

1959 Survivor Benefit Program Actuarial Valuation *As of June 30, 2018*



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Actuarial Certification



April 2019

To the best of our knowledge, this report is complete and accurate and contains sufficient information to fully and fairly disclose the funded condition of the 1959 Survivor Program for Public Agency 1st, 2nd, 3rd, 4th, and Indexed Level, and the State and Schools 5th Level Pools. This valuation is based on the beneficiary and membership data provided to the Actuarial Office, the statement of assets provided by the CalPERS Financial Office, and the benefits provided under this program. It is our opinion that this valuation has been performed by qualified actuaries in accordance with generally accepted actuarial principles, in accordance with standards of practice prescribed by the Actuarial Standards Board, and that the assumptions and methods are internally consistent and reasonable for this program.

The undersigned are actuaries for CalