other purpose or by other parties may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the report for other purposes. Because of the risk of misinterpretation of actuarial results, Buck recommends requesting its advance review of any statement, document, or filing to be based on information contained in this report. Buck will accept no liability for any such statement, document or filing made without its prior review.

Actuarial Standard of Practice No. 56 ("ASOP 56") provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. Buck uses third-party software for the review of valuations prepared by the CalPERS professional actuarial staff. The model is intended to replicate the liabilities associated with the CalPERS valuations. During the parallel valuation, Buck compares the results of the model developed from the third-party software with the results of CalPERS valuations, and any significant differences are investigated. Buck uses an extensive review process in which the results of liability calculations produced by the third-party software are checked using detailed sample output. Buck also reviews the third-party model when significant changes are made to the software or model. The review is performed by experts within the company who are familiar with applicable funding methods as well as the manner in which the model generates its output.

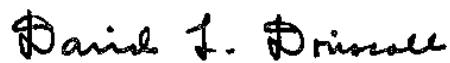
This report was prepared under the supervision of David L. Driscoll, a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries and an Enrolled Actuary, and Peer

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Reviewed by Kelly L. Adams, a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries and an Enrolled Actuary. We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report. This report has been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about it.

Respectfully submitted,

Buck Global, LLC (Buck)



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Section I - Introduction

Under the California Constitution, the Board of Administration has plenary authority and fiduciary responsibility to provide for actuarial services. The CalPERS Chief Actuary advises the Board and directs the activities of the CalPERS professional actuarial staff. The Board also retains the services of an outside actuarial firm to review the work of the CalPERS professional actuarial staff and to certify that such work satisfies actuarial professional standards.

Buck was contracted to provide parallel valuation and certification services to the Board.

This report presents a summary of findings from the actuarial reviews we have completed as a part of Contract 2015-8123, along with commentary on how issues were resolved and what issues remain outstanding.

Our review methodology for each actuarial valuation examined as part of Contract 2015-8123 was as follows:

- We did not audit or review the final valuation data provided to us by CalPERS for any of the actuarial reviews completed, as review of the data was explicitly excluded from the scope of this assignment.
- We reviewed the actuarial assumptions and methods used for each valuation under examination. Our review was based on Actuarial Standards of Practice (ASOP) applicable to the selection of economic assumptions (ASOP 27) and the selection of demographic assumptions (ASOP 35).
- We completed parallel actuarial valuations for each valuation under examination in order to compare our key valuation results with those published in the valuation report prepared for the plan. CalPERS requested that we reconcile any differences of more than 5% between the two sets of valuation results.
- We also reviewed each valuation report under examination for compliance with applicable Actuarial Standards of Practice, including:
 - ASOP 4 – Measuring Pension Obligations and Determining Pension Plan Costs or Contributions
 - ASOP 6 – Measuring Retiree Group Benefits Obligations and Determining Retiree Group Benefits Program Periodic Costs or Actuarially Determined Contributions
 - ASOP 51 – Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions

Section II of this report summarizes Tasks 1 and 4 of Contract 2015-8123, pertaining to CalPERS's Public Agency valuations. Specifically, it provides a recap of issues identified in those Tasks, commentary on how issues were resolved, and what issues remain outstanding. Section III provides the same information for Tasks 2 and 5, pertaining to CalPERS's State and Schools valuations. Section IV provides the same information for Tasks 3 and 6, pertaining to CalPERS's Judges, Legislators, and 1959 Survivors valuations. Section V presents our final comments and recommendations following the actuarial reviews we completed under Contract 2015-8123.

Section II – Summary of Tasks 1 and 4 – Public Agencies

In both Tasks 1 and 4, we concluded that the assumptions used in the Public Agency valuations were reasonable, and that the methodology used to select these assumptions was appropriate and consistent with guidance provided in ASOPs 27 and 35. We assessed the assumed annual rate of return assumption of 7.50% for valuations reviewed under Task 1 and the scheduled 7.00% assumption for valuations reviewed under Task 4 using our own economic modelling tool and determined both to be reasonable.

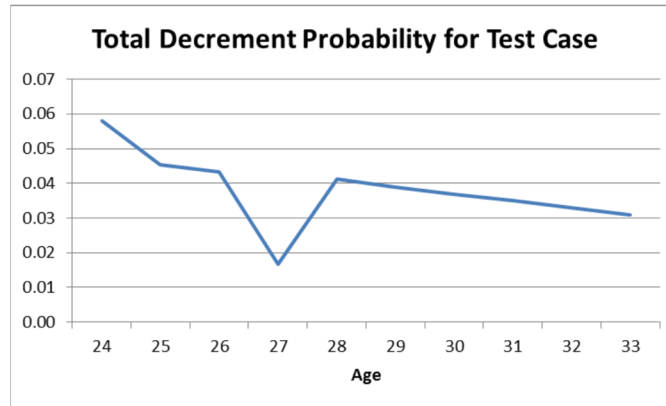
For the 10 largest public agency plans selected for both tasks, we replicated total present values of future benefits, actuarial accrued liabilities, normal costs, and total employer contribution rates within 5% of the corresponding results reported by CalPERS. In Task 1, there were discrepancies of more than 5% between our calculation and CalPERS' calculation of the present value of future benefits and/or accrued liabilities for four of the 10 random public agency plans reviewed. In Task 4, there were discrepancies of more than 5% between our calculation and CalPERS' calculation of the accrued liabilities for four of the 10 random public agency plans reviewed. The following points were noted as explanation for the discrepancies observed:

Task 1: Parallel Valuation and Certification of the Actuarial Valuations of the CalPERS Contracting Public Agency Plans as of June 30, 2014

In Task 1, we found that there was a difference in the application of the probabilities of termination for certain participants. In general, the affected participants had fewer than five years of service and were employed part-time or for other reasons had service less than their elapsed time since entry into the plan, although differences between Buck's and CalPERS's applications of the termination decrement occurred occasionally for other types of members as well.

As background, CalPERS employed two tables of decrements that are applied to participants who may terminate before retirement. One table consisted of probabilities that such participants would terminate and elect to take a refund of their contributions in lieu of leaving their money in the plan. The other table consisted of probabilities that they would terminate and leave their money in the plan instead of taking a refund – i.e., that they would choose to receive a retirement income benefit from the plan. These rates were based on vesting service and, together, the two tables indicated the overall probability of termination by a participant at each age. In general, these termination rates were applied consistently for participants who were vested or had been working in a full-time position in which service credited for benefit eligibility purposes was equal to elapsed time in the plan from date of hire. For such participants, after entry into the plan providing their coverage, the valuations posited continually decreasing probabilities of termination as they approach retirement.

Occasionally, we found situations in which rounding, the timing applied in the application of decrements, and the type of service used to select each decrement led to inconsistencies in the way decrements were applied in aggregate. The following chart illustrates one such example. It shows the total decrement probabilities for a sample active participant who was 24 years old and had completed 1.3 years of service on the valuation date. As can readily be seen, there was a temporary reduction in decrement probabilities in the year of attainment of age 27 due to the manner in which the termination probability was applied. The participant was projected to attain eligibility for vesting in that year, but not until after the manner in which decrements were applied led to an unexpected (and perhaps unintended) decrease in the assumed probability of termination



This issue was resolved, as noted in our Task 4 report.

The difference in the application of termination decrement probabilities was noted as a source of difference for two of the four plans for which the differences in Buck's and CalPERS's values of accrued liabilities exceeded the 5% threshold. Differences for two other plans exceeded the 5% threshold due to reasonable differences in the rounding conventions used for the calculation of service and age while allocating the present value of future benefits (PVFB) to past service and future service under the entry age normal cost method. The dollar amounts of such differences were very small, but the percentage difference could be significant simply because of the relatively small plan sizes (e.g. in one plan, a \$170 difference in calculated accrued liabilities resulted in a 15.99% overall difference). Because the dollar amounts were small, neither of these were considered significant for purposes of our review.

Final comments and recommendation from Task 1 included:

1. Add information to the reports to meet the then-new ASOP 4 requirements.

This recommendation was reflected in the June 30, 2017 valuations reviewed as part of Task 4.

2. Consider revising either the termination decrement tables or the process the valuation system uses to draw the probabilities. The suggestion was that the termination decrement issue described above could be resolved by implementing a single termination assumption with post-decrement probabilities applied to value the assumed rates of those who elect an annuity upon termination vs. those who elect a refund of contributions.

The termination decrement issue was resolved for the June 30, 2017 valuation reviewed as part of Task 4, though CalPERS continues to use the dual termination decrement approach.

3. Consider including additional demographic data in pooled public agency valuation reports.

This recommendation was not addressed in the June 30, 2017 valuations reviewed as part of Task 4 and remained a recommendation in our Task 4 report. The CalPERS Actuarial Office noted that they agreed with this recommendation and that they have begun implementing the addition of this information in all pooled reports beginning with the June 30, 2020 reports.

Task 4: Parallel Valuation and Certification of the Actuarial Valuations of the CalPERS Contracting Public Agency Plans as of June 30, 2017

In Task 4, our observations were organized into two categories:

1. Differences in valuation system. No two valuation systems will produce identical results due to differing approaches to age and service rounding, adjustments for mid-year timing, consideration of monthly-vs.-annual payments, and similar conventions. These differences generally will not produce materially different results.
2. Areas for which refinement of calculation would be advisable.

Differences in valuation system

The following observations relate to evident differences in valuation system. These are not errors; they simply reflect differences of approach. These items do not have a material effect on overall liabilities but can give rise to significant percentage differences at the level of individual participants.

- For new entrants, Buck's valuation system, ProVal, uses rounded funding ages, so that in the year of hire, the accrued liability is \$0. CalPERS's valuation system imputes a half-year of accrual to a new participant; i.e., the accrued liability is nonzero, which would result in a difference of 100% for such a participant. However, the dollar amounts involved are immaterial.
- Some of the large individual percentage differences in normal cost were observed for active participants over the maximum assumed retirement age, for whom ProVal will compute a normal cost of \$0 whereas CalPERS's valuation system always imputes a half-year of benefit accrual, causing their normal costs to be nonzero and a percentage difference of 100% in the results. However, the dollar amounts involved are inconsequential.
- For active participants, CalPERS uses rounded mid-year age to assign age-based decrement probabilities. For retirees, CalPERS uses rounded beginning-of-year age to assign the age-based decrement probabilities. This issue has an immaterial impact.
- For active participants, CalPERS calculates the present value of future benefits (PVFB) based on a data field representing benefit service earned as of the valuation date with the agency plan being valued. It then attributes this liability, using the entry age cost method, based on a data field that is representative of a full career with the CalPERS system. For most participants, these two data fields are consistent, i.e., the service they measure is substantially the same. There are individuals for which these two fields measure two different service periods, e.g., transfers and part-time employees. CalPERS determines the entry age normal cost rate using the full-career field, and then uses this rate to attribute the liability derived using the current-agency benefit service field.

We believe the theoretical basis for this approach can be illustrated by example: consider two identical plans A and B. CalPERS' method would result in identical normal cost and actuarial accrued liability values regardless of whether an individual stays in plan A or transfers to B (in which case there is also a benefit being valued in plan A). The case for this theoretical approach weakens if A and B are not identical. If B provides greater benefits than A, then there is the potential for "over-accruing" liability and vice versa if B provides lesser benefits than A. Assuming there is not significant transfer activity, it is unlikely that any resulting over/under-accrual would have a material effect on overall liabilities.

As noted, these are acceptable differences in valuation system; no action was required or expected to be taken. They do serve to explain some relatively large discrepancies on an individual basis.

Areas for refinement

We identified two areas where the refinement of the valuation calculations was advisable:

- First, there was an apparent inconsistency in the valuation of the refund of contributions benefit. The present value of a participant's future benefits was based on his or her actual accumulated balance as of the valuation date. However, the accrued liability and normal cost were determined using a theoretical accumulated balance built by assumption from entry age. Generally, the theoretical balance was greater than the actual, which produced some unusual results. For example, for contract package 101723 in Santa Clara, the present value of future benefits was \$38,305,221, normal cost was \$11,715,744, and accrued liability was -\$51,823,567. This was generally a small percentage of the overall liability, so resulting differences tended to be inconsequential, but it did show up more noticeably in some of the smaller PEPRA plans (which presently cover only those with short service).

Following discussions on this point with CalPERS staff, we deemed this issue to reflect a difference in valuation systems rather than an area for refinement. This was documented in our Task 5 report.

- For retirees with a child beneficiary under the continuance portion of the Post Retirement Survivor Allowance, the CalPERS valuation does not appear to reflect cessation of continuance when the beneficiary attains age 18. This issue did not lead to differences between the present values of future benefits calculated by Buck and CalPERS to exceed the 5% threshold for any plan under examination.

We understand this issue has been resolved by CalPERS.

The primary source of differences for the four relatively small plans in Task 4 noted with accrued liabilities outside of the 5% threshold was simply age and service rounding differences between CalPERS's and Buck's valuation systems.

Final comments and recommendations from Task 4 included:

1. Distinguish (where appropriate) between phasing in the impacts of economic assumption changes and phasing in of assumption changes themselves and identify margins for adverse deviations.

The phase-ins commented on above have been fully implemented, so there is no further action to be done in relation to this suggestion until and unless future phase-ins are made.

2. Consider including additional demographic data in pooled public agency valuation reports.

The CalPERS Actuarial Office noted that they agreed with this recommendation and that they have begun implementing the addition of this information in all pooled public agency valuation reports beginning with the June 30, 2020 reports.

Section III – Summary of Tasks 2 and 5 – State and Schools

For both Tasks 2 and 5, we concluded that the assumptions used in the State and Schools valuations were reasonable and the methodology used to select these assumptions was appropriate and consistent with guidance provided in ASOP 27 and 35. We assessed the assumed annual rate of return assumption of 7.50% for valuations reviewed under Task 2 and the scheduled 7.00% assumption for State valuations and 7.25% assumption for Schools valuations reviewed under Task 5 using our own economic modelling tool and determined both to be reasonable.

Task 2: Parallel Valuation and Certification of the Actuarial Valuations of the CalPERS State and Schools Plans as of June 30, 2015

For Task 2, we replicated employer contribution rates within 5% of the corresponding results reported by CalPERS for all plans under consideration. We also replicated total present values of future benefits, actuarial accrued liabilities, and normal costs within the 5% threshold for all plans except State Miscellaneous Tier 2. To identify the reasons for these discrepancies, we analyzed differences in the development of our results as compared to the development of CalPERS' results.

As background, Tier 2 participants have the option to purchase Tier 1 level benefits by making additional employee contributions beyond those required under Tier 2 benefit provisions. The valuation assumes that all Tier 2 participants will elect to make these additional employee contributions and purchase Tier 1 level benefits. To reflect this assumption in our parallel valuation, additional special employee contributions were projected to accumulate with interest from participants' dates of participation to their dates of termination. From participants' dates of termination to their projected dates of retirement, special employee contribution accounts were accumulated with interest only. This total special employee contribution account was used to reduce the gross liability.

We identified three areas where the refinement of the valuation report and/or calculations was advisable:

1. Add information to the reports to meet new ASOP 4 requirements

This recommendation was addressed in the June 30, 2018 valuations reviewed as part of Task 5.

2. For some separated participants in Tier 2, the special employee contribution account was set to zero in the participant data, with balances accumulating only for future years. This missing starting value for the special employee account balance resulted in smaller offsets to the gross liability in both the CalPERS and Buck valuations and therefore an overstatement of the expected net liability. We recommended that the valuation reflect the prior special employee contribution amounts, if they are available.

This issue appears to have been fixed for some, but not all, participants. Only 26% of Tier 2 separated participants observed in Task 5 had a non-zero conversion account balance in the data.

For separated participants in Tier 2, CalPERS accumulated the special employee contribution account with additional employee contributions in the future, even though they were no longer in covered employment and were thus unable to make such contributions. This assumption of continued special employee contributions by separated participants resulted in an overstatement of the value of the special employee contribution account and an understatement of the liability in the CalPERS valuation. We

suggested that the calculation of the special accumulated employee contributions should be adjusted to accumulate balances with interest only for participants who have separated from active employment.

The June 30, 2018 valuation reports appear to have addressed this recommendation.

3. Pre-Retirement Mortality for Separated Participants

For separated employees in all plans, we observed that the mortality assumption (decrement) was not being applied in the period prior to retirement for participants who have separated from employment and are entitled to benefits at a future retirement age. We believe the pre-retirement mortality decrement should be applied in determining liabilities for all participants for all future years.

The June 30, 2018 valuation reports appear to have addressed this recommendation.

There was another observation relating to active employees in State Miscellaneous Tier 2. We noted a slight difference between the approaches Buck and CalPERS took to implementing the Entry Age Normal Cost Method in the valuation. Buck accumulated the special employee contributions from entry age so that they replicated the special employee contributions balances as of the valuation date. CalPERS calculated special employee contributions from entry age independently of the balances on the valuation date. Both methods are reasonable and the difference in these approaches affects only the split of actuarial liabilities between past and future service and not the amounts of the liabilities themselves. The net impact for Miscellaneous Tier 2 is that the Buck valuation produced a lower normal cost and correspondingly higher actuarial accrued liability than the CalPERS valuation.

No action was recommended as this was deemed a difference in valuation system.

Task 5: Parallel Valuation and Certification of the Actuarial Valuations of the CalPERS State and Schools Plans as of June 30, 2018

In Task 5, our calculations for total present values of future benefits, actuarial accrued liabilities, and total normal costs differed by less than 5% from the corresponding results reported by CalPERS for all plans under consideration. We were able to closely replicate the present value of future benefits, in most cases within 0.5% of CalPERS' results. The attribution of this liability under the entry age method gave rise to a slightly greater variance, particularly in the normal cost. As part of this process we observed several items that contributed to this variance, which we categorized in one of two ways:

1. Differences in valuation system. No two valuation systems will produce identical results due to differing approaches to age and service rounding, adjustments for mid-year timing, consideration of monthly-vs.- annual payments, and similar conventions. These differences generally will not produce materially different results.
2. Areas for which refinement of calculation would be advisable.

The following observations relate to apparent differences in valuation systems. These are not errors; they simply reflect differences of approach. These items do not have a material effect on overall liabilities but can give rise to significant percentage differences in results calculated for individual participants.

- The present value of a participant's future benefits is based on his or her actual credited service amount as of the valuation date. However, the accrued liability and normal cost are determined using a theoretical

service amount built by assumption from entry age. Generally, the theoretical service is at least as much as the actual, which tends to produce a lower accrued liability and a higher normal cost than if actual service were used.

- Similar to the treatment of service noted above, the refund of contributions is valued by calculating the present value of a participant's future benefits based on his or her actual accumulated balance as of the valuation date, but the accrued liability and normal cost are determined using a theoretical accumulated balance built by assumption from entry age. If CalPERS were to apply the attribution method by projecting the current account balance as of the valuation date back to entry age and forward to future decrement ages (as opposed to creating the theoretical balance starting at entry age), we expect that the active accrued liability would increase and the normal cost would decrease, both to an immaterial degree. For example, applying this approach to the Safety plan, the accrued liability would increase by 0.2% and the normal cost would decrease by 0.4%.
- For new entrants, ProVal uses rounded funding ages, so that in the year of hire, their accrued liability is \$0. CalPERS imputes a half-year of accrual to a new participant; i.e., the accrued liability is nonzero, which would result in a difference of 100% for such participants. However, the dollar amounts involved are immaterial.
- Some of the large individual percentage differences in normal cost were observed for active participants over the maximum assumed retirement age, for whom ProVal will compute a normal cost of \$0 whereas CalPERS's valuation system always imputes a half-year of benefit accrual, causing their normal costs to be nonzero and a percentage difference of 100% in the results. However, the dollar amounts involved are inconsequential.

As noted, these are deemed to be acceptable differences in valuation systems; no action was required or expected to be taken. They do serve to explain some relatively large discrepancies identified in results for individual participants.

In Task 5, we identified two areas where the refinement of the valuation report and/or calculations was advisable:

1. The valuation reports indicated that when a member was eligible for retirement, the termination with vested benefit decrement ceased to apply. It appeared that this was not happening in some of the State valuations. Discussions with the CalPERS actuarial staff revealed that the continued application of the decrement after attainment of retirement eligibility was intentional. We suggested that the description of the decrement provided in the reports be modified to state this clearly.

The CalPERS Actuarial Office noted that they believed the application of the decrement in their valuation programs was correct. The description will be modified in the June 30, 2020 report to be consistent with the application.

2. Distinguish (where appropriate) between phasing in the impacts of economic assumption changes and phasing in of assumption changes themselves and identify margins for adverse deviations.

The economic assumptions (expected rate of investment return, payroll growth rate, and inflation rate) were changed effective with the June 30, 2018 valuations. In addition, for the Schools valuation, they were scheduled to be changed again in the June 30, 2019 valuation.

Our understanding is that the gradual phase-in is reflected only in the determination of contributions and thus constitutes a form of "direct contribution rate smoothing". Such smoothing for the impact of

assumption changes is identified as an Acceptable Practice in the 2015 paper of the California Actuarial Advisory Panel, “Actuarial Funding Policies and Practices for Public Pensions and OPEB Plans – and Level Cost Allocation Model”. We suggest that it be made clear that the phase-in of the change in the assumed rate of return is made solely for the purpose of determining contributions. Further, if the revised assumption incorporates any margin for adverse deviations, we recommend that such margins be quantified in accordance with the requirements of the applicable Actuarial Standards of Practice.

The phase-ins commented on above have been fully implemented, so there is no further action to be taken in relation to this suggestion until and unless future phase-ins are made.

Section IV – Summary of Tasks 3 and 6 – Judges, Legislators, and 1959 Survivors

For both Tasks 3 and 6, we concluded that the assumptions used in the Judges I (JRS I), Judges II (JRS II), Legislators (LRS), and 1959 Survivors valuations were reasonable and the methodology used to select these assumptions was appropriate and consistent with guidance provided in ASOP 27 and 35. We assessed the assumed annual rate of return assumptions under each of the valuations reviewed using our own economic modelling tool and determined all of them to be reasonable.

For both Tasks 3 and 6, we replicated total present values of future benefits, actuarial accrued liabilities, normal costs, and total employer contribution rates within 5% of the corresponding results reported by CalPERS for all of the plans.

Task 3: Parallel Valuation and Certification of the Actuarial Valuations of the Judges' Retirement Systems, Judges' Retirement Systems II, the Legislators' Retirement System, and the 1959 Survivor Benefit Program as of June 30, 2016

In Task 3, we identified three areas where the refinement of the valuation report and/or calculations was advisable:

1. For JRS I, JRS II, and LRS: add information to the reports to meet new ASOP 4 requirements.

This recommendation was resolved with the June 30, 2019 valuations reviewed as part of Task 6, with the following exceptions:

For JRS II and LRS, we recommended adding a statement regarding the impact of the funding policy on future contributions and funded status. The June 30, 2019 valuations did not contain such a statement. The CalPERS Actuarial Office noted that they agree with the suggested text modification and will implement such modifications beginning with the June 30, 2020 reports.

2. For JRS I: Pre-Retirement Mortality for Separated Participants

For separated employees in all plans, we observed that the mortality assumption (decrement) was not being applied in the period prior to retirement for participants who have separated from employment and are entitled to benefits at a future retirement age. We believe the pre-retirement mortality decrement should be applied in determining liabilities for all participants for all future years.

The June 30, 2019 valuation addressed this recommendation.

3. For 1959 Survivors: add information to the reports to meet new ASOP 6 requirements

The June 30, 2019 valuation did not address this recommendation. Specifically:

- a. **The report did not include a statement regarding the impact of the funding policy on future contributions and funded status**
- b. **The report did not include a statement about the appropriateness of reported measures of the funded status on the plan for various purposes.**

- c. The report did not include a statement about future measurements and the fact that they may differ from current measurements.**

The CalPERS Actuarial Office noted that they agree with the suggested text modification and will implement such modifications beginning with the June 30, 2020 reports.

Task 6: : Parallel Valuation and Certification of the Actuarial Valuations of the Judges' Retirement Systems, Judges' Retirement Systems II, the Legislators' Retirement System, and the 1959 Survivor Benefit Program as of June 30, 2019

In Task 6, we made a number of observations that relate to evident differences in valuation system. These are not errors; they simply reflect differences of approach. These items do not have a material effect on overall liabilities but can give rise to significant percentage differences in results computed for individual participants.

1. For JRS I: It appears that the present value of future benefits (PVFB) associated with Extended Service Incentive Program (ESIP) balances did not tie directly to the ESIP balance reported in the data. We suspect this to be the primary source of difference for several active records for which the differences between Buck's calculation and CalPERS's was outside of the 5% threshold. In any case, we consider these discrepancies to have an immaterial effect on the overall accuracy of the valuation.
2. For JRS II: Buck's PVFB calculation differed by more than 5% for approximately 3% of the population. This is due primarily to the treatment of individuals expected to retire on or after the maximum assumed retirement age. The maximum assumed retirement age is age 70 and since many individuals enter the plan at a relatively older age they may not be eligible to retire until age 70 or later. In those instances, CalPERS imputes one-half year of service in the year of retirement, whereas ProVal assumes retirement at beginning of year. Since those first eligible to retire on or after age 70 generally have fewer than 20 years of service, the imputed half-year of service can produce a benefit that is several percentage points different from the benefit ProVal computes,

In the CalPERS valuation, the present value of a participant's future benefits is based on his or her actual credited service amount as of the valuation date. However, the accrued liability and normal cost are determined using a theoretical service amount built by assumption from entry age. Generally, the theoretical service is at least as much as the actual, which tends to produce a lower accrued liability and a higher normal cost than if actual service were used. This difference in approach has an insignificant effect on calculation of the plan's funded status.

