Imperial County Employees' Retirement System

Actuarial Valuation and Review as of June 30, 2018

Segal Consulting

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December 7, 2018

Board of Retirement
Imperial County Employees' Retirement System
1221 West State Street
El Centro, CA 92243

Dear Board Members:

We are pleased to submit this Actuarial Valuation and Review as of June 30, 2018. It summarizes the actuarial data used in the valuation, establishes the funding requirements for fiscal 2019-2020 and analyzes the preceding year's experience.

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

The measurements shown in this actuarial valuation may not be applicable for other purposes. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period); and changes in plan provisions or applicable law.

The actuarial calculations were completed under the supervision of Andy Yeung, ASA, EA, MAAA, FCA. We are Members of the American Academy of Actuaries and we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of our knowledge, the information supplied in the actuarial valuation is complete and accurate. Further, in our opinion, the assumptions as approved by the Board of Retirement are reasonably related to the experience of and the expectations for the System.

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

Segal Consulting, a Member of The Segal Group, Inc.

Sincerely,

By: Andy Yeung

Andy Yeung, ASA, EA, MAAA, FCA
Vice President and Actuary

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

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SECTION 1

VALUATION SUMMARY

SECTION 2

VALUATION RESULTS

SECTION 3

SUPPLEMENTAL INFORMATION

SECTION 4

REPORTING INFORMATION

Purpose

This report has been prepared by Segal Consulting to present a valuation of the Imperial County Employees' Retirement System (ICERS) as of June 30, 2018. The valuation was performed to determine whether the assets and contributions are sufficient to provide the prescribed benefits. The contribution requirements presented in this report are based on:

- The benefit provisions of the Retirement System, as administered by the Board.
- The characteristics of covered active members, inactive vested members, retired members and beneficiaries as of June 30, 2018, provided by ICERS;
- The assets of the Plan as of June 30, 2018, provided by ICERS;
- Economic assumptions regarding future salary increases and investment earnings adopted by the Board for the June 30, 2018 valuation; and
- Other actuarial assumptions, regarding employee terminations, retirement, death, etc. adopted by the Board for the June 30, 2018 valuation.

The rates calculated in this report may be adopted by the Board for the fiscal year that extends from July 1, 2019 through June 30, 2020.

One of the general goals of an actuarial valuation is to establish contributions which fully fund the System's liabilities, and which, as a percentage of payroll, remain as level as possible for each generation of active members. Annual actuarial valuations measure the progress toward this goal, as well as test the adequacy of the contribution rates.

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

Reference: Page 50

The contribution requirements are determined as a percentage of payroll. The System's employer rates provide for both normal cost and a payment or credit to amortize any unfunded or overfunded actuarial accrued liabilities. In this valuation, we have applied the funding policy adopted by the Board on March 21, 2012 and reviewed by the Board on May 8, 2017, which continues to amortize the System's remaining outstanding balance of the June 30, 2012 unfunded actuarial accrued liability (UAAL) over a closed period of 19 years (with 13 years remaining as of June 30, 2018). Furthermore, effective with the June 30, 2013 valuation, any changes in UAAL that emerge after June 30, 2012 will be amortized over the periods specified in the

Board's funding policy. In particular, any change in UAAL as a result of actuarial gains or losses is amortized over a 15-year closed period, and any change in UAAL as a result of a change in actuarial assumptions is amortized over 20 years.

Reference: Pages 66-69

A schedule of current amortization balances and payments may be found in Section 4, Appendix C. A graphical projection of the UAAL amortization bases and payments is shown in Appendix D.

Please note that Actuarial Standard of Practice (ASOP) No. 4 provides guidelines that actuaries have to follow when selecting actuarial assumptions. For a plan such as that offered by the Retirement System that may utilize unallocated earnings on an ad-hoc basis to provide contribution rate relief and additional non-statutory benefits, we are required to indicate in the valuation report that the possible impact of any such application of future excess earnings on the future financial condition of the plan has not been explicitly measured in the valuation.[1]

Significant Issues in Valuation Year

The following key findings were the result of this actuarial valuation:

Reference: Pages 14 and 16

- After we completed the June 30, 2017 valuation, several bargaining units entered into agreements with the County for the employer to pick up the Supplemental UAAL contributions for the Tier 3 members. The employer and member contribution rates, adjusted to reflect the agreements, were provided in our letter dated August 2, 2018. The results of this valuation reflect agreements to pick up those contributions in effect as of November 20, 2018 for ten County bargaining units. A list of these bargaining units and their combined payroll is provided in Section 2. Members who are not a part of the bargaining units that have reached this agreement (referenced in this valuation report as "Member Pays Supplemental UAAL") have a separate set of Tier 3 employer and member contribution rates that differ from the Tier 3 employer and member contribution rates for members belonging to the bargaining units that have reached this agreement (referenced in this valuation report as "Employer Picks Up Supplemental UAAL").

Reference: Page 35

- As of June 30, 2018, the System has a zero balance in the Member and Retiree Non-valuation Reserves, Employee Benefit Enhancement Reserve, Employee COLA Contribution Relief Reserve and Unallocated Earnings Reserve. Because the interest credited on the valuation reserves, gross of the negative contingency reserve, was greater than the System's actual investment return, in order to credit interest to the valuation reserves at the assumed earnings rate the balance of the Contingency Reserve decreased from negative $74.9 million as of June 30, 2017 to negative $82.2 million as of June 30,

[1] *It should be noted that under the Board's interest crediting policy, the balance of $82.2 million in negative contingency reserve has to be fully restored before any unallocated earnings can be spent on providing discretionary benefits. We expect that in the next several years, there will be a very small probability of any unallocated earnings.*

2018. According to the Interest Crediting and Undistributed Earnings Policy updated by the Board in 2011, the Contingency Reserve has to be restored to 1% of the assets in the future before the System will accumulate unallocated earnings that could be used to provide contribution rate relief and/or non-statutory benefits.

Reference: Pages 21 and 36

- In this June 30, 2018 valuation, the ratio of the valuation value of assets to the actuarial accrued liabilities has increased from 86.1% to 88.3%. On a market value basis, this funded ratio has increased from 85.6% to 88.0%. In this valuation, the System's UAAL when measured on a valuation value of assets basis has decreased from $126.5 million to $110.2 million. A reconciliation of the change in UAAL is provided in Section 3, Exhibit H.

Reference: Page 16

- Safety Legacy members are exempt from making member contributions to fund the regular benefits after they have attained 30 years of service, and such contributions will be picked up by the employer. As there is one Safety Legacy member who has attained 30 years of service as of June 30, 2018, we have included the pickup contributions for both Normal Cost and UAAL related to the supplemental benefits in Chart 13. A similar adjustment has also been made to the Normal Cost for the regular benefits. (There is a similar provision in the 1937 Act for the General Legacy members but those members would have to be hired on or before March 7, 1973 in addition to having 30 years of service. There are no such members as of June 30, 2018.)

Reference: Pages 18 and 70

- The adopted and recommended aggregate employer rate[2] from the June 30, 2017 valuation was 22.53%. The aggregate employer rate[2] calculated in this valuation has decreased to 21.75% of payroll. The employer rates include the funding of the Regular benefit plus an amount required to fund the outstanding balance of one-third of the UAAL for the Safety members' Supplemental benefit as determined in the June 30, 2006 valuation, plus the pickup of Supplemental UAAL contributions for Tier 3 members belonging to a bargaining unit that has reached such agreement. This year's decrease in the rate is primarily due to: (i) salary increases less than expected, (ii) a greater than expected return on the assets for Regular benefits (after smoothing), (iii) a gain due to retirement experience, and (iv) other actuarial gains, offset somewhat by (v) contributions lower than expected due to the one-year lag in implementing the contribution rates recommended in the June 30, 2017 valuation and (vi) an overall increase in the UAAL rate resulting from a smaller than expected increase in total payroll. A reconciliation of the System's aggregate employer rate is provided in Section 2, Subsection D, Chart 14. In addition, a reconciliation of the System's employer rates by tier is provided in Section 4, Appendix E.

Reference: Pages 19 and 71

- The adopted and recommended aggregate member rate[3] from the June 30, 2017 valuation was 12.55%. The aggregate member rate[3] calculated in this valuation has increased to 12.61% of payroll. This year's increase in the rate is primarily

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[2] *The calculated employer rates include an employer pick-up of members' contributions equal to 3% of payroll for General and Safety members in the Legacy Tiers.*

[3] *The aggregate member rate is calculated by taking the member rates for a General Legacy member at entry age 33, a Safety Legacy member at entry age 28, a General Tier 3 member, and a Safety Tier 3 member, and weighting those rates by the projected compensations for members in the four tiers.*

due to: (i) a less than expected return on the assets for Supplemental benefits (after smoothing), (ii) an overall increase in the UAAL rate resulting from a smaller than expected increase in total payroll, and (iii) other actuarial losses, offset somewhat by (iv) salary increases less than expected. A reconciliation of the System's aggregate member rate is provided in Section 2, Subsection D, Chart 15. In addition, a reconciliation of the System's member rates by tier is provided in Section 4, Appendix E.

Reference: Page 15

- Contributions toward administrative expenses are allocated between the employers and the members based on the relative proportion of their respective contributions to the total. In recent valuations, we have only changed the allocation of contribution rates for administrative expenses after each experience study. However, the agreements reached by several bargaining units for the employer to pick up the Supplemental UAAL contributions for Tier 3 members have changed the relative proportion of employer and member contributions used in the original allocation. Therefore, we have updated the allocation of contributions toward administrative expenses in the recommended employer and member contribution rates as of June 30, 2018. As more bargaining units may sign on with this agreement, we will continue this practice of updating the allocation annually in future actuarial valuations to reflect any changes in the relative proportions of employer and member contributions.

Reference: Page 5

Reference: Pages 9 and 10

- As indicated in Section 2, Subsection B (see Chart 7), the net total unrecognized investment losses as of June 30, 2018 are $6.8 million, as compared to the net total unrecognized investment losses of $8.4 million in the June 30, 2017 valuation. These investment losses will be recognized in the determination of the valuation value of assets for funding purposes in the next few years, and will offset any investment gains that may occur after June 30, 2018. If the System earns the assumed net rate of investment return of 7.25% per year on a market value basis, that will result in investment losses on the valuation value of assets in the next few years. This means that, if the actual market return is equal to the assumed 7.25% rate and all other actuarial assumptions are met, the contribution requirements would increase in the next few years.

  The unrecognized investment losses represent 0.8% of the market value of assets as of June 30, 2018. Unless offset by future investment gains or other favorable experience, the recognition of the $6.8 million market losses is expected to have an impact on the System's future funded ratio and the aggregate employer and member contributions. This potential impact may be illustrated as follows:

  - If the deferred losses were recognized immediately in the valuation value of assets (and assuming further that the Reserve for Capital Assets were to be used to offset some of those losses), the funded percentage would decrease from 88.3% to 88.0%.

    For comparison purposes, if all the deferred losses in the June 30, 2017 valuation had been recognized immediately in the June 30, 2017 valuation, the funded percentage would have decreased from 86.1% to 85.6%.

- If the deferred losses were recognized immediately in the valuation value of assets (and assuming further that the Reserve for Capital Assets were to be used to offset some of those losses), the aggregate employer contribution rate would increase from 21.75% of payroll to 22.00% of payroll and the aggregate member contribution rate would increase from 12.61% of payroll to 12.63% of payroll.

  For comparison purpose, if all the deferred losses in the June 30, 2017 valuation had been recognized immediately in the June 30, 2017 valuation, the recommended aggregate employer contribution rate would have increased from 22.71%[4] of payroll to 22.97% of payroll and the recommended aggregate member contribution rate would have increased from 12.73%[4] of payroll to 12.76% of payroll.

- The actuarial valuation report as of June 30, 2018 is based on financial information as of that date. Changes in the value of assets subsequent to that date are not reflected. Declines in asset values will increase the actuarial cost of the plan, while increases will decrease the actuarial cost of the plan.

[4] *These recommended rates are slightly different from those shown above because they have not been recomposited to reflect the proportion of payrolls among the different Tiers and General/Safety membership classes. Also, these recommended rates are before any adjustment to reflect the pickup of Supplemental UAAL contributions for certain Tier 3 members.*

Impact of Future Experience on Contribution Rates

Future contribution requirements may differ from those determined in the valuation because of:

1) differences between actual experience and anticipated experience;
2) changes in actuarial assumptions or methods;
3) changes in statutory provisions; and
4) difference between the contribution rates determined by the valuation and those adopted by the Board.

New Actuarial Standard of Practice on Risk Assessment

The Actuarial Standards Board approved a new Actuarial Standard of Practice No. 51 (ASOP 51) regarding risk assessment. ASOP 51 will be effective with ICERS' June 30, 2019 actuarial valuation. ASOP 51 requires actuaries to identify risks that "may reasonably be anticipated to significantly affect the plan's future financial condition". Investment risk, asset/liability mismatch risk, interest rate risk, longevity and other demographic risks and contribution risk are also cited as examples in ASOP 51. The standard does not require the actuary to evaluate the likelihood of contributing entities to make contributions when due, nor does it require the actuary to assess the likelihood or consequences of future changes in applicable law.

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

Prior to the next valuation, we will discuss with ICERS what information should be included in ICERS' risk report for the June 30, 2019 valuation.

Summary of Key Valuation Results (Continued)

	June 30, 2018		June 30, 2017	
Employer Contribution Rates:	Total Rate	Estimated Annual Amount[1]	Total Rate	Estimated Annual Amount[1]
General Legacy	21.46%	$14,767,000	22.09%	$15,201,000
General Tier 3 *(Member Pays Supplemental UAAL)*	16.21%	821,000	16.75%	848,000
General Tier 3 *(Employer Picks Up Supplemental UAAL)*	16.67%	3,769,000	17.21%	3,892,000
Safety Legacy	30.69%	5,292,000	32.33%	5,575,000
Safety Tier 3 *(Member Pays Supplemental UAAL)*	23.42%	1,187,000	24.80%	1,257,000
Safety Tier 3 *(Employer Picks Up Supplemental UAAL)*	27.67%	0	28.93%	0
All Categories Combined	21.75%	$25,836,000	22.53%	$26,773,000
Aggregate Member Contribution Rates:	Total Rate	Estimated Annual Amount[1]	Total Rate	Estimated Annual Amount[1]
General Legacy (Average Entry Age: 33)	10.85%	$7,466,000	10.83%	$7,452,000
General Tier 3 *(Member Pays Supplemental UAAL)*	9.85%	499,000	9.83%	498,000
General Tier 3 *(Employer Picks Up Supplemental UAAL)*	9.34%	2,112,000	9.32%	2,108,000
Safety Legacy (Average Entry Age: 28)	22.84%	3,939,000	22.67%	3,909,000
Safety Tier 3 *(Member Pays Supplemental UAAL)*	19.02%	964,000	18.69%	947,000
Safety Tier 3 *(Employer Picks Up Supplemental UAAL)*	14.40%	0	14.20%	0
All Categories combined	12.61%	$14,980,000	12.55%	$14,914,000
Funded Status:				
Actuarial accrued liability	$945,385,000		$910,321,000	
Valuation value of assets (VVA)[2]	835,211,000		783,848,000	
Market value of assets (MVA)	831,484,000		779,075,000	
Funded percentage on VVA basis (VVA/AAL)	88.3%		86.1%	
Funded percentage on MVA basis (MVA/AAL)	88.0%		85.6%	
Unfunded actuarial accrued liability on VVA basis	$110,174,000		$126,473,000	
Unfunded actuarial accrued liability on MVA basis	$113,901,000		$131,246,000	
Key Economic Assumptions:				
Interest rate	7.25%		7.25%	
Inflation rate	3.00%		3.00%	
Across-the-board salary increase	0.50%		0.50%	

(1) *Based on June 30, 2018 projected annual compensation.*

(2) *Excludes non-valuation reserves.*

Summary of Key Valuation Demographic and Financial Data

	June 30, 2018	June 30, 2017	Percentage Change
Active Members:			
Number of members	2,161	2,186	(1.1%)
Average age	42.1	42.0	0.1
Average service	10.1	10.0	0.1
Projected total compensation	$118,800,000	$119,934,000	(0.9%)
Average projected compensation	$54,974	$54,865	0.2%
Retired Member and Beneficiaries:			
Number of members:			
Service retired	878	820	7.1%
Disability retired	138	132	4.5%
Beneficiaries	177	169	4.7%
Total	1,193	1,121	6.4%
Average age	69.1	69.1	0.0
Average monthly benefit	$2,904	$2,858	1.6%
Vested Terminated Members[(1)]:			
Number of vested terminated members	500	451	10.9%
Average age	42.9	43.5	(0.6)
Summary of Financial Data:			
Market value of assets	$831,483,648	$779,074,836	6.7%
Return on market value of assets	7.89%	12.32%	N/A
Actuarial value of assets	$838,285,698	$787,434,753	6.5%
Return on actuarial value of assets	7.61%	6.98%	N/A
Valuation value of assets	$835,211,129	$783,847,755	6.6%
Return on valuation value of assets	7.71%	7.09%	N/A

(1) *Includes terminated members due only a refund of member contributions.*

Important Information about Actuarial Valuations

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

In order to prepare an actuarial valuation, Segal Consulting ("Segal") relies on a number of input items. These include:

- **Plan benefits** Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan description in this report to confirm that Segal has correctly interpreted the plan provisions.
- **Participant data** An actuarial valuation for a plan is based on data provided to the actuary by ICERS. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.
- **Assets** This valuation is based on the market value of assets as of the valuation date, as provided by ICERS.
- **Actuarial assumptions** In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan's assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results, that does not mean that the previous assumptions were unreasonable.

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

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

- An actuarial valuation is a measurement of the plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.
- If ICERS is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.
- Segal does not provide investment, legal, accounting, or tax advice. Segal's valuation is based on our understanding of applicable guidance in these areas and of the plan's provisions, but they may be subject to alternative interpretations. ICERS should look to their other advisors for expertise in these areas.

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

A. MEMBER DATA

The actuarial valuation and review considers the number and demographic characteristics of covered members, including active members, vested terminated members, retired members and beneficiaries.

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

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

A historical perspective of how the member population has changed over the past ten valuations can be seen in this chart.

CHART 1

Member Population: 2009 – 2018

Year Ended June 30	Active Members	Vested Terminated Members[1]	Retired Members and Beneficiaries[2]	Ratio of Non-Actives to Actives
2009	1,935	244	857	0.57
2010	1,944	247	877	0.58
2011	1,947	247	924	0.60
2012	1,921	332	977	0.68
2013	1,919	354	975	0.69
2014	1,987	374	1,007	0.70
2015	2,057	404	1,027	0.70
2016	2,127	425	1,078	0.71
2017	2,186	451	1,121	0.72
2018	2,161	500	1,193	0.78

(1) *Starting with the June 30, 2012 valuation, includes terminated members due a refund of member contributions. For all years, members with both General and Safety service were counted once based on their latest membership category.*

(2) *Prior to the 2013 valuation, retired members and beneficiaries receiving both General and Safety benefits were reported as two separate records. Starting with the June 30, 2013 valuation, these members are only counted once based on their latest membership category. There were 66 such retired members and beneficiaries as of June 30, 2013.*

Active Members

Plan costs are affected by the age, years of service and compensation of active members. In this year's valuation, there were 2,161 active members with an average age of 42.1 years, average years of service of 10.1 and average compensation of $54,974. The 2,186 active members in the prior valuation had an average age of 42.0 years, average service of 10.0 and average compensation of $54,865.

Inactive Members

In this year's valuation, there were 500 members with a vested right to a deferred or immediate vested benefit or entitled to a return of their member contributions versus 451 in the prior valuation.

These graphs show a distribution of active members by age and by years of service.

CHART 2

Distribution of Active Members by Age as of June 30, 2018

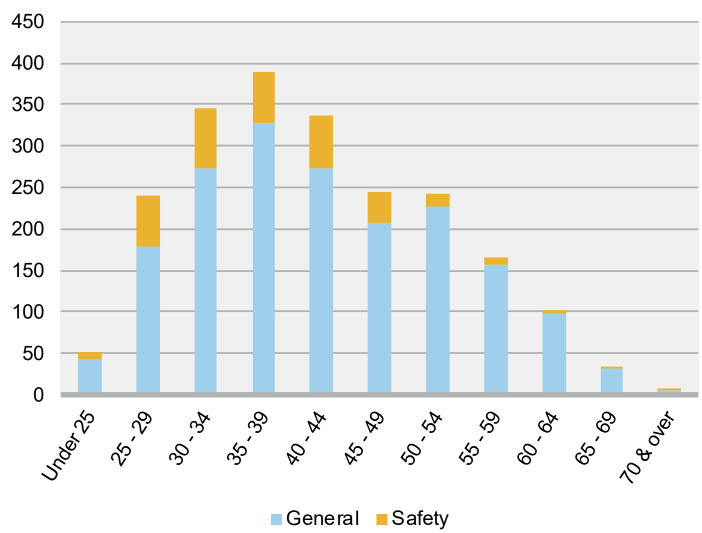
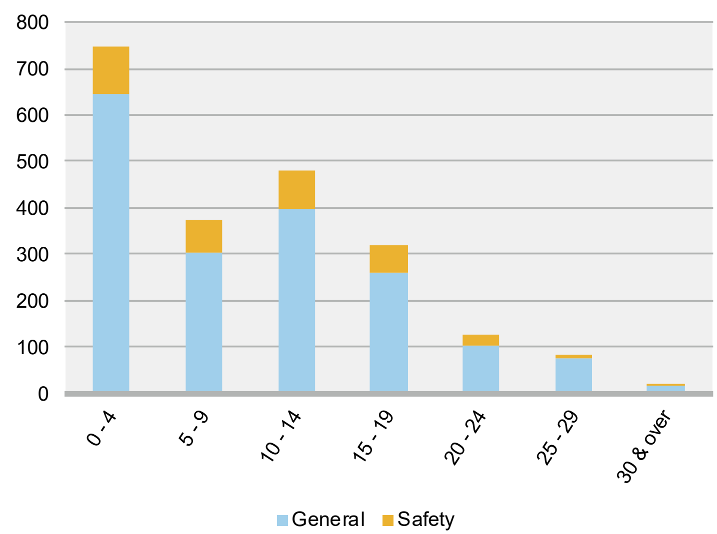


CHART 3

Distribution of Active Members by Years of Service as of June 30, 2018



Retired Members and Beneficiaries

As of June 30, 2018, 1,016 retired members and 177 beneficiaries were receiving total monthly benefits of $3,465,000. For comparison, in the previous valuation, there were 952 retired members and 169 beneficiaries receiving monthly benefits of $3,204,000.

These graphs show a distribution of the current retired members and beneficiaries based on their monthly amount and age, by type of pension.

CHART 4

Distribution of Retired Members and Beneficiaries by Type and by Monthly Amount as of June 30, 2018

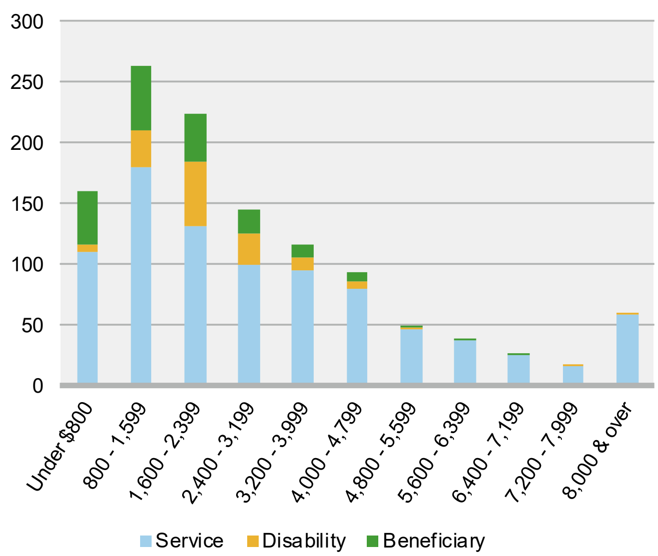
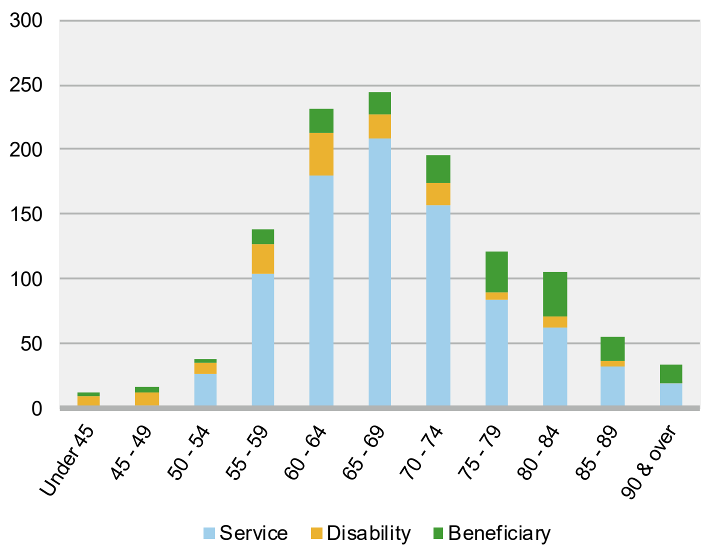


CHART 5

Distribution of Retired Members and Beneficiaries by Type and by Age as of June 30, 2018



B. FINANCIAL INFORMATION

Retirement plan funding anticipates that, over the long term, both contributions (net of administrative expenses starting in 2015) and net investment earnings (less investment fees) will be needed to cover benefit payments.

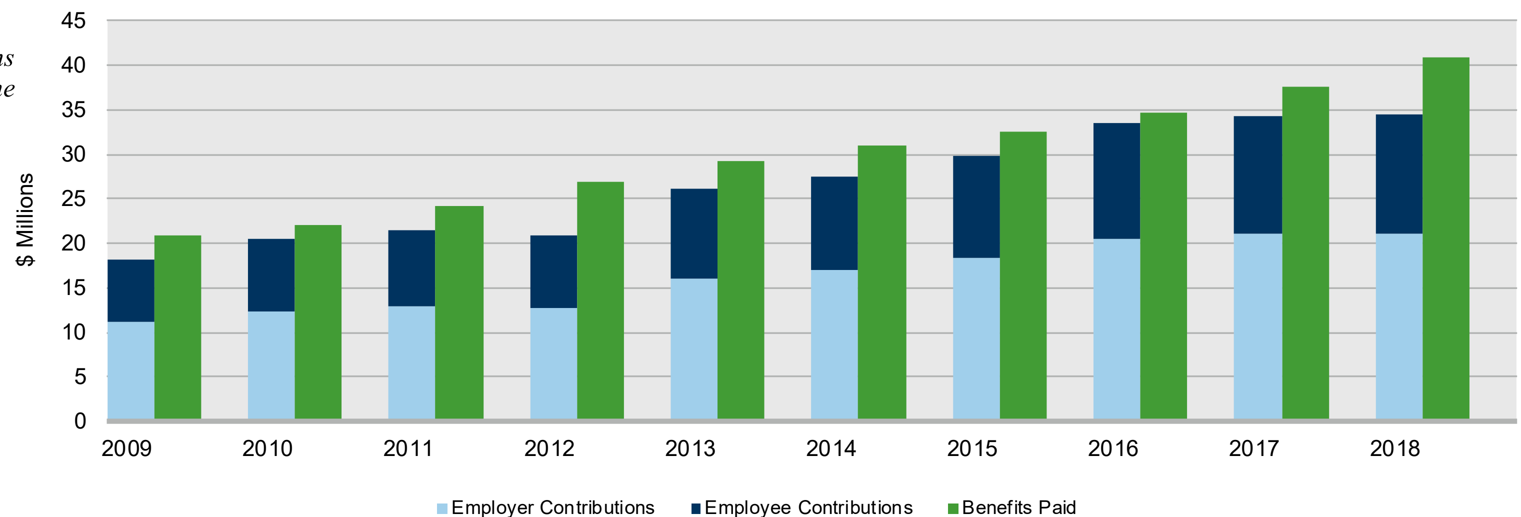
Retirement plan assets change as a result of the net impact of these income and expense components.

Additional financial information, including a summary of these transactions for the valuation year, is presented in Section 3, Exhibits D and E.

The chart depicts two components of changes in the actuarial value of assets over the last ten years. Note: The first bar represents increases in assets due to contributions during each year while the second bar details the decreases due to benefit payments.

CHART 6

Comparison of Contributions with Benefits for Years Ended June 30, 2009 – 2018



The chart shows the determination of the actuarial value of assets as of the valuation date.

CHART 7
Determination of Actuarial Value of Assets for Year Ended June 30, 2018 (As Prepared by ICERS)

Six Month Period From	To	Total Actual Market Return (net)	Expected Market Return (net)	Investment Gain (Loss)	Deferred Factor	Deferred Return
01/01/2014	06/30/2014	$32,528,614	$25,620,963	$6,907,651	0.1	$690,765
07/01/2014	12/31/2014	(10,352,400)	26,817,010	(37,169,410)	0.2	(7,433,882)
01/01/2015	06/30/2015	21,084,669	26,361,000	(5,276,331)	0.3	(1,582,899)
07/01/2015	12/31/2015	(24,947,582)	26,253,854	(51,201,436)	0.4	(20,480,574)
01/01/2016	06/30/2016	26,673,765	25,251,820	1,421,945	0.5	710,973
07/01/2016	12/31/2016	26,224,337	26,163,655	60,682	0.6	36,409
01/01/2017	06/30/2017	59,548,536	27,038,927	32,509,609	0.7	22,756,726
07/01/2017	12/31/2017	53,571,926	29,132,665	24,439,261	0.8	19,551,409
01/01/2018	06/30/2018	7,587,563	30,977,537	(23,389,974)	0.9	(21,050,977)

1. Total Deferred Return[1]	$(6,802,050)
2. Net Market Value	831,483,648
3. a. Actuarial Value of Assets (Item 2 – Item 1)	838,285,698
b. Ratio of Actuarial Value of Assets to Market Value of Assets (Item 3a ÷ Item 2)	100.82%
4. Actuarial Value of Assets – Corridor Limits:	
a. Lower Limit – 70% of Net Market Value	$582,038,554
b. Upper Limit – 130% of Net Market Value	1,080,928,742
5. Actuarial Value of Assets (within corridor)	838,285,698
6. Non-valuation reserves and designations:	
a. Member and Retiree Non-Valuation Reserves	$0
b. Contingency Reserve, Limited to Not Less Than $0	0
c. Employee Benefit Enhancement	0
d. Employee COLA Contribution Relief	0
e. Unallocated Earnings	0
f. Fixed Asset Reserve	0
g. Retiree Health Insurance Premiums	0
h. Miscellaneous	0
i. Reserve for Capital Assets	3,074,569
j. Subtotal	$3,074,569
7. Valuation Value of Assets (Item 5 – Item 6j)	$835,211,129

Note: Results may not total exactly due to rounding.

[1] *The amounts of deferred return that will be recognized in each subsequent valuation are as follows:*

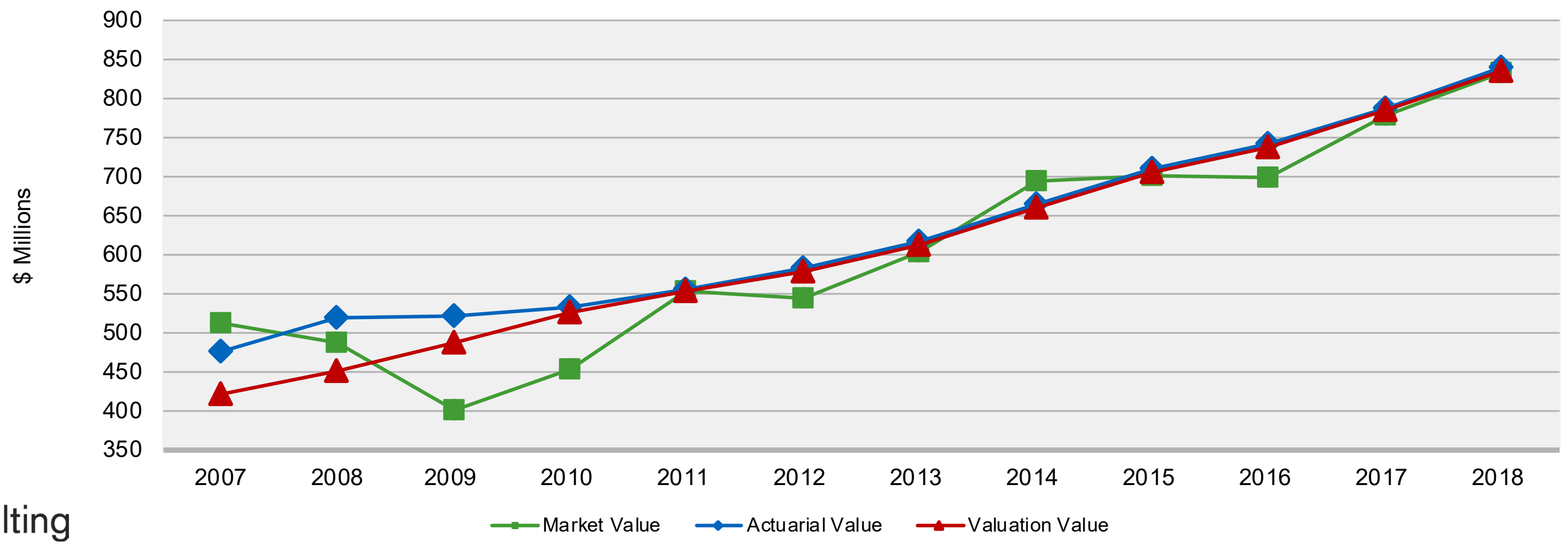
6/30/2019	$(11,030,366)
6/30/2020	(3,759,615)
6/30/2021	6,866,110
6/30/2022	3,460,818
6/30/2023	(2,338,997)

The market value, actuarial value, and valuation value of assets are representations of the ICERS' financial status. As investment gains and losses are gradually taken into account, the actuarial value of assets tracks the market value of assets, but with less volatility. The valuation value of assets is the actuarial value, excluding any non-valuation reserves. The valuation asset value is significant because ICERS' liabilities are compared to these assets to determine what portion, if any, remains unfunded. Amortization of the unfunded actuarial accrued liability is an important element in determining the contribution requirement.

This chart shows the change in market value, actuarial value and valuation value over the past twelve years.

CHART 8

Relative Values of Market Value, Actuarial Value and Valuation Value of Assets for Years Ended June 30, 2007 – 2018



C. ACTUARIAL EXPERIENCE

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

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

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

The total experience gain was $14.7 million, a $3.6 million gain from investments (after smoothing), a loss of $8.0 million from contribution experience and a $19.2 million gain from all other sources. The net experience variation from individual sources other than investments was 2.0% of the actuarial accrued liability. A discussion of the major components of the actuarial experience is provided on the following pages.

This chart provides a summary of the actuarial experience during the past year.

CHART 9

Actuarial Experience for Year Ended June 30, 2018

1.	Net gain from investments[1]	$3,602,000
2.	Net (loss) from contribution experience	(8,041,000)
3.	Net gain from other experience[2]	19,164,000
4.	Net experience gain: (1) + (2) + (3)	$14,725,000

[1] *Details in Chart 10.*

[2] *See Section 3, Exhibit H for further details. Does not include the effect of plan or assumption changes, if any.*

Investment Rate of Return
A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on ICERS' investment policy. For valuation purposes, the assumed rate of return on the valuation value of assets was 7.25% for the 2017/2018 plan year (based on the June 30, 2017 valuation). The actual rate of return on a valuation basis for the 2017/2018 plan year was 7.71%.

Since the actual return for the year was greater than the assumed return, ICERS experienced an actuarial gain on the valuation value of assets during the year ended June 30, 2018 with regard to its investments.

This chart shows the gain/(loss) due to investment experience.

CHART 10

Investment Experience for Year Ended June 30, 2018 – Market Value, Actuarial Value and Valuation Value of Assets

	Market Value	Actuarial Value	Valuation Value
1. Actual return	$61,159,489	$59,601,622	$60,114,051
2. Average value of assets	774,699,498	783,059,415	779,472,417
3. Actual rate of return: (1) ÷ (2)	7.89%	7.61%	7.71%
4. Assumed rate of return	7.25%	7.25%	7.25%
5. Expected return: (2) x (4)	56,165,714	56,771,808	56,511,750
6. Actuarial gain/(loss): (1) - (5)	$4,993,775	$2,829,814	$3,602,301

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

CHART 11

Investment Return – Market Value, Actuarial Value and Valuation Value: 2009 – 2018

	Market Value Investment Return		Actuarial Value Investment Return		Valuation Value Investment Return	
Year Ended June 30	**Amount**	**Percent**	**Amount**	**Percent**	**Amount**	**Percent**
2009	$(83,535,781)	(17.17%)	$5,767,623	1.12%	$35,048,007	7.76%
2010	52,247,233	13.04%	12,321,475	2.37%	38,043,434	7.82%
2011	102,867,409	22.82%	25,933,294	4.89%	29,730,509	5.68%
2012	(1,690,458)	(0.31%)	31,968,680	5.79%	31,399,883	5.72%
2013	61,035,244	11.24%	37,610,549	6.49%	37,380,401	6.49%
2014	93,940,703	15.64%	51,145,482	8.33%	50,662,571	8.30%
2015[1]	12,811,880	1.86%	50,202,263	7.59%	50,521,248	7.69%
2016	1,726,183	0.25%	36,242,034	5.13%	36,294,248	5.16%
2017	85,772,873	12.32%	51,597,137	6.98%	52,109,565	7.09%
2018	61,159,489	7.89%	59,601,622	7.61%	60,114,051	7.71%
Five-Year Average Return		7.43%		7.12%		7.18%
Ten-Year Average Return		6.20%		5.61%		6.94%

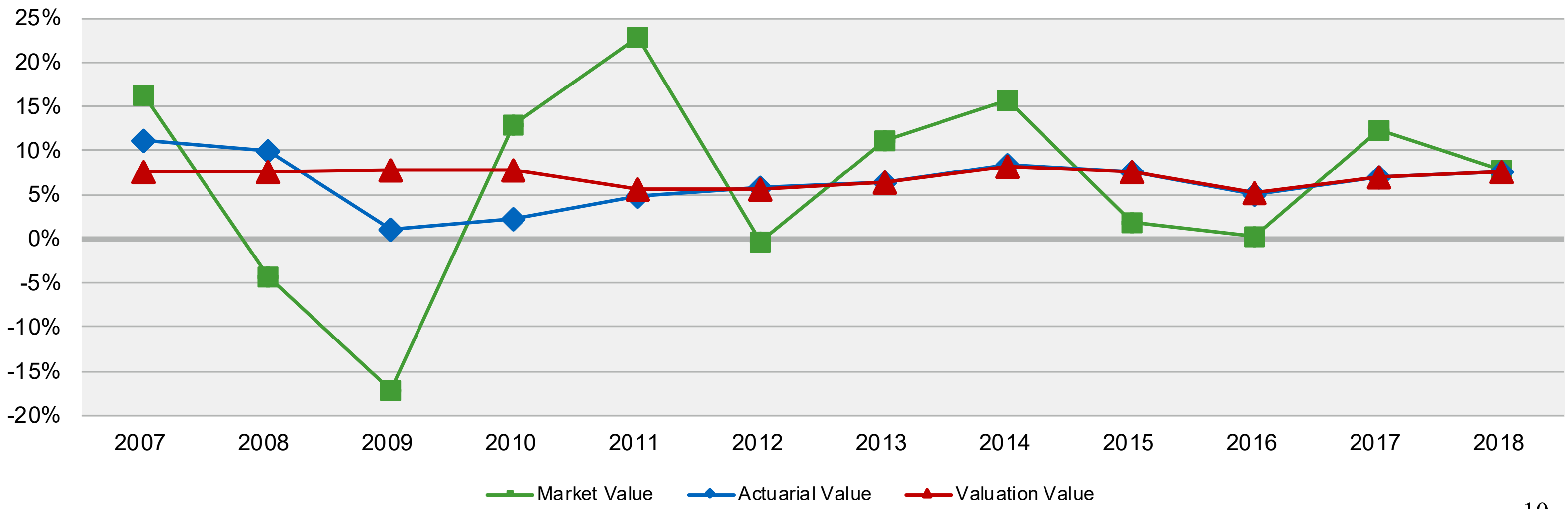
[1] *Starting with 2015, returns provide have been developed on a gross of administrative expense basis.*

Subsection B described the actuarial asset valuation method that gradually takes into account fluctuations in the market value rate of return. The effect of this is to stabilize the actuarial rate of return, which contributes to leveling pension plan costs.

This chart illustrates how this leveling effect has actually worked over the years 2007 - 2018.

CHART 12

Market, Actuarial and Valuation Rates of Return for Years Ended June 30, 2007 – 2018



Other Experience

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

- actual turnover among the participants,
- retirement experience (earlier or later than expected),
- mortality (more or fewer deaths than expected),
- the number of disability retirements,
- salary increases different than assumed, and
- COLA increases for retirees different than assumed.

The net gain from this other experience for the year ended June 30, 2018 amounted to $19.2 million which is 2.0% of the actuarial accrued liability. See Exhibit H for a detailed development of the unfunded actuarial accrued liability.

D. EMPLOYER AND MEMBER CONTRIBUTIONS

Employer contributions consist of two components:

Normal Cost

The annual contribution rate that, if paid annually from a member's first year of membership through the year of retirement, would accumulate to the amount necessary to fully fund the member's retirement-related benefits. Accumulation includes annual crediting of interest at the assumed investment earning rate. The contribution rate is expressed as a level percentage of the member's compensation.

Contribution to the Unfunded Actuarial Accrued Liability (UAAL)

The annual contribution rate that, if paid annually over the UAAL amortization period, would accumulate to the amount necessary to fully fund the UAAL. Accumulation includes annual crediting of interest at the assumed investment earning rate. The contribution (or rate credit in the case of a negative UAAL) is calculated to remain as a level percentage of future active member payroll (including payroll for new members as they enter the System) assuming a constant number of active members. In order to remain as a level percentage of payroll, amortization payments (credits) are scheduled to increase at the annual wage inflation rate of 3.50% (i.e., 3.00% price inflation plus 0.50% real across-the-board salary increase).

Effective with the June 30, 2013 valuation, the System's remaining outstanding balance of the June 30, 2012 UAAL associated with the Regular benefit is being amortized over a declining 19-year period (13 years remaining as of June 30, 2018). The Unfunded Actuarial Accrued Liability associated with the Supplemental UAAL relief for Safety members is amortized over a declining 19-year period (with 13 years remaining as of June 30, 2018). The change in UAAL that arises due to actuarial gains or losses at each valuation is amortized over a 15-year closed period. Any change in UAAL as a result of a change in actuarial assumptions or methods will be amortized over a 20-year closed period. Any change in UAAL that arises due to plan amendments will be amortized over a 15-year closed period and any change in UAAL due to temporary retirement incentive programs will be amortized over a 5-year closed period.

The recommended employer contributions are provided on Chart 13.

Member Contributions

General Legacy &
Safety Legacy Tiers

Articles 6 and 6.8 of the 1937 Act define the methodology to be used in the calculation of member basic contribution rates for General Legacy members and Safety Legacy members, respectively.

The basic contribution rate for the Regular benefit is determined so that the accumulation of a member's basic contributions made in a given year until a certain age will be sufficient to fund an annuity at that age that is equal to 1/120 of Final Average Salary for General and 1/100 of Final Average Salary for Safety. That age is 55 for all General and 50 for all Safety.

It is assumed that contributions are made annually at the same rate, starting at entry age. In addition to their basic contributions for the Regular benefit, members pay one-half of the total normal cost necessary to fund their cost-of-living Regular benefit. Accumulation includes semi-annual crediting of interest at the assumed investment earning rate.

Members pay the additional Normal Cost attributable to the difference between the Total (i.e., Regular plus Supplemental) and Regular benefits. In addition, members also pay for the cost of any unfunded actuarial accrued liability attributable to the difference between the Total and the Regular benefits.

The member contribution rates are provided in Appendix A.

General Tier 3 & Safety Tier 3

Pursuant to Section 7522.30(a) of the Government Code, General Tier 3 and Safety Tier 3 members are required to contribute at least 50% of the Normal Cost rate. In addition, there are certain additional requirements that would have to be met such as requiring the new employees to pay the contribution rate of "similarly situated employees", if it is greater (reference: Section 7522.30(c)). We further understand that different rules may have to be applied for collectively bargained employees, non-represented, managerial or other supervisory employees (reference: Section 7522.30(e)). In preparing the Normal Cost rates in this report, we have assumed that exactly 50% of the Normal Cost would be paid by the new members and we have taken into account in this valuation only the requirements of Section 7522.30(c), but not requirements of Section 7522.30(e).

Members also pay for the cost of any unfunded actuarial accrued liability (UAAL) for General Legacy and Safety Legacy Tiers attributable to the difference between the Total (i.e., Regular plus Supplemental) and the Regular benefits.

The results of this valuation reflect an agreement in effect for ten County bargaining units for the employer to pick up the Supplemental UAAL contributions for the Tier 3 members. According to a list provided by ICERS on November 20, 2018, these bargaining units are as follows: (1) Management, (2) Department Heads, (3) Confidential Professional, (4) Confidential Clerical, (5) Professional Employee Group (and Professional Employee Group Exceptions), (6) Technical (Teamster), (7) Crafts, Labor & Trades (Teamster), (8) Clerical (Teamster), (9) Working Supervisors, and (10) Board of Supervisors. Members who are not a part of the bargaining units that have reached this agreement (referenced in this valuation report as "Member Pays Supplemental UAAL") have a separate set of Tier 3 employer and member contribution rates that differ from the Tier 3 employer and member contribution rates for members belonging to the bargaining units that have reached this agreement (referenced in this valuation report as "Employer Picks Up Supplemental UAAL").

The member contribution rates are provided in Appendix B.

Administrative Expense

The Board adopted an explicit administrative expense assumption of 1.80% of payroll effective with the June 30, 2017 valuation.

The explicit administrative expense is allocated to both the employer and member based on the components of the total aggregate contribution rates as of June 30, 2018 before including administrative expenses. This results in an administrative expense load shown in the following table:

	Average Contribution Rates Before Administrative Expense	Weighting	Total Loading
Employer	20.61%	63.61%	1.14%
Member	11.79%	36.39%	0.66%
		100.00%	1.80%

Under this approach, the employer Normal Cost is then increased by the same percent of payroll as the member rate with the remaining employer loading allocated to the employer UAAL rate. The administrative expense load has been added to the Regular Basic rates. The table below shows this allocation.

Allocation of Administrative Expense Load as % of Payroll

Component	% of Payroll
Addition to Employer Regular Basic Normal Cost Rate	0.66%
Addition to Employer Regular Basic UAAL Rate	0.48%
Addition to Member Regular Basic Rate	0.66%
Total Addition to Contribution Rates	1.80%

CHART 13

Recommended Employer Contribution Rates (Dollar Amounts in Thousands)

	June 30, 2018[1]						June 30, 2017[2]	
	BASIC		COLA		TOTAL		TOTAL	
	Rate	Estimated Annual Amount[3]	Rate	Estimated Annual Amount[3]	Rate	Estimated Annual Amount[3]	Rate	Estimated Annual Amount[3]
General Legacy Members								
Normal Cost	12.76%	$8,780	1.83%	$1,260	14.59%	$10,040	14.66%	$10,088
UAAL	2.74%	1,885	4.13%	2,842	6.87%	4,727	7.43%	5,113
Total Contribution	15.50%	$10,665	5.96%	$4,102	21.46%	$14,767	22.09%	$15,201
General Tier 3 *(Member Pays Supplemental UAAL)*								
Normal Cost	7.81%	$395	1.53%	$78	9.34%	$473	9.32%	$472
UAAL	2.74%	139	4.13%	209	6.87%	348	7.43%	376
Total Contribution	10.55%	$534	5.66%	$287	16.21%	$821	16.75%	$848
General Tier 3 *(Employer Picks Up Supplemental UAAL)*								
Normal Cost	7.81%	$1,766	1.53%	$346	9.34%	$2,112	9.32%	$2,108
UAAL	3.10%	700	4.23%	957	7.33%	1,657	7.89%	1,784
Total Contribution	10.91%	$2,466	5.76%	$1,303	16.67%	$3,769	17.21%	$3,892
Safety Legacy Members[4]								
Normal Cost	18.58%	$3,204	3.09%	$533	21.67%	$3,737	21.73%	$3,747
UAAL[5]	3.26%	562	5.76%	993	9.02%	1,555	10.60%	1,828
Total Contribution	21.84%	$3,766	8.85%	$1,526	30.69%	$5,292	32.33%	$5,575
Safety Tier 3 *(Member Pays Supplemental UAAL)*								
Normal Cost	11.63%	$589	2.77%	$141	14.40%	$730	14.20%	$720
UAAL	3.26%	$165	5.76%	292	9.02%	457	10.60%	537
Total Contribution	14.89%	$754	8.53%	$433	23.42%	$1,187	24.80%	$1,257
Safety Tier 3 *(Employer Picks Up Supplemental UAAL)*								
Normal Cost	11.63%	$0	2.77%	$0	14.40%	$0	14.20%	$0
UAAL	6.42%	$0	6.85%	0	13.27%	0	14.73%	0
Total Contribution	18.05%	$0	9.62%	$0	27.67%	$0	28.93%	$0
All Categories Combined								
Normal Cost	12.40%	$14,734	1.99%	$2,358	14.39%	$17,092	14.42%	$17,135
UAAL	2.90%	3,451	4.46%	5,293	7.36%	8,744	8.11%	9,638
Total Contribution	15.30%	$18,185	6.45%	$7,651	21.75%	$25,836	22.53%	$26,773

CHART 13 (Continued)
Recommended Employer Contribution Rates (Dollar Amounts in Thousands)

(1) *The Basic Normal Cost and UAAL rates shown for each cost group as of June 30, 2018 include an explicit administrative expense of 0.66% and 0.48% of payroll, respectively.*

(2) *The Basic Normal Cost and UAAL rates shown for each cost group as of June 30, 2017 include an explicit administrative expense of 0.64% and 0.52% of payroll, respectively.*

(3) *Amounts are in thousands and are based on June 30, 2018 projected annual compensation (also in thousands). Starting with this year's valuation, the table below includes a breakdown of the Tier 3 payroll into two subcategories: Tier 3 members in bargaining units that require the members to pay Supplemental UAAL contributions, and Tier 3 members in bargaining units that require the employer to pick up the Supplemental UAAL contributions.*

	Legacy	Tier 3 *(Member Pays Supplemental UAAL)*	Tier 3 *(Employer Picks Up Supplemental UAAL)*	Total
General	$68,812	$5,063	$22,613	$96,488
Safety	$17,244	$5,068	$0	$22,312
Total	$86,056	$10,131	$22,613	$118,800

(4) *Includes pickup of member contributions of 0.02% Normal Cost and 0.02% UAAL associated with the Supplemental benefit for a member who has attained 30 years of service as of June 30, 2018. A similar adjustment has also been made to the Normal Cost for the Regular benefit.*

(5) *The UAAL Total Rate associated with the Safety Supplemental UAAL Relief is 1.06% as of June 30, 2018 and 1.01% as of June 30, 2017.*

The chart reconciles the employer contribution from the prior valuation to the amount determined in this valuation.

The employer contribution rates as of June 30, 2018 are based on all of the data described in the previous sections, the actuarial assumptions described in Section 4, and the Plan provisions adopted at the time of preparation of the Actuarial Valuation. They include all changes affecting future costs, adopted benefit changes, actuarial gains and losses, and changes in actuarial assumptions.

Reconciliation of Recommended Employer Contribution Rate

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

CHART 14

Reconciliation of Recommended Employer Contribution from June 30, 2017 to June 30, 2018

	Total Contribution Rate[1]
Recommended Contribution Rate as of June 30, 2017	22.53%
Effect of actuarial experience during 2017/2018:	
1. Effect of investment gain after smoothing	(0.32%)
2. Effect of actual contributions less than expected[2]	0.57%
3. Effect of salary increases less than expected	(1.12%)
4. Effect of amortizing prior year's UAAL over a smaller than expected change in total payroll	0.34%
5. Effect of retirement gain	(0.14%)
6. Effect of demographic changes on Normal Cost	(0.05%)
7. Effect of increase in the Supplemental UAAL contributions for Tier 3 members picked up by employer	0.00%
8. Effect of other net experience gains[3]	(0.06%)
Subtotal	(0.78%)
Recommended Contribution Rate as of June 30, 2018	21.75%

[1] *A reconciliation of recommended employer contribution rates by tier can be found in Appendix E.*

[2] *This is primarily due to the one-year lag in implementing the contribution rates recommended in the June 30, 2017 valuation.*

[3] *Other differences in actual versus expected experience include mortality, disability, and withdrawal experience, and a change in the allocation of administrative expenses.*

The chart reconciles the member contribution from the prior valuation to the amount determined in this valuation.

The member contribution rates as of June 30, 2018 are based on all of the data described in the previous sections, the actuarial assumptions described in Section 4, and the Plan provisions adopted at the time of preparation of the Actuarial Valuation. They include all changes affecting future costs, adopted benefit changes, actuarial gains and losses, and changes in actuarial assumptions.

Reconciliation of Recommended Member Contribution Rate

The chart below details the changes in the recommended member contribution rate from the prior valuation to the current year's valuation.

CHART 15

Reconciliation of Recommended Member Contribution from June 30, 2017 to June 30, 2018

	Total Contribution Rate[1]
Recommended Contribution Rate as of June 30, 2017[2]	12.55%
Effect of actuarial experience during 2017/2018:	
1. Effect of investment loss after smoothing[3]	0.05%
2. Effect of actual contributions less than expected[4]	0.02%
3. Effect of salary increases less than expected	(0.10%)
4. Effect of amortizing prior year's UAAL over a lower than expected increase in total payroll	0.05%
5. Effect of retirement loss	0.02%
6. Effect of demographic changes on Normal Cost	0.01%
7. Effect of other net experience losses[5]	0.01%
Subtotal	0.06%
Recommended Contribution Rate as of June 30, 2018[2]	12.61%

(1) *A reconciliation of recommended member contribution rates by tier can be found in Appendix E.*

(2) *The aggregate member rates are based on average entry age of 33 and 28 for General Legacy and Safety Legacy, respectively.*

(3) *Similar to prior valuations, the impact of investment experience is different in the rate reconciliation for the employer and the member due to such factors as actual versus estimated timing when contributions and benefits were paid during the year, rounding, etc.*

(4) *This is primarily due to the one-year lag in implementing the contribution rates recommended in the June 30, 2017 valuation.*

(5) *Other differences in actual versus expected experience include mortality, disability, and withdrawal experience, and a change in the allocation of administrative expenses.*

E. FUNDED RATIO

A critical piece of information regarding the Plan's financial status is the funded ratio. The ratios compare the valuation value of assets and the market value of assets to the actuarial accrued liabilities of the Plan as calculated. High ratios indicate a well-funded plan with assets sufficient to cover the plan's actuarial accrued liabilities. Lower ratios may indicate recent changes to benefit structures, funding of the plan below actuarial requirements, poor asset performance, or a variety of other factors. The chart below depicts a history of the funded ratios for this plan.

Chart 17 on the next page shows the Plan's schedule of funding progress for the last ten years.

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

CHART 16

Funded Ratio for Years Ending June 30, 2007 – 2018

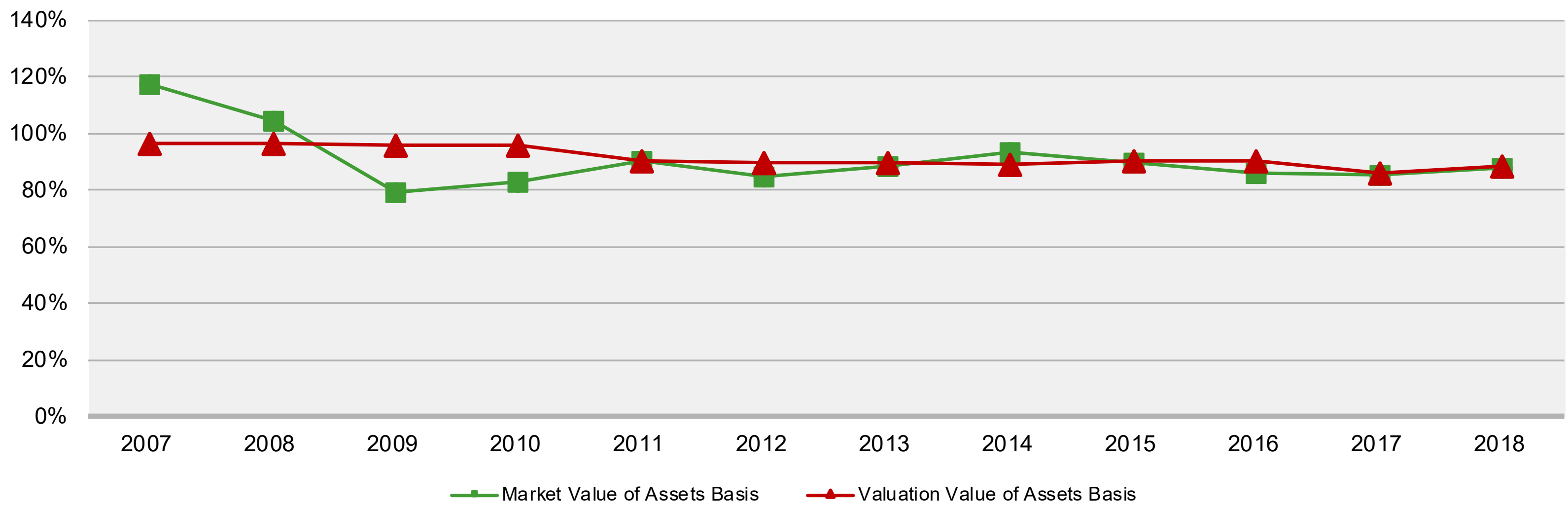


Chart 17

Schedule of Funding Progress (Dollar Amounts in Thousands)

Actuarial Valuation Date	Valuation Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded/ (Overfunded) AAL (UAAL) (b) - (a)	Funded Ratio (%) (a) / (b)	Projected Covered Payroll (c)	UAAL as a Percentage of Covered Payroll (%) [(b) - (a)] / (c)
6/30/2010	$524,522	$546,342	$21,820	96.0	$98,085	22.2
6/30/2011	552,209	613,584	61,375	90.0	101,610	60.4
6/30/2012	577,753	643,322	65,569	89.8	100,356	65.3
6/30/2013	611,989	684,303	72,314	89.4	102,548	70.5
6/30/2014	659,148	741,242	82,094	88.9	105,731	77.6
6/30/2015	704,758	782,840	78,082	90.0	112,465	69.4
6/30/2016	737,506	816,442	78,936	90.3	115,443	68.4
6/30/2017	783,848	910,321	126,473	86.1	119,934	105.5
6/30/2018	835,211	945,385	110,174	88.3	118,800	92.7

F. VOLATILITY RATIOS

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

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

For ICERS, the current AVR is about 7.0. This means that a 1% asset gain/(loss) (relative to the assumed investment return) translates to about 7.0% of one-year's payroll. Since ICERS amortizes actuarial gains and losses over a period of 15 years, there would be a 0.6% of payroll decrease/(increase) in the required contribution for each 1% asset gain/(loss).

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

The LVR also indicates how volatile contributions will be in response to changes in the Actuarial Accrued Liability due to actual experience or to changes in actuarial assumptions.

For ICERS, the current LVR is about 8.0. This is about 14.3% higher than the AVR. Therefore, we would expect that contribution volatility will increase over the long-term.

This chart shows how the asset and liability volatility ratios have varied over time.

CHART 18

Volatility Ratios for Years Ended June 30, 2009 – 2018

	Asset Volatility Ratios			Liability Volatility Ratios		
Year Ended June 30	**General**	**Safety**	**Total**	**General**	**Safety**	**Total**
2009	N/A	N/A	4.3	4.8	8.2	5.4
2010	N/A	N/A	4.6	5.0	8.1	5.6
2011	N/A	N/A	5.4	5.4	8.9	6.0
2012	4.9	7.9	5.4	5.7	9.5	6.4
2013	5.3	8.3	5.9	6.0	9.6	6.7
2014	5.9	9.3	6.6	6.3	10.3	7.0
2015	5.6	8.9	6.2	6.2	10.2	7.0
2016	5.4	8.8	6.1	6.3	10.6	7.1
2017	5.9	9.3	6.5	6.8	11.0	7.6
2018	6.3	10.0	7.0	7.1	11.5	8.0

EXHIBIT A

Table of Plan Coverage

i. General Legacy

Category	Year Ended June 30 2018[1]	2017[2]	Change From Prior Year
Active members in valuation			
Number	1,163	1,260	(7.7%)
Average age	47.0	46.3	0.7
Average service	14.5	13.6	0.9
Projected total compensation	$68,812,036	$73,415,474	(6.3%)
Projected average compensation	$59,168	$58,266	1.5%
Member account balances	$73,484,329	$71,800,053	2.3%
Vested terminated members[3]			
Number	321	312	2.9%
Average age	46.0	46.0	0.0
Retired members			
Number in pay status	717	670	7.0%
Average age	69.9	70.0	(0.1)
Average monthly benefit	$2,887	$2,853	1.2%
Disabled members			
Number in pay status	69	66	4.5%
Average age	66.5	66.8	(0.3)
Average monthly benefit	$1,739	$1,669	4.2%
Beneficiaries			
Number in pay status	146	141	3.5%
Average age	75.7	75.3	0.4
Average monthly benefit	$1,595	$1,527	4.5%

(1) *Includes 8 active members, 1 vested terminated member, 5 retired members, 2 disabled members, and 2 beneficiaries with service from both the General and Safety Legacy Tiers.*

(2) *Includes 7 active members, 2 vested terminated members, 3 retired members, 1 disabled member, and 2 beneficiaries with service from both the General and Safety Legacy Tiers.*

(3) *Includes terminated members due only a refund of member contributions.*

EXHIBIT A (Continued)

Table of Plan Coverage

ii. General Tier 3

Category	Year Ended June 30 2018[1]	Year Ended June 30 2017[2]	Change From Prior Year
Active members in valuation			
Number	654	581	12.6%
Average age	35.5	35.1	0.4
Average service	2.4	1.9	0.5
Projected total compensation	$27,675,625	$23,911,508	15.7%
Projected average compensation	$42,317	$41,156	2.8%
Member account balances	$5,609,466	$3,880,459	44.6%
Vested terminated members[3]			
Number	109	69	58.0%
Average age	35.9	37.1	(1.2)
Retired members			
Number in pay status	1	1	0.0%
Average age	69.2	68.2	1.0
Average monthly benefit	$955	$937	1.9%
Disabled members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Beneficiaries			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A

(1) *Includes 3 active members with service from both the General and Safety Tiers 3.*

(2) *Includes 3 active members with service from both the General and Safety Tiers 3.*

(3) *Includes terminated members due only a refund of member contributions.*

EXHIBIT A (Continued)

Table of Plan Coverage

iii. Safety Legacy

Category	Year Ended June 30 2018[1]	Year Ended June 30 2017[2]	Change From Prior Year
Active members in valuation			
Number	243	265	(8.3%)
Average age	41.5	41.1	0.4
Average service	13.4	12.9	0.5
Projected total compensation	$17,243,711	$18,673,078	(7.7%)
Projected average compensation	$70,962	$70,464	0.7%
Member account balances	$35,060,796	$34,515,607	1.6%
Vested terminated members[3]			
Number	60	62	(3.2%)
Average age	40.3	39.7	0.6
Retired members			
Number in pay status	160	149	7.4%
Average age	65.0	64.9	0.1
Average monthly benefit	$4,807	$4,746	1.3%
Disabled members			
Number in pay status	69	66	4.5%
Average age	59.9	59.9	0.0
Average monthly benefit	$2,882	$2,914	(1.1%)
Beneficiaries			
Number in pay status	31	28	10.7%
Average age	68.8	68.3	0.5
Average monthly benefit	$2,361	$2,372	(0.5%)

(1) *Includes 111 active members, 24 vested terminated members, 56 retired members, 21 disabled members and 7 beneficiaries with service from both the General and Safety Legacy Tiers.*

(2) *Includes 121 active members, 26 vested terminated members, 54 retired members, 19 disabled members and 7 beneficiaries with service from both the General and Safety Legacy Tiers.*

(3) *Includes terminated members due only a refund of member contributions.*

EXHIBIT A (Continued)

Table of Plan Coverage

iv. Safety Tier 3

Category	Year Ended June 30 2018[1]	2017[2]	Change From Prior Year
Active members in valuation			
Number	101	80	26.3%
Average age	29.9	29.1	0.8
Average service	2.3	2.0	0.3
Projected total compensation	$5,067,874	$3,934,178	28.8%
Projected average compensation	$50,177	$49,177	2.0%
Member account balances	$1,843,643	$1,187,286	55.3%
Vested terminated members[3]			
Number	10	8	25.0%
Average age	33.4	32.4	1.0
Retired members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Disabled members			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A
Beneficiaries			
Number in pay status	0	0	N/A
Average age	N/A	N/A	N/A
Average monthly benefit	N/A	N/A	N/A

(1) *Includes 25 active members and 3 vested terminated members with service from both General and Safety Tiers 3.*

(2) *Includes 21 active members and 1 vested terminated member with service from both General and Safety Tiers 3.*

(3) *Includes terminated members due only a refund of member contributions.*

EXHIBIT B

Members in Active Service as of June 30, 2018
By Age, Years of Service, and Average Compensation

i. General Legacy

		Years of Service								
Age	**Total**	**0-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40 & over**
Under 25	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
25 - 29	14	4	9	1	- -	- -	- -	- -	- -	- -
	$49,471	$45,121	$51,698	$46,825	- -	- -	- -	- -	- -	- -
30 - 34	102	4	72	25	1	- -	- -	- -	- -	- -
	50,776	45,378	50,764	52,056	$41,189	- -	- -	- -	- -	- -
35 - 39	202	5	68	103	26	- -	- -	- -	- -	- -
	56,345	51,211	55,388	57,483	55,325	- -	- -	- -	- -	- -
40 - 44	219	3	46	104	60	5	1	- -	- -	- -
	58,542	61,663	50,658	57,694	63,713	$61,190	$176,507	- -	- -	- -
45 - 49	174	- -	26	52	56	30	10	- -	- -	- -
	61,051	- -	58,606	52,299	61,743	74,875	67,563	- -	- -	- -
50 - 54	192	- -	26	42	53	33	30	7	1	- -
	60,343	- -	55,366	54,147	55,956	71,249	70,140	$52,959	$80,387	- -
55 - 59	139	1	18	33	35	22	22	6	2	- -
	63,445	153,316	50,081	59,564	52,481	65,357	82,833	93,484	70,261	- -
60 - 64	86	- -	11	24	21	11	11	3	3	2
	60,483	- -	59,975	48,940	57,334	67,701	80,113	83,272	52,224	$65,408
65 - 69	29	- -	2	13	8	2	3	1	- -	- -
	72,082	- -	33,079	55,129	79,636	50,788	145,681	131,823	- -	- -
70 & over	6	- -	1	1	1	1	1	1	- -	- -
	69,758	- -	67,064	42,788	75,698	82,484	132,711	17,807	- -	- -
Total	1,163	17	279	398	261	104	78	18	6	2
	$59,168	$56,256	$53,314	$55,685	$59,308	$69,904	$79,867	$73,948	$62,930	$65,408

EXHIBIT B (Continued)

Members in Active Service as of June 30, 2018
By Age, Years of Service, and Average Compensation

ii. General Tier 3

		Years of Service								
Age	**Total**	**0-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40 & over**
Under 25	42	42	- -	- -	- -	- -	- -	- -	- -	- -
	$32,951	$32,951	- -	- -	- -	- -	- -	- -	- -	- -
25 - 29	165	164	1	- -	- -	- -	- -	- -	- -	- -
	38,272	38,171	$54,875	- -	- -	- -	- -	- -	- -	- -
30 - 34	170	161	9	- -	- -	- -	- -	- -	- -	- -
	43,945	43,425	53,240	- -	- -	- -	- -	- -	- -	- -
35 - 39	125	119	6	- -	- -	- -	- -	- -	- -	- -
	43,807	43,371	52,451	- -	- -	- -	- -	- -	- -	- -
40 - 44	54	50	4	- -	- -	- -	- -	- -	- -	- -
	46,798	45,039	68,796	- -	- -	- -	- -	- -	- -	- -
45 - 49	33	31	2	- -	- -	- -	- -	- -	- -	- -
	43,105	41,545	67,277	- -	- -	- -	- -	- -	- -	- -
50 - 54	34	32	2	- -	- -	- -	- -	- -	- -	- -
	47,167	46,525	57,435	- -	- -	- -	- -	- -	- -	- -
55 - 59	17	17	- -	- -	- -	- -	- -	- -	- -	- -
	46,872	46,872	- -	- -	- -	- -	- -	- -	- -	- -
60 - 64	11	10	1	- -	- -	- -	- -	- -	- -	- -
	42,678	41,499	54,471	- -	- -	- -	- -	- -	- -	- -
65 - 69	3	3	- -	- -	- -	- -	- -	- -	- -	- -
	70,260	70,260	- -	- -	- -	- -	- -	- -	- -	- -
70 & over	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Total	654	629	25	- -	- -	- -	- -	- -	- -	- -
	$42,317	$41,729	$57,113	- -	- -	- -	- -	- -	- -	- -

EXHIBIT B (Continued)

Members in Active Service as of June 30, 2018
By Age, Years of Service, and Average Compensation

iii. Safety Legacy

		Years of Service								
Age	Total	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
25 - 29	14	1	12	1	- -	- -	- -	- -	- -	- -
	$58,093	$63,505	$57,858	$55,497	- -	- -	- -	- -	- -	- -
30 - 34	42	- -	21	21	- -	- -	- -	- -	- -	- -
	66,226	- -	65,296	67,156	- -	- -	- -	- -	- -	- -
35 - 39	53	2	13	31	7	- -	- -	- -	- -	- -
	70,431	72,652	64,449	70,671	$79,841	- -	- -	- -	- -	- -
40 - 44	63	4	11	16	29	3	- -	- -	- -	- -
	69,748	67,433	66,878	69,906	70,070	$79,400	- -	- -	- -	- -
45 - 49	37	- -	1	6	17	10	3	- -	- -	- -
	76,499	- -	85,100	73,606	71,844	80,735	$91,676	- -	- -	- -
50 - 54	17	- -	2	1	3	8	3	- -	- -	- -
	71,003	- -	83,648	58,509	64,531	67,106	83,601	- -	- -	- -
55 - 59	10	- -	- -	1	3	4	1	1	- -	- -
	76,723	- -	- -	64,291	91,754	64,922	99,111	$68,881	- -	- -
60 - 64	4	- -	1	2	- -	- -	1	- -	- -	- -
	83,380	- -	69,617	96,550	- -	- -	70,803	- -	- -	- -
65 - 69	2	1	- -	1	- -	- -	- -	- -	- -	- -
	162,688	153,936	- -	171,440	- -	- -	- -	- -	- -	- -
70 & over	1	- -	- -	1	- -	- -	- -	- -	- -	- -
	58,320	- -	- -	58,320	- -	- -	- -	- -	- -	- -
Total	243	8	61	81	59	25	8	1	- -	- -
	$70,962	$79,060	$64,935	$71,140	$72,562	$73,683	$86,968	$68,881	- -	- -

EXHIBIT B (Continued)

Members in Active Service as of June 30, 2018
By Age, Years of Service, and Average Compensation

iv. Safety Tier 3

		Years of Service								
Age	**Total**	**0-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40 & over**
Under 25	10	10	- -	- -	- -	- -	- -	- -	- -	- -
	$44,619	$44,619	- -	- -	- -	- -	- -	- -	- -	- -
25 - 29	48	44	4	- -	- -	- -	- -	- -	- -	- -
	48,362	47,880	$53,657	- -	- -	- -	- -	- -	- -	- -
30 - 34	32	28	4	- -	- -	- -	- -	- -	- -	- -
	54,261	53,255	61,304	- -	- -	- -	- -	- -	- -	- -
35 - 39	10	10	- -	- -	- -	- -	- -	- -	- -	- -
	52,103	52,103	- -	- -	- -	- -	- -	- -	- -	- -
40 - 44	1	1	- -	- -	- -	- -	- -	- -	- -	- -
	42,946	42,946	- -	- -	- -	- -	- -	- -	- -	- -
45 - 49	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
50 - 54	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
55 - 59	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
60 - 64	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
65 - 69	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
70 & over	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Total	101	93	8	- -	- -	- -	- -	- -	- -	- -
	$50,177	$49,549	$57,481	- -	- -	- -	- -	- -	- -	- -

EXHIBIT C

Reconciliation of Member Data – June 30, 2017 to June 30, 2018

	Active Members	Vested Terminated Members	Pensioners	Disableds	Beneficiaries	Total
Number as of June 30, 2017	2,186	451	820	132	169	3,758
New members	173	8	0	0	0	181
Terminations – with vested rights	(82)	82	0	0	0	0
Contribution refunds	(55)	(16)	0	0	0	(71)
Retirements	(60)	(14)	74	0	0	0
New disabilities	(6)	(1)	(2)	9	0	0
Return to work	9	(9)	0	0	0	0
Died with or without beneficiary	(4)	(1)	(13)	(3)	9[1]	(12)
Data adjustments	0	0	(1)	0	(1)	(2)
Number as of June 30, 2018	2,161	500	878	138	177	3,854

(1) *This is the net increase in the number of beneficiaries after subtracting the number of beneficiaries who died during the year.*

EXHIBIT D

Summary Statement of Income and Expenses on an Actuarial Value Basis

	Year Ended June 30,			
	2018		2017	
Contribution income:				
Employer contributions	$21,014,523		$21,009,400	
Member contributions	13,405,766		13,299,670	
Contribution income		$34,420,289		$34,309,070
Investment income:				
Interest, dividends and other income	$7,700,934		$8,440,819	
Adjustment toward market value	55,101,213		45,922,652	
Less investment fees	(3,200,525)		(2,766,334)	
Net investment income		$59,601,622		$51,597,137
Total income available for benefits		$94,021,911		$85,906,207
Less benefit payments:				
Service retirement	$(39,951,343)		$(36,525,724)	
Death payments	(88,750)		(174,310)	
Member refunds	(906,659)		(934,947)	
Benefit payments		$(40,946,752)		$(37,634,981)
Less administrative expenses		(2,224,214)		(2,441,608)
Change in reserve for future benefits		$50,850,945		$45,829,617

Note: Results may not total properly due to rounding.

EXHIBIT E
Summary Statement of Assets

	Year Ended June 30,			
	2018		2017	
Cash equivalents		$5,083,669		$4,501,046
Accounts receivable:				
Contributions	$1,112,595		$1,054,433	
Interest and dividends	663,326		567,943	
Receivables – sale of investments	8,585,517		1,104,270	
Others	69,485		1,559,086	
Total accounts receivable		$10,430,923		$4,285,732
Capital Assets		$3,074,569		$3,586,998
Investments:				
Fixed income	220,843,540		$226,745,952	
Equities	475,409,205		458,737,630	
Alternative	41,611,794		19,717,404	
Real estate	76,495,528		65,424,407	
Total investments at market value		$814,360,067		$770,625,393
Total assets		$832,949,228		$782,999,169
Less accounts payable:				
Investment payables	(1,406,579)		$(2,294,388)	
Forward currency contract	0		(1,569,753)	
Account payable – other	(59,001)		(60,192)	
Total accounts payable		$(1,465,580)		$(3,924,333)
Net assets at market value		$831,483,648		$779,074,836
Net assets at actuarial value		$838,285,698		$787,434,753
Net assets at valuation value		$835,211,129		$783,847,755

Note: Results may not total properly due to rounding.

EXHIBIT F

Actuarial Balance Sheet

An overview of the Plan's funding is given by an Actuarial Balance Sheet. In this approach, we first determine the amount and timing of all future payments that will be made by the Plan for current participants. We then discount these payments at the valuation interest rate to the date of the valuation, thereby determining their present value. We refer to this present value as the "liability" of the Plan.

Second, we determine how this liability will be met. These actuarial "assets" include the net amount of assets already accumulated by the Plan, the present value of future member contributions, the present value of future employer normal cost contributions, and the present value of future employer payments to amortize the UAAL.

Assets	Regular & Tier 3 ($000)	Supplemental ($000)	Total ($000)
1. Total valuation assets	$758,497	$76,714	$835,211
2. Present value of future contributions by members			
a. entry age normal cost	108,486	21,158	129,644
b unfunded actuarial accrued liability	0	15,325	15,325
3. Present value of future employer contributions for:			
a. entry age normal cost	128,184	0(1)	128,184
b unfunded actuarial accrued liability	92,438	2,411(1)	94,849
4. Total current and future assets	$1,087,605	$115,608	1,203,213
Liabilities			
5. Present value of benefits already granted	$454,131	$48,489	$502,620
6. Present value of benefits to be granted	633,474	67,119	700,593
7. Total liabilities	$1,087,605	$115,608	$1,203,213

(1) *Before taking into consideration employer pickup of member contributions after Safety Legacy members have attained 30 years of service.*

EXHIBIT G

Summary of Reported Asset Information as of June 30, 2018

	Regular & Tier 3 Reserves	Supplemental Reserves	Total Reserves
Included in Valuation Value of Assets			
Members' deposit reserves	$129,706,553	$36,630,792	$166,337,345
Employer's advance reserves	327,143,767	8,464,710	335,608,477
Service pension reserves (members' contributions)	99,065,442	5,953,972	105,019,414
Service pension reserves (employer's contributions)	243,986,710	29,295,855	273,282,565
Disability pension reserves (members' contributions)	3,775,787	996,993	4,772,780
Disability pension reserves (employer's contributions)	21,301,041	2,054,789	23,355,830
Survivors' death benefit reserve	6,131,848	176,854	6,308,702
Death benefit reserve	2,754,396	0	2,754,396
Total before transfer	$833,865,544	$83,573,965	$917,439,509
Excluded from Valuation Value of Assets			
Member and retiree non-valuation reserves			$0
Contingency reserve[1]			(82,228,380)
Employee benefit enhancement			0
Employee COLA contribution relief			0
Unallocated earnings			0
Fixed asset reserve			0
Retiree health insurance premiums			0
Market stabilization reserve			(6,802,050)
Reserve for Capital Assets			3,074,569
Miscellaneous			0
Total			(85,955,861)
Grand Total			$831,483,648

[1] *If Contingency Reserve is negative, it is applied as an offset that reduces value of the reserves that are included in the Valuation Value of Assets used in the valuation.*

EXHIBIT H

Development of Unfunded Actuarial Accrued Liability as of June 30, 2018

			(Dollar amounts in Thousands)
1	Expected unfunded actuarial liability:		
	a. Unfunded actuarial accrued liability at beginning of year		$126,473
	b. Total Normal Cost payable at middle of year[1]		29,651
	c. Expected administrative expenses		2,159
	d. Expected employer and member contributions		(42,173)
	e. Interest		8,789
	f. Expected unfunded actuarial accrued liability at end of year: (1a) + (1b) + (1c) + (1d) + (1e)		$124,899
2	Changes due to:		
	a. Gain from investment return after smoothing	$(3,602)	
	b. Loss from actual contributions less than expected[2]	8,041	
	c. Gain from salary increases less than expected	(16,878)	
	d. Gain from actual retirement experience	(1,788)	
	e. Other net experience gains[3]	(498)	
	f. Total changes	$(14,725)	
3	Actual unfunded actuarial accrued liability at end of year (1f) + (2f)		$110,174

Note: The "Net gain from other experience" of $19,164,000 shown in Section 2, Chart 9 is equal to the sum of items (2c) through (2e).

(1) *Excludes administrative expense load.*

(2) *This is primarily due to the one-year lag in implementing the contribution rates recommended in the June 30, 2017 valuation.*

(3) *Other differences in actual versus expected experience include mortality, disability, and withdrawal experience.*

EXHIBIT I

Section 415 Limitations

Section 415 of the Internal Revenue Code (IRC) specifies the maximum benefits that may be paid to an individual from a defined benefit plan and the maximum amounts that may be allocated each year to an individual's account in a defined contribution plan.

A qualified pension plan may not pay benefits in excess of the Section 415 limits. The ultimate penalty for non-compliance is disqualification: active participants could be taxed on their vested benefits and the IRS may seek to tax the income earned on the plan's assets.

In particular, Section 415(b) of the IRC limits the maximum annual benefit payable at the Normal Retirement Age to a dollar indexed for inflation. That limit is $220,000 for 2018 and $225,000 for 2019. Normal Retirement Age for these purposes is age 62. These are the limits in simplified terms. They must generally be adjusted based on each participant's circumstances, for such things as age at retirement, form of benefits chosen and after tax contributions.

For members in the Legacy tiers, benefits in excess of the limits may be paid through a qualified governmental excess plan that meets the requirements of Section 415(m).

Legal Counsel's review and interpretation of the law and regulations should be sought on any questions in this regard.

Contributions rates determined in this valuation have not been reduced for the Section 415 limitations. Actual limitations will result in gains as they occur.

EXHIBIT J

Definitions of Pension Terms

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

Assumptions or Actuarial Assumptions: The estimates on which the cost of the Plan is calculated including:

(a) Investment return — the rate of investment yield that the Plan is anticipated to earn over the long-term future;

(b) Mortality rates — the death rates of employees and pensioners; life expectancy is based on these rates;

(c) Retirement rates — the rate or probability of retirement at a given age; and

(d) Turnover rates — the rates at which employees of various ages and years of service are expected to leave employment for reasons other than death, disability, or retirement.

Normal Cost: The amount of contributions required to fund the cost allocated to the current year of service, determined as a level percent of payroll over the employee’s career.

Actuarial Accrued Liability For Actives: The equivalent of the accumulated normal costs allocated to the years before the valuation date.

Actuarial Accrued Liability For Pensioners: The single sum value of lifetime benefits to existing pensioners. This sum takes account of life expectancies appropriate to the ages of the pensioners and the interest that the sum is expected to earn before it is entirely paid out in benefits.

Unfunded (Overfunded) Actuarial Accrued Liability: The extent to which the actuarial accrued liability of the Plan exceeds (or is exceeded by) the assets of the Plan. There are many approaches to paying off the unfunded or overfunded actuarial accrued liability, from meeting the interest accrual only to amortizing it over a specific period of time.

EXHIBIT J (Continued)

Definitions of Pension Terms

Amortization of the Unfunded (Overfunded) Actuarial Accrued Liability: Payments made over a period of years equal in value to the Plan's unfunded or overfunded actuarial accrued liability.

Rate of Investment Return: The rate of earnings of the Plan from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next.

Payroll or Compensation: Compensation Earnable and Pensionable Compensation expected to be paid to active members during the twelve months following the valuation date. Only Compensation Earnable and Pensionable Compensation that would possibly go into the determination of retirement benefits are included.

EXHIBIT I

Summary of Actuarial Valuation Results

The valuation was made with respect to the following data supplied to us:			
1.	Retired members as of the valuation date (including 177 beneficiaries in pay status)		1,193
2.	Members inactive during year ended June 30, 2018 with vested rights[1]		500
3.	Members active during the year ended June 30, 2018		2,161

The actuarial factors as of the valuation date are as follows (amounts in thousands):			
1.	Normal cost[2]		$30,484
2.	Present value of future benefits		1,203,213
3.	Present value of future normal costs		257,828
4.	Actuarial accrued liability		945,385
	Retired members and beneficiaries	$502,620	
	Inactive members with vested rights[1]	36,238	
	Active members	406,527	
5.	Valuation value of assets		835,211
6.	Unfunded actuarial accrued liability		$110,174

(1) *Includes terminated members due a refund of member contributions.*

(2) *Includes administrative expense load.*

EXHIBIT I (Continued)

Summary of Actuarial Valuation Results (Dollar Amounts in Thousands)

The determination of the required contribution is as follows:	Dollar Amount[1]	% of Payroll
1. Total normal cost	$30,484	25.66%[2]
2. Expected member normal cost contributions	13,392	11.27%[3]
3. Employer normal cost: (1) - (2)	$17,092	14.39%
4. Amortization of total unfunded actuarial accrued liability	$10,152	8.55%
5. Amortization of unfunded actuarial accrued liability paid by member	1,408	1.19%[3]
6. Amortization of unfunded actuarial accrued liability paid by employer: (4) - (5)	$8,744	7.36%
7. Total required employer contribution: (3) + (6)	$25,836	21.75%

(1) *Based on June 30, 2018 projected annual compensation.*

(2) *The Total Normal Cost for each tier is follows:*

General Legacy	*24.73%*
General Tier 3	*18.68%*
Safety Legacy	*39.65%*
Safety Tier 3	*28.80%*

(3) *This is the aggregate member contribution rate based on summing the contributions for each member.*

Note: Both Total Normal Cost and Total UAAL rates include an explicit administrative expense load.

EXHIBIT II

Actuarial Assumptions and Methods

Rationale for Assumptions:	The information and analysis used in selecting each assumption that has a significant effect on this actuarial valuation is shown in the July 1, 2013 through June 30, 2016 Actuarial Experience Study dated April 27, 2017. Unless otherwise noted, all actuarial assumptions and methods shown below apply to all members. These assumptions have been adopted by the Board.
<u>Economic Assumptions</u>	
Net Investment Return:	7.25%, net of investment expenses.
Administrative Expenses:	1.80% of payroll, 1.14% allocated to the employers and 0.66% allocated to the members based on the components of the total aggregate contribution rate (before expenses) for the employer and member.
Employer Contribution Crediting Rate:	3.00%
Consumer Price Index:	Increase of 3.00% per year, retiree COLA increases due to CPI subject to a 2.00% maximum change per year for all General and Safety.
Future Growth in the Tier 3 Wage Cap:	3.00%

Individual Salary Increases:

Annual Rate of Compensation Increase

Inflation: 3.00% per year, plus “across the board” real salary increases of 0.50% per year, plus the following merit and promotional increases based on service.

Years of Service	General	Safety
Less than 1	4.75%	8.00%
1	4.50	6.25
2	4.25	5.50
3	4.00	5.50
4	3.50	4.00
5	3.25	3.50
6	3.00	3.25
7	2.75	3.25
8	2.75	3.25
9	2.75	3.25
10	2.50	2.50
11	2.25	2.00
12	2.00	1.50
13	1.75	1.50
14	1.50	1.50
15 or more	1.25	1.25

Demographic Assumptions

Mortality Rates:

Post-Retirement Healthy (General and Safety):	Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table projected 20 years with the two-dimensional MP-2016 projection scale, set forward one year
Post-Retirement Disabled (General and Safety):	Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table projected 20 years with the two-dimensional MP-2016 projection scale, set forward 7 years for males and 5 years for females
Pre-Retirement (General and Safety):	Headcount-Weighted RP-2014 Employee Mortality Table projected 20 years with the two-dimensional MP-2016 projection scale
Member Contribution Rates:	For General Legacy Members: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table projected 20 years with the two-dimensional MP-2016 projection scale, set forward one year, weighted 30% male and 70% female
	For Safety Legacy Members: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table projected 20 years with the two-dimensional MP-2016 projection scale, set forward one year, weighted 80% male and 20% female

The above mortality tables contain about a 20% margin, based on actual to expected deaths, to reflect future mortality improvement, based on a review of mortality experience as of the measurement date.

Termination Rates Before Retirement:

	Rate (%) Mortality[1]			
	General[2]		Safety[3]	
Age	Male	Female	Male	Female
25	0.05	0.02	0.05	0.02
30	0.05	0.02	0.05	0.02
35	0.06	0.03	0.06	0.03
40	0.07	0.04	0.07	0.04
45	0.10	0.07	0.10	0.07
50	0.17	0.12	0.17	0.12
55	0.28	0.18	0.28	0.18
60	0.47	0.26	0.47	0.26
65	0.83	0.38	0.83	0.38

(1) *Based on the Headcount-weighted RP-2014 Employee Mortality Table, projected 20 years with the two-dimensional MP-2016 projection scale.*

(2) *All pre-retirement deaths are assumed to be non-service connected.*

(3) *50% of pre-retirement deaths are assumed to be non-service connected and the remaining 50% are assumed to be service connected.*

Termination Rates Before Retirement (Continued):

	Rate (%) Disability		
Age	General[1]		Safety[2]
	Male	Female	Male and Female
20	0.000	0.000	0.020
25	0.006	0.006	0.038
30	0.010	0.022	0.230
35	0.016	0.054	0.500
40	0.050	0.088	0.780
45	0.088	0.130	1.110
50	0.142	0.180	2.000
55	0.236	0.260	2.500
60	0.310	0.420	2.500
65	0.132	0.200	1.000

(1) *60% of General disabilities are assumed to be service-connected disabilities. The remaining 40% are assumed to be non-service connected disabilities.*

(2) *100% of Safety disabilities are assumed to be service-connected disabilities.*

Termination Rates Before Retirement (Continued):

Rate (%) Termination (< 5 Years of Service)		
Years of Service	General	Safety
0	18.50	10.00
1	9.00	9.00
2	7.50	8.00
3	6.50	6.00
4	6.50	6.00

Rate (%) Termination (5+ Years of Service)[(1)]		
Age	General	Safety
20	6.00	5.50
25	6.00	5.20
30	5.40	4.10
35	4.40	3.05
40	3.70	2.30
45	3.20	1.70
50	3.00	0.60
55	3.00	0.00
60	2.40	0.00

Proportion of Total Termination Assumed to Receive Refunds and Deferred Vested Benefit (%)		
Years of Service	Refunds	Deferred Vested Benefits
0-4	100.00	0.00
5-9	45.00	55.00
10-14	40.00	60.00
15-19	30.00	70.00
20 or more	0.00	100.00

(1) *No termination is assumed after a member is eligible for retirement.*

Retirement Rates:

	Rate (%)			
Age	**General Legacy**	**General Tier 3**	**Safety Legacy**	**Safety Tier 3**
46	0.00	0.00	0.00	0.00
47	0.00	0.00	0.00	0.00
48	0.00	0.00	0.00	0.00
49	0.00	0.00	3.00	0.00
50	2.00	0.00	9.00	8.00
51	2.00	0.00	18.00	7.00
52	3.00	3.00	18.00	11.00
53	3.00	2.00	15.00	12.00
54	5.00	3.00	15.00	12.00
55	6.00	4.00	17.00	14.00
56	7.00	5.50	17.00	14.00
57	9.00	7.50	25.00	14.00
58	11.00	7.50	25.00	10.00
59	13.00	9.50	25.00	10.00
60	15.00	11.00	40.00	40.00
61	17.00	11.00	40.00	40.00
62	20.00	15.00	40.00	40.00
63	25.00	20.00	40.00	40.00
64	30.00	21.00	40.00	40.00
65	30.00	26.00	50.00	50.00
66	30.00	28.00	50.00	50.00
67	30.00	30.00	50.00	50.00
68	40.00	40.00	50.00	50.00
69	40.00	40.00	50.00	50.00
70	40.00	40.00	100.00	100.00
71	40.00	40.00	100.00	100.00
72	40.00	40.00	100.00	100.00
73	40.00	40.00	100.00	100.00
74	40.00	40.00	100.00	100.00
75	100.00	100.00	100.00	100.00

Retirement Age and Benefit for Deferred Vested Members: For current and future deferred vested members, retirement age assumptions are as follows:

General:	Age 58
Safety:	Age 54

For current deferred non-reciprocal members who terminated with less than five years of service and left their contributions on deposit, we assume that they will retire at age 70 for General and at age 60 for Safety. We assume that 65% of future General and 75% of future Safety deferred vested members will continue to work for a reciprocal employer. For reciprocal members, projected salary is calculated based on the salary increase assumption.

Future Benefit Accruals: 1.0 year of service per year of employment.

Terminal Pay Conversions: The following assumptions for terminal pay due to conversion of unused vacation and holiday compensation time as a percentage of final average pay are used:

General Legacy:	5.0%
Safety Legacy:	6.0%
Tier 3	None

Sick Leave Conversion: Conversion of 22 hours for General (36 hours for Safety) for each year of service.

Unknown Data for Members: Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.

Inclusion of Deferred Vested Members: All deferred vested members are included in the valuation.

Percent Married: 80% of male members; 60% of female members.

Age of Spouse: Male members are 3 years older than their spouse and female members are 2 years younger than their spouse.

Actuarial Methods	
Actuarial Cost Method:	Entry Age Actuarial Cost Method. Entry Age equals attained age less years of service. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis and are based on costs allocated as a level percentage of compensation, as if the current benefit formulas have always been in effect (i.e., "replacement life within each tier").
Actuarial Value of Assets:	The Actuarial Value of Assets is determined by phasing in any difference between actual and expected market return over 5 years or 10 six-month interest crediting periods. The Actuarial Value of Assets is further adjusted, if necessary, to be within 30% of the Market Value of Assets.
Valuation Value of Assets:	The Actuarial Value of Assets reduced by the value of the non-valuation reserves.
Amortization of Unfunded Actuarial Accrued Liability (Regular Legacy &Tier 3 Benefits):	The Unfunded Actuarial Accrued Liability associated with the Regular Legacy Benefit as of June 30, 2012 is amortized over a declining 19-year period (with 13 years remaining as of June 30, 2018). Any new UAAL emerging after June 30, 2012 that arises due to actuarial gains or losses will be amortized over a 15-year closed period. Any change in UAAL as a result of a change in actuarial assumptions or methods will be amortized over a 20-year closed period. Any change in UAAL that arises due to plan amendments will be amortized over a 15-year closed period and any change in UAAL due to temporary retirement incentive programs will be amortized over a 5-year closed period. If ICERS becomes overfunded, such surplus and any subsequent surpluses will be amortized over an open amortization period of 30 years.
Amortization of Unfunded Actuarial Accrued Liability (Safety Supplemental Benefit):	The Unfunded Actuarial Accrued Liability associated with the Supplemental UAAL relief for Safety members is amortized over a declining 19-year period (with 13 years remaining as of June 30, 2018).
Changes in Actuarial Assumptions:	The assumptions that changed from the previous valuation are as follows:
Administrative Expenses:	1.80% of payroll, 1.16% allocated to the employers and 0.64% allocated to the members based on the components of the total aggregate contribution rate (before expenses) for the employer and member.

EXHIBIT III

Summary of Plan Provisions

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

Membership Eligibility:	
	Membership with ICERS usually begins with the first day of the pay period following the date of appointment to a full-time position of at least 30 hours per week.
General	All General members terminated before July 1, 2005 will receive the General Regular Benefit. All General members terminated on or after July 1, 2005 with membership dates prior to January 1, 2013 will receive the Regular plus Supplemental Benefit. All other General members will receive the CalPEPRA Benefit (Tier 3).
Safety	All Safety members with membership dates prior to January 1, 2013 will receive the Regular plus Supplemental Benefit. All other Safety members will receive the CalPEPRA Benefit (Tier 3).
Final Compensation for Benefit Determination:	
General Legacy & Safety Legacy	Highest consecutive 12 months of compensation earnable (§31462.1) (FAS1).
Tier 3	Highest consecutive 36 months of pensionable compensation (§7522.32) (FAS3).
Service:	Years of service (Yrs).

Service Retirement Eligibility:

General Legacy	Age 50 with 10 years of service, or after 30 years, regardless of age or age 70 regardless of service (§31672).
General Tier 3	Age 52 with 5 years of service (§7522.20(a)).
Safety Legacy	Age 50 with 10 years of service, or after 20 years, regardless of age or age 60 regardless of service (§31663.25).
Safety Tier 3	Age 50 with 5 years of service (§7522.25(d)).

Benefit Formula:

	Retirement Age	Benefit Formula
General Regular (§31676.11)	50	1.24% x FAS1 x Years of Service
	55	1.67% x FAS1 x Years of Service
	60	2.18% x FAS1 x Years of Service
	65 or later	2.61% x FAS1 x Years of Service

	Retirement Age	Benefit Formula
General Regular Plus Supplemental	50	1.48% x FAS1 x Years of Service
(§31676.14)	55	1.95% x FAS1 x Years of Service
	60	2.44% x FAS1 x Years of Service
	65 or later	2.61% x FAS1 x Years of Service

	Retirement Age	Benefit Formula
General Tier 3(§7522.20(a))	52	1.00% x FAS3 x Years of Service
	55	1.30% x FAS3 x Years of Service
	60	1.80% x FAS3 x Years of Service
	62	2.00% x FAS3 x Years of Service
	65	2.30% x FAS3 x Years of Service
	67 or later	2.50% x FAS3 x Years of Service

	Retirement Age	Benefit Formula
Safety Regular (§31664)	50	2.00% x FAS1 x Years of Service
	55 or later	2.62% x FAS1 x Years of Service

	Retirement Age	Benefit Formula
Safety Regular Plus Supplemental (§31664.1)	50	3.00% x FAS1 x Years of Service
	55 or later	3.00% x FAS1 x Years of Service

	Retirement Age	Benefit Formula
Safety Tier 3 (§7522.25(d))	50	2.00% x FAS3 x Years of Service
	55	2.50% x FAS3 x Years of Service
	57 or later	2.70% x FAS3 x Years of Service

Maximum Benefit:

General Legacy & Safety Legacy	100% of Highest Average Compensation (§31676.11, §31676.14, §31664 and §31664.1).
Tier 3	None

Non-Service Connected Disability:	
All Members	
Eligibility	Five years of service (§31720).
Benefit Formula	20% of Final Compensation for the first five years of service plus 2% for each year of additional service for a maximum of 40% of Final Compensation (§31727.7). The service retirement benefit is paid, if greater.
Service-Connected Disability:	
All Members	
Eligibility	No age or service requirements (§31720).
Benefit Formula	50% of the Final Compensation or 100% of Service Retirement benefit, if greater (§31727.4).
Pre-Retirement Death:	
All Members	
Eligibility	None.
Basic lump sum benefit	Refund of employee contributions with interest, plus one month's compensation for each year of service, to a maximum of six months' compensation (§31781).
Death in line of duty	50% of Final Compensation or 100% of Service Retirement benefit, if greater, payable to spouse or minor children (§31787).
	OR
Vested Members	
Eligibility	Five years of service.
Basic benefit	60% of the greater of Service or Ordinary Disability Retirement benefit payable to surviving eligible spouse (§31765.1, §31781.1), in lieu of the basic lump sum benefit above.
Death in line of duty	50% of Final compensation or 100% of Service Retirement benefit, if greater, payable to spouse or minor children (§31787).

<u>*Safety Members*</u>	
Eligibility	None.
Violent Death	Lump sum of twelve months compensation.

Death After Retirement:	
<u>*All Members*</u>	
Service or Non-Service Connected Disability Retirement	60% of member's unmodified allowance continued to eligible spouse (§31760.1) and $5,000 lump sum benefit payable to member's beneficiary (§31789.3). An eligible spouse is a surviving spouse who was married to the member at least one year prior to the date of retirement (§31760.1) or at least two years prior to the date of death and has attained age 55 on or prior to the date of death (§31786.1).
Line-of-Duty Disability	100% of member's allowance continued to eligible spouse (§31786).
Withdrawal Benefits:	
Less than Five Years of Service	Refund of accumulated member contributions with interest, or earned benefit at age 70 (§31628). Effective January 1, 2003, a member may also elect to leave contributions on deposit in the retirement fund (§31629.5).
Five or More Years of Service	If contributions left on deposit, entitled to earned benefits commencing at any time after eligible to retire (§31700).
Post-retirement Cost-of-Living Benefits:	
General and Safety	Future changes based on Consumer Price Index to a maximum of 2% per year; excess "banked" (§31870).

Compensation Earnable (General and Safety Legacy):	Includes base pay plus uniform allowance, shift differential, on-call pay, bilingual pay, training officer stipend, bomb stipend, EMT/paramedic stipend, firefighters in lieu of holiday pay, resident duty pay, educational allowance, annual buyback vacation (Dept. heads only), staff stipend, in lieu of mileage, and sick leave buyback. Certain vacation, holiday compensation time, and administrative leave which are earned but not used may also be added to compensation earnable.
Pensionable Salary (General and Safety Tier 3):	Includes base pay plus shift differential, on-call pay, bilingual pay, training officer stipend, bomb stipend, EMT/paramedic stipend, firefighters in lieu of holiday pay, hazardous stipend, educational allowance, and staff stipend.

Member Contributions:	Please refer to Appendix A for specific rates.
General Legacy	
Basic Regular Benefit	Provide for an average annuity at age 55 equal to 1/120 of FAS1 (§31621.1).
Cost-of-Living Regular Benefit	Provide for one-half of future Cost-of-Living costs.
Supplemental	Members pay the additional Normal Cost attributable to the difference between the Total (i.e., Regular and Supplemental benefits) and Regular benefits. In addition, members also pay for the cost of any unfunded actuarial accrued liability attributable to the difference between the Total and the Regular benefits.
Employer Pickup	3% of pay.
General Tier 3	50% of the total Normal Cost.
Supplemental UAAL	Members also pay, as the same level percentage salary as all other General members, the cost of any unfunded actuarial accrued liability attributable to the difference between the Total and the Regular benefits for General Legacy members.
Employer Pickup	None
Safety Legacy	
Basic Regular Benefit	Provide for an average annuity at age 50 equal to 1/100 of FAS1 (§31639.25).
Cost-of-Living Regular Benefit	Provide for one-half of future Cost-of-Living costs.
Supplemental	Members pay the additional Normal Cost attributable to the difference between the Total (i.e., Regular and Supplemental benefits) and Regular benefits. In addition, members also pay for the cost of any unfunded actuarial accrued liability attributable to the difference between the Total and the Regular benefits.
Employer Pickup	3% of pay.
Safety Tier 3	50% of the total Normal Cost
Supplemental UAAL	Members also pay, as the same level percentage salary as all other Safety members, the cost of any unfunded actuarial accrued liability attributable to the difference between the Total and the Regular benefits for Safety Legacy members.
Employer Pickup	None

Other Information:	Safety Legacy members with 30 or more years of service are exempt from paying member contributions. The same applies for General Legacy members hired on or before March 7, 1973.
Plan Amendment:	There have been no changes in plan provisions since the previous valuation.

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

Appendix A

Member Contribution Rates for Legacy Members

Comparison of Total Member Rate from June 30, 2018 (New) and June 30, 2017 (Current) Valuations

General Legacy Members – Current

Entry Age	Basic[1]	COLA	Supplemental[2]	Pickup	Total
25	8.05%	1.84%	2.76%	(3.00%)	9.65%
35	9.25%	2.14%	2.76%	(3.00%)	11.15%
45	10.46%	2.44%	2.76%	(3.00%)	12.66%

General Legacy Members – New

Entry Age	Basic[1]	COLA	Supplemental[2]	Pickup	Total
25	8.07%	1.84%	2.77%	(3.00%)	9.68%
35	9.27%	2.14%	2.77%	(3.00%)	11.18%
45	10.48%	2.44%	2.77%	(3.00%)	12.69%

Safety Legacy Members – Current

Entry Age	Basic[1]	COLA	Supplemental[2]	Pickup	Total
25	10.64%	3.27%	11.13%	(3.00%)	22.04%
35	12.40%	3.85%	11.13%	(3.00%)	24.38%
45	13.49%	4.20%	11.13%	(3.00%)	25.82%

Safety Legacy Members – New

Entry Age	Basic[1]	COLA	Supplemental[2]	Pickup	Total
25	10.66%	3.28%	11.28%	(3.00%)	22.22%
35	12.42%	3.86%	11.28%	(3.00%)	24.56%
45	13.51%	4.21%	11.28%	(3.00%)	26.00%

[1] *The Basic rates shown above also include an administrative expense load of 0.66% of payroll for 2018 (new) rates and 0.64% of payroll for 2017 (current) rates.*

[2] *The breakdown of the Supplemental Benefit into NC and UAAL rates is as follows:*

	General Legacy Members – Current	*General Legacy Members – New*	*Safety Legacy Members – Current*	*Safety Legacy Members – New*
NC	*2.25%*	*2.26%*	*6.64%*	*6.66%*
UAAL	*0.51%*	*0.51%*	*4.49%*	*4.62%*

Appendix A (Continued)

Member Contribution Rates for Legacy Members

General Legacy Members' Contribution Rates based on the June 30, 2018 Actuarial Valuation as a percentage of payroll

Age	Basic	COLA	Supplemental	Pickup	Total
15	7.17%	1.62%	2.77%	(3.00%)	8.56%
16	7.17%	1.62%	2.77%	(3.00%)	8.56%
17	7.27%	1.64%	2.77%	(3.00%)	8.68%
18	7.36%	1.66%	2.77%	(3.00%)	8.79%
19	7.46%	1.69%	2.77%	(3.00%)	8.92%
20	7.56%	1.71%	2.77%	(3.00%)	9.04%
21	7.66%	1.74%	2.77%	(3.00%)	9.17%
22	7.76%	1.76%	2.77%	(3.00%)	9.29%
23	7.86%	1.79%	2.77%	(3.00%)	9.42%
24	7.97%	1.82%	2.77%	(3.00%)	9.56%
25	8.07%	1.84%	2.77%	(3.00%)	9.68%
26	8.18%	1.87%	2.77%	(3.00%)	9.82%
27	8.29%	1.89%	2.77%	(3.00%)	9.95%
28	8.40%	1.92%	2.77%	(3.00%)	10.09%
29	8.52%	1.95%	2.77%	(3.00%)	10.24%
30	8.64%	1.98%	2.77%	(3.00%)	10.39%
31	8.76%	2.01%	2.77%	(3.00%)	10.54%
32	8.88%	2.04%	2.77%	(3.00%)	10.69%
33	9.01%	2.07%	2.77%	(3.00%)	10.85%
34	9.14%	2.11%	2.77%	(3.00%)	11.02%
35	9.27%	2.14%	2.77%	(3.00%)	11.18%
36	9.41%	2.17%	2.77%	(3.00%)	11.35%

Age	Basic	COLA	Supplemental	Pickup	Total
37	9.55%	2.21%	2.77%	(3.00%)	11.53%
38	9.70%	2.24%	2.77%	(3.00%)	11.71%
39	9.86%	2.28%	2.77%	(3.00%)	11.91%
40	10.00%	2.32%	2.77%	(3.00%)	12.09%
41	10.13%	2.35%	2.77%	(3.00%)	12.25%
42	10.24%	2.38%	2.77%	(3.00%)	12.39%
43	10.34%	2.40%	2.77%	(3.00%)	12.51%
44	10.42%	2.42%	2.77%	(3.00%)	12.61%
45	10.48%	2.44%	2.77%	(3.00%)	12.69%
46	10.54%	2.45%	2.77%	(3.00%)	12.76%
47	10.61%	2.47%	2.77%	(3.00%)	12.85%
48	10.66%	2.48%	2.77%	(3.00%)	12.91%
49	10.70%	2.49%	2.77%	(3.00%)	12.96%
50	10.72%	2.50%	2.77%	(3.00%)	12.99%
51	10.69%	2.49%	2.77%	(3.00%)	12.95%
52	10.64%	2.48%	2.77%	(3.00%)	12.89%
53	10.53%	2.45%	2.77%	(3.00%)	12.75%
54	10.25%	2.38%	2.77%	(3.00%)	12.40%

Interest:	7.25% per annum
COLA:	2.00%
Administrative Expenses:	0.66% of payroll added to Basic rates
Mortality:	See Exhibit II, page 44
Salary Increase:	See Exhibit II, page 43
COLA Loading Factor:	24.83% for Regular Benefits, applied to Basic rates prior to adjustment for administrative expenses
Non-Refundability Factor:	90.70%

Appendix A (Continued)
Member Contribution Rates for Legacy Members

Safety Legacy Members' Contribution Rates based on the June 30, 2018 Actuarial Valuation as a percentage of payroll

Age	Basic	COLA	Supplemental	Pickup	Total
15	9.42%	2.87%	11.28%	(3.00%)	20.57%
16	9.42%	2.87%	11.28%	(3.00%)	20.57%
17	9.55%	2.92%	11.28%	(3.00%)	20.75%
18	9.68%	2.96%	11.28%	(3.00%)	20.92%
19	9.81%	3.00%	11.28%	(3.00%)	21.09%
20	9.94%	3.04%	11.28%	(3.00%)	21.26%
21	10.08%	3.09%	11.28%	(3.00%)	21.45%
22	10.22%	3.14%	11.28%	(3.00%)	21.64%
23	10.36%	3.18%	11.28%	(3.00%)	21.82%
24	10.51%	3.23%	11.28%	(3.00%)	22.02%
25	10.66%	3.28%	11.28%	(3.00%)	22.22%
26	10.81%	3.33%	11.28%	(3.00%)	22.42%
27	10.97%	3.38%	11.28%	(3.00%)	22.63%
28	11.13%	3.43%	11.28%	(3.00%)	22.84%
29	11.30%	3.49%	11.28%	(3.00%)	23.07%
30	11.47%	3.55%	11.28%	(3.00%)	23.30%
31	11.65%	3.60%	11.28%	(3.00%)	23.53%
32	11.84%	3.67%	11.28%	(3.00%)	23.79%
33	12.03%	3.73%	11.28%	(3.00%)	24.04%
34	12.23%	3.79%	11.28%	(3.00%)	24.30%
35	12.42%	3.86%	11.28%	(3.00%)	24.56%
36	12.62%	3.92%	11.28%	(3.00%)	24.82%

Age	Basic	COLA	Supplemental	Pickup	Total
37	12.84%	4.00%	11.28%	(3.00%)	25.12%
38	13.01%	4.05%	11.28%	(3.00%)	25.34%
39	13.14%	4.09%	11.28%	(3.00%)	25.51%
40	13.20%	4.11%	11.28%	(3.00%)	25.59%
41	13.26%	4.13%	11.28%	(3.00%)	25.67%
42	13.33%	4.16%	11.28%	(3.00%)	25.77%
43	13.41%	4.18%	11.28%	(3.00%)	25.87%
44	13.48%	4.20%	11.28%	(3.00%)	25.96%
45	13.51%	4.21%	11.28%	(3.00%)	26.00%
46	13.39%	4.18%	11.28%	(3.00%)	25.85%
47	13.27%	4.14%	11.28%	(3.00%)	25.69%
48	13.04%	4.06%	11.28%	(3.00%)	25.38%
49	12.46%	3.87%	11.28%	(3.00%)	24.61%

Interest:	7.25% per annum
COLA:	2.00%
Administrative Expenses:	0.66% of payroll added to Basic rates
Mortality:	See Exhibit II, page 44
Salary Increase:	See Exhibit II, page 43
COLA Loading Factor:	32.80% for Regular Benefits, applied to Basic rates prior to adjustment for administrative expenses
Non-Refundability Factor:	91.91%

Appendix B

Member Contribution Rates for Tier 3 Members

General and Safety Tier 3 Members – Current

	Basic	COLA	Legacy Supplemental UAAL	Total
General Tier 3 *(Member Pays Supplemental UAAL)*	7.79%	1.53%	0.51%	9.83%
General Tier 3 *(Employer Picks Up Supplemental UAAL)*	7.79%	1.53%	0.00%	9.32%
Safety Tier 3 *(Member Pays Supplemental UAAL)*	11.46%	2.74%	4.49%	18.69%
Safety Tier 3 *(Employer Picks Up Supplemental UAAL)*	11.46%	2.74%	0.00%	14.20%

General and Safety Tier 3 Members – New

	Basic	COLA	Legacy Supplemental UAAL	Total
General Tier 3 *(Member Pays Supplemental UAAL)*	7.81%	1.53%	0.51%	9.85%
General Tier 3 *(Employer Picks Up Supplemental UAAL)*	7.81%	1.53%	0.00%	9.34%
Safety Tier 3 *(Member Pays Supplemental UAAL)*	11.63%	2.77%	4.62%	19.02%
Safety Tier 3 *(Employer Picks Up Supplemental UAAL)*	11.63%	2.77%	0.00%	14.40%

The General Tier 3 member contribution rate is 50% of the Total Normal Cost (Basic + COLA) plus, as the same level percentage salary as all other General members, the cost of any unfunded actuarial accrued liability attributable to the difference between the Total and the Regular benefits for General Legacy members. The Basic rate shown above also includes an administrative expense load of 0.64% and 0.66% of payroll, for current member rates and new member rates, respectively.

The Safety Tier 3 member contribution rate is 50% of the Total Normal Cost (Basic + COLA) plus, as the same level percentage salary as all other Safety members, the cost of any unfunded actuarial accrued liability attributable to the difference between the Total and the Regular benefits for Safety Legacy members. The Basic rate shown above also includes an administrative expense load of 0.64% and 0.66% of payroll, for current member rates and new member rates, respectively.

Note: It is our understanding that in the determination of pension benefits under the PEPRA tier formulas, the maximum compensation that can be taken into account for 2018 is $145,666 (reference Section 7522.10). These amounts should be adjusted for changes to the Consumer Price Index for All Urban Consumers after 2017 (reference Section 7522.10(d)).