3. For LRS: In the CalPERS valuation, the present value of a participant's future benefits is based on his or her actual credited service amount as of the valuation date. However, the accrued liability and normal cost are determined using a theoretical service amount built by assumption from entry age. Generally, the theoretical service is at least as much as the actual, which tends to produce a lower accrued liability and a higher normal cost than if actual service were used. One of the two participants in the LRS plan has actual service that is lower than his "Normal Cost Start Date" would imply, which causes Buck's calculation of the normal cost to differ from CalPERS' normal cost by more than 5%. The difference in approach has an insignificant effect on the calculation of the plan's funded status, and though the percentage difference in the entry age normal costs exceeds 5%, the dollar amount of the difference is negligible relative to the \$115.8 million asset value as of June 30, 2019. We believe that CalPERS method is acceptable. In any case, changing this method would have no material effect on the plan's funding integrity.

We identified three areas in which the refinement of the valuation report and/or calculations was advisable:

1. For JRS I: Both ASOP 27 (Section 4.1.1) and ASOP 35 (Section 4.1.1) state that the actuary should disclose whether each significant assumption represents an estimate of future experience, an observation of the estimates inherent in market data or a combination. The mortality, inflation, salary increase, and payroll growth assumptions specifically refer to the separate experience study. It may be inferred that the requirement for these specific assumptions is met by the reference to the experience study. However, this is not the case for the other assumptions. We believe future reports would more completely fulfill the requirements of the ASOP 27 and ASOP 35 by including a statement that all assumptions represent an estimate of future experience.

The CalPERS Actuarial Office noted that they agree with the suggested text modification and will implement such modifications beginning with the June 30, 2020 reports.

2. For JRS II: **Add information to the report to meet communication requirements.**

We note the following items may be considered for inclusion in future reports in order to more completely fulfill the requirements of ASOP 27 and ASOP 35.

- a. In accordance with ASOP 27 (Section 4.1.1) and ASOP 35 (Section 4.1.1), a statement that all assumptions represent an estimate of future experience. We note the mortality, inflation, salary increases, and payroll growth assumptions specifically refer to the separate experience study. It may be inferred the requirement for these specific assumptions is met by the reference to the experience study. However, this is not the case for the other assumptions for which the experience study is not referenced.
- b. A description of the treatment of the Monetary Credit Account in the actuarial assumptions. In particular, participation and form of payment elections for the Monetary Credit Account benefit.

The CalPERS Actuarial Office noted that they agree with the suggested text modification and will implement such modifications beginning with the June 30, 2020 reports.

3. For LRS: **Add information to the report to meet communication requirements.**

We note the following items may be considered for inclusion in future reports in order to more completely fulfill the requirements of ASOP 27 and ASOP 35.

- a. In accordance with ASOP 27 (Section 4.1.1) and ASOP 35 (Section 4.1.1), a statement that all assumptions represent an estimate of future experience. We note the mortality and inflation assumptions specifically refer to the separate experience study. It may be inferred the requirement for these specific assumptions is met by the reference to the experience study. However, this is not the case for the other assumptions for which the experience study is not referenced.
- b. In accordance with ASOP 27 (Section 4.1.2), a disclosure of the rationale for the economic assumptions other than inflation. We note this may be accomplished by referencing the experience study for all assumptions to which it is applicable and explicitly stating the rationale for any assumptions to which the experience study is not applicable.

The CalPERS Actuarial Office noted that they agree with the suggested text modification and will implement such modifications beginning with the June 30, 2020 reports.

4. For 1959 Survivors:

a. **Add information to the report to meet ASOP 27 communication requirements.**

We note the following items may be considered for inclusion in future reports to more completely fulfill the requirements of ASOP 27.

- i. In accordance with Section 4.1.1, a statement that the return on investment assumption represents an estimate of future experience.
- ii. In accordance with Section 4.1.2, a disclosure of the rationale for the return on investment assumption.