Appendix C

UAAL Amortization Schedule as of June 30, 2018 (Dollar Amounts in Thousands)

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Amortization Payment
General Legacy Regular Plus General Tier 3	June 30, 2012	Restart Amortization	$40,847	$38,478	13	$3,764
	June 30, 2013	Actuarial Loss	5,116	4,451	10	539
	June 30, 2014	Actuarial Gain	(7,650)	(6,924)	11	(774)
	June 30, 2014	Assumption Changes	10,549	10,395	16	867
	June 30, 2015	Actuarial Gain	(2,641)	(2,472)	12	(258)
	June 30, 2016	Actuarial Loss	743	714	13	70
	June 30, 2017	Actuarial Loss	635	623	14	58
	June 30, 2017	Assumption Changes	36,622	36,580	19	2,697
	June 30, 2018	Actuarial Gain	(9,142)	(9,142)	15	(801)
				$72,703		$6,162
General Legacy Supplemental	June 30, 2012	Restart Amortization	$4,449	$4,191	13	$410
	June 30, 2013	Actuarial Gain	(213)	(186)	10	(23)
	June 30, 2014	Actuarial Gain	(687)	(622)	11	(70)
	June 30, 2014	Assumption Changes	1,702	1,677	16	140
	June 30, 2015	Actuarial Gain	(412)	(386)	12	(40)
	June 30, 2016	Actuarial Gain	(191)	(184)	13	(18)
	June 30, 2017	Actuarial Gain	(335)	(329)	14	(30)
	June 30, 2017	Assumption Changes	1,264	1,263	19	93
	June 30, 2018	Actuarial Gain	(229)	(229)	15	(20)
				$5,195		$442
Safety Legacy Regular Plus Safety Tier 3	June 30, 2012	Restart Amortization	$11,321	$10,665	13	$1,043
	June 30, 2013	Actuarial Loss	815	709	10	86
	June 30, 2014	Actuarial Gain	(3,097)	(2,803)	11	(313)
	June 30, 2014	Assumption Changes	6,871	6,771	16	565
	June 30, 2015	Actuarial Gain	(654)	(613)	12	(64)
	June 30, 2016	Actuarial Loss	800	769	13	75
	June 30, 2017	Actuarial Loss	1,773	1,741	14	161
	June 30, 2017	Assumption Changes	7,653	7,644	19	564
	June 30, 2018	Actuarial Gain	(5,148)	(5,148)	15	(451)
				$19,735		$1,666

Note: Results may not total exactly due to rounding.

Appendix C (Continued)

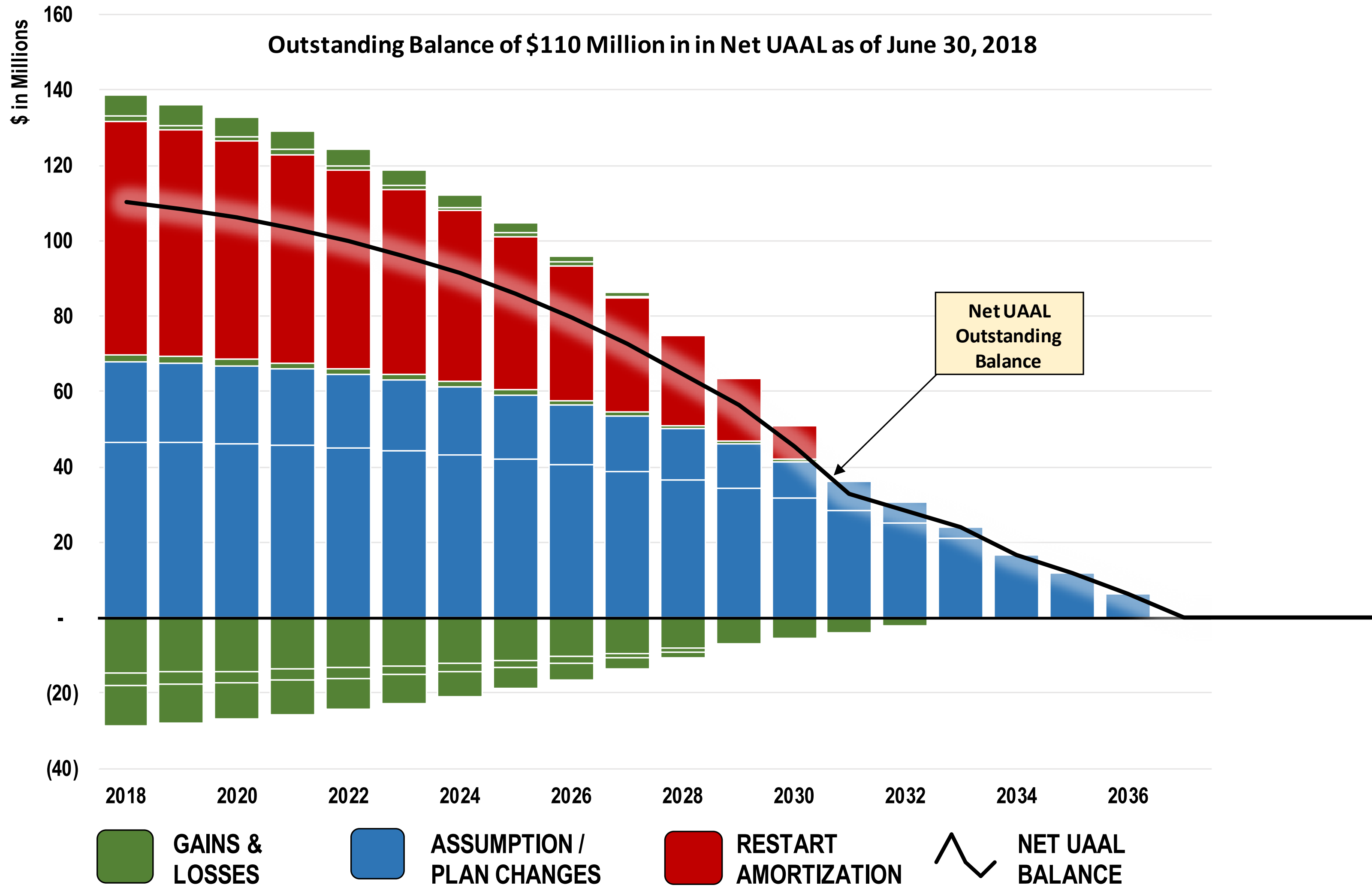
UAAL Amortization Schedule as of June 30, 2018 (Dollar Amounts in Thousands)

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Amortization Payment
Safety Legacy Supplemental	June 30, 2012	Restart Amortization	$8,952	$8,433	13	$825
	June 30, 2013	Actuarial Loss	965	839	10	102
	June 30, 2014	Actuarial Gain	(210)	(191)	11	(21)
	June 30, 2014	Assumption Changes	2,526	2,489	16	208
	June 30, 2015	Actuarial Loss	129	120	12	13
	June 30, 2016	Actuarial Loss	160	153	13	15
	June 30, 2017	Actuarial Gain	(268)	(263)	14	(24)
	June 30, 2017	Assumption Changes	1,168	1,167	19	86
	June 30, 2018	Actuarial Gain	(206)	(206)	15	(18)
				$12,541		$1,186

	Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Amortization Payment
Grand Total	June 30, 2012	Restart Amortization	$65,569	$61,767	13	$6,042
	June 30, 2013	Actuarial Loss	6,683	5,813	10	703
	June 30, 2014	Actuarial Gain	(11,644)	(10,540)	11	(1,179)
	June 30, 2014	Assumption Changes	21,648	21,332	16	1,780
	June 30, 2015	Actuarial Gain	(3,578)	(3,351)	12	(349)
	June 30, 2016	Actuarial Loss	1,512	1,452	13	142
	June 30, 2017	Actuarial Loss	1,805	1,772	14	164
	June 30, 2017	Assumption Changes	46,707	46,654	19	3,439
	June 30, 2018	Actuarial Gain	(14,725)	(14,725)	15	(1,290)
				$110,174		$9,452

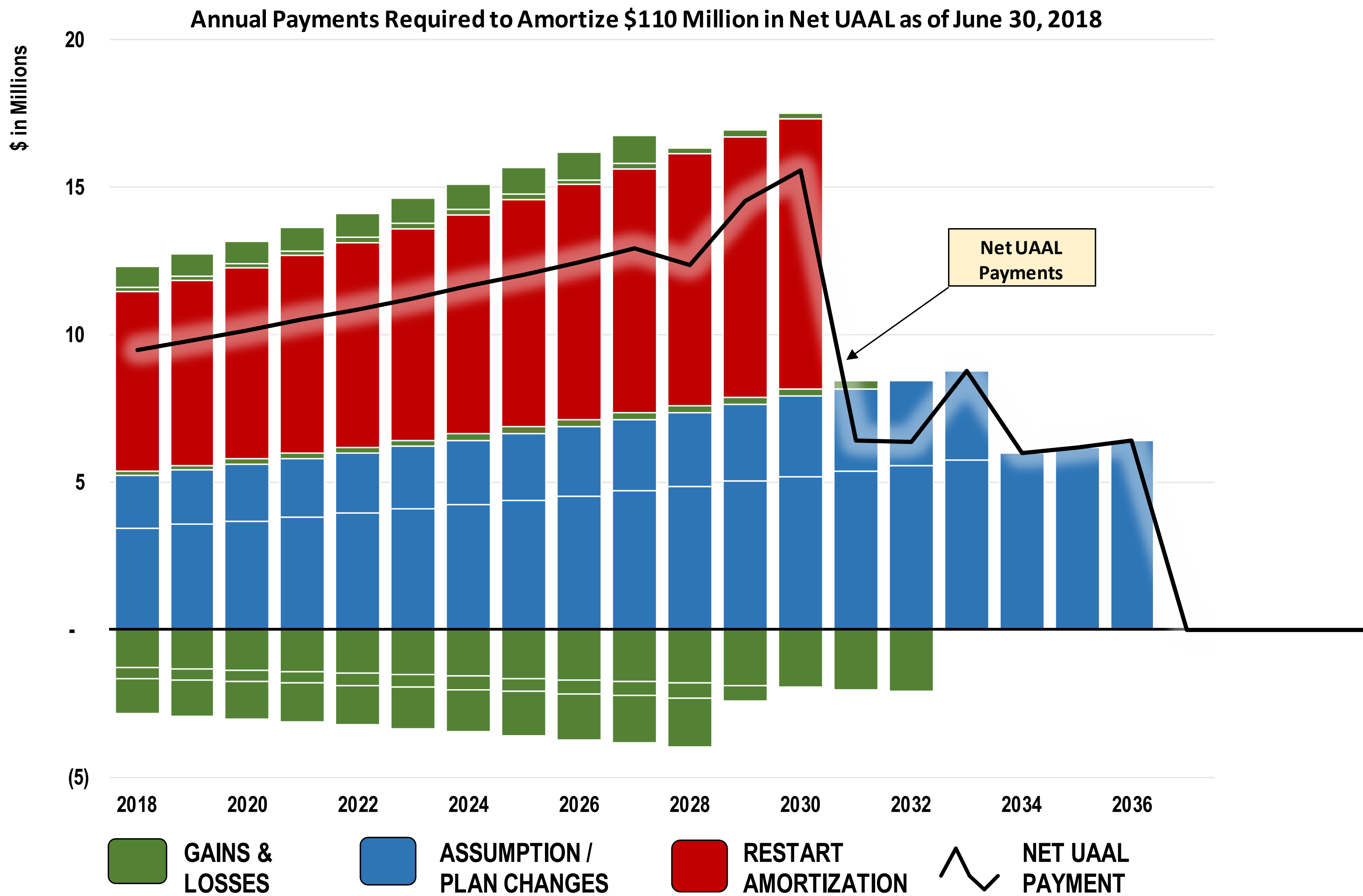
Note: Results may not total exactly due to rounding.

Appendix D
Projection of UAAL Outstanding Balances and Payments



Appendix D (Continued)

Projection of UAAL Outstanding Balances and Payments



Appendix E

Reconciliation of Recommended Contribution Rates by Tier from June 30, 2017 to June 30, 2018

Reconciliation of Recommended Employer Contribution Rate

	General Legacy	General Tier 3 (Member Pays Supplemental UAAL)	General Tier 3 (Employer Picks Up Supplemental UAAL)	Safety Legacy	Safety Tier 3 (Member Pays Supplemental UAAL)	Safety Tier 3 (Employer Picks Up Supplemental UAAL)	Total
Recommended Contribution Rate as of June 30, 2017	22.09%	16.75%	17.21%	32.33%	24.80%	28.93%	22.53%
Effect of actuarial experience during 2017/2018:							
1. Effect of investment gain after smoothing	(0.29%)	(0.29%)	(0.29%)	(0.45%)	(0.45%)	(0.45%)	(0.32%)
2. Effect of actual contributions less than expected[1]	0.55%	0.55%	0.55%	0.66%	0.66%	0.66%	0.57%
3. Effect of salary increases less than expected	(0.95%)	(0.95%)	(0.95%)	(1.87%)	(1.87%)	(1.87%)	(1.12%)
4. Effect of amortizing prior year's UAAL over a smaller than expected change in total payroll	0.30%	0.30%	0.30%	0.49%	0.49%	0.49%	0.34%
5. Effect of retirement gain	(0.14%)	(0.14%)	(0.14%)	(0.16%)	(0.16%)	(0.16%)	(0.14%)
6. Effect of demographic changes on Normal Cost	(0.09%)	0.00%	0.00%	(0.06%)	0.18%	0.18%	(0.05%)
7. Effect of increase in the Supplemental UAAL contributions for Tier 3 members picked up by employer	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%
8. Effect of other net experience gains[2]	(0.01%)	(0.01%)	(0.01%)	(0.25%)	(0.23%)	(0.24%)	(0.06%)
Subtotal	(0.63%)	(0.54%)	(0.54%)	(1.64%)	(1.38%)	(1.26%)	(0.78%)
Recommended Contribution Rate as of June 30, 2018	21.46%	16.21%	16.67%	30.69%	23.42%	27.67%	21.75%

(1) *This is primarily due to the one-year lag in implementing the contribution rates recommended in the June 30, 2017 valuation.*

(2) *Other differences in actual versus expected experience include mortality, disability, and withdrawal experience, and a change in the allocation of administrative expenses. In particular, there were more Safety pre-retirement deaths than assumed in the year ended June 30, 2018.*

Appendix E (Continued)

Reconciliation of Recommended Contribution Rates by Tier from June 30, 2017 to June 30, 2018

Reconciliation of Recommended Member Contribution Rate

	General Legacy	General Tier 3 (Member Pays Supplemental UAAL)	General Tier 3 (Employer Picks Up Supplemental UAAL)	Safety Legacy	Safety Tier 3 (Member Pays Supplemental UAAL)	Safety Tier 3 (Employer Picks Up Supplemental UAAL)	Total
Recommended Contribution Rate as of June 30, 2017	10.83%(1)	9.83%	9.32%	22.67%(1)	18.69%	14.20%	12.55%
Effect of actuarial experience during 2017/2018:							
1. Effect of investment loss after smoothing(3)	0.03%	0.03%	N/A	0.18%	0.18%	N/A	0.05%
2. Effect of actual contributions less than expected(4)	0.01%	0.01%	N/A	0.07%	0.07%	N/A	0.02%
3. Effect of salary increases less than expected	(0.07%)	(0.07%)	N/A	(0.32%)	(0.32%)	N/A	(0.10%)
4. Effect of amortizing prior year's UAAL over a smaller than expected change in total payroll	0.02%	0.02%	N/A	0.22%	0.22%	N/A	0.05%
5. Effect of retirement (gain)/loss	(0.02%)	(0.02%)	N/A	0.16%	0.16%	N/A	0.02%
6. Effect of demographic changes on Normal Cost	0.00%	0.00%	0.00%	0.02%	0.18%	0.18%	0.01%
7. Effect of other net experience (gains)/losses(5)	0.05%	0.05%	0.02%	(0.16%)	(0.16%)	0.02%	0.01%
Subtotal	0.02%	0.02%	0.02%	0.17%	0.33%	0.20%	0.06%
Recommended Contribution Rate as of June 30, 2018	10.85%(2)	9.85%	9.34%	22.84%(2)	19.02%	14.40%	12.61%

(1) *The above rates are based on average entry age of 33 and 28 for General Legacy and Safety Legacy, respectively. The weighted aggregate member contribution rates over all entry ages as of June 30, 2017 are 10.65% and 22.42% for General Legacy and Safety Legacy, respectively.*

(2) *The above rates are based on average entry age of 33 and 28 for General Legacy and Safety Legacy, respectively. The weighted aggregate member contribution rates over all entry ages as of June 30, 2018 are 10.65% and 22.60% for General Legacy and Safety Legacy, respectively.*

(3) *Similar to prior valuations, the impact of investment experience is different in the rate reconciliation for the employer and the member due to such factors as actual versus estimated timing when contributions and benefits were paid during the year, rounding, etc.*

(4) *This is primarily due to the one-year lag in implementing the contribution rates recommended in the June 30, 2017 valuation.*

(5) *Other differences in actual versus expected experience include mortality, disability, and withdrawal experience, and a change in the allocation of administrative expenses. In particular, there were more Safety pre-retirement deaths than assumed in the year ended June 30, 2018.*