The CalPERS Actuarial Office noted that they agree with the suggested text modification and will implement such modifications beginning with the June 30, 2020 reports.

b. **Revise the treatment of the new element of the projection of the unfunded liability (UAL) labeled “Changes in Contributions due to Contribution (Gain)/Loss.”**

The projected UAL is the base that is amortized as part of the required contribution determination. The element in question was added to “reflect differences in calculated Normal Costs from the prior year and the current year, as well as differences in Actual and Estimated members.” The idea is to anticipate contributions that deviate from expected levels due to the realization of head counts or changes in the normal cost rate; e.g., if actual head counts are greater than expected, then more contributions will be made than expected, resulting in a contribution gain. According to the indicated formula, a positive number serves to reduce the projected UAL and a negative number serves to increase the projected UAL. However, it appears that the reverse case should be applied.

Consider, for example, PA 1st Level Pool. The prior valuation assumed 7,300 actives, but there were actually 7,290. The lower head count would result in decreased contributions, which is an experience loss to the plan. A loss would increase the projected UAL, but in the projection on page 14, it is shown as lowering it.

It should be noted that the amortization treatment appears to be correct, and the resulting premium amounts are therefore unaffected. The two pools for which explicit amortization is applicable are as follows:

- State 5th Level –The “Projected Balance 6/30/2020” of \$38,741,015 shown on page 16 does not equal the projected UAL developed on page 13 (line 3h, \$38,276,781). On page 13, the “Changes in Contributions due to Contribution (Gain)/Loss” of \$224,395 reduced the projected UAL. On page 16, it was added to the amortization base as a loss.
- Public Agency 4th Level—the amortization is not explicitly described, but the report indicates that the amortization period is 30 years. The projected UAL shown on page 14 is (\$7,234,369) and reflects a “Changes in Contributions due to Contribution (Gain)/Loss” of (\$207,106). The amortization amount shown on page 14 (line 4d) is (\$596,979). This should be a 30-year amortization of the projected UAL, adjusted to mid-year with interest. Using this information to solve for the amortization base obtains (\$7,662,830). This can be shown to be the result of “reversing the signs”, i.e., increasing the projected UAL by \$207,106, but reducing the amortization base by \$207,106.

The CalPERS Actuarial Office noted that they agree with this suggestion and have implemented the change in their valuation programming. The June 30, 2020 report will reflect this change.

c. **Refine the projected UAL calculation with a more precise application of interest on the projected employee contributions.**

The premium employees pay is constant throughout the year; e.g., if the premium is \$2 per employee per month, then \$24 is collected for an active member over the course of the year. Thus, for purposes of determining funding requirements, the employee premium is a mid-year contribution, in effect. In instances in which the projected UAL is reduced for employee contributions in excess of funding requirements, the report is adjusting the expected employee premiums paid (line 3e) by one-half year's interest, i.e., it is the product of the annualized prior year premium rate, the projected active count, and the interest adjustment equal to $1.07^{1/2}$. Since the premiums are effectively mid-year, then the interest adjustment actually increases the value to end of year. Thus, the interest applied to that value in line 3h is unwarranted.

From a practical point of view, the only way this could have an effect is if the employee contributions only partially exceed the required contribution, which means that group would have to be nearly fully funded, but not entirely so. None of the seven groups are in this situation, thus, no group is affected this year since those groups for which the necessary condition applies (employee contributions are in excess of funding requirements) are so well-funded that the amortization is simply an offset of the normal cost; i.e., the UAL is not explicitly used in the amortization.

The CalPERS Actuarial Office noted that they are considering modifications pursuant to this recommendation. The June 30, 2020 report will likely incorporate some such modification.

d. **Provide more detail on the development of normal cost for all groups except PA Indexed Level Pool.**

The development of the normal costs should be more overt, including more detail on the historical information used to develop the normal cost. Also, for PA 1st, 2nd, 3rd and 4th Level Pools, we recommend furnishing more detail on how the grouping method, as explained in the footnote, was used to determine the normal cost for each individual pool.

The CalPERS Actuarial Office noted that they are considering modifications pursuant to this recommendation. The June 30, 2020 report will likely incorporate some such modification.

Section V – Final Comments and Recommendations

The results of the reviews completed by Buck pursuant to Contract 2015-8123 confirm that the actuarial process followed by CalPERS is thorough, complete, and complies with applicable Actuarial Standards of Practice. We have been able to closely replicate key valuation results, and differences generally were due to reasonable differences in valuation systems.

The CalPERS Actuarial Office has addressed each of the outstanding issues noted in this report, and have indicated their intention to resolve them with the June 30, 2020 valuations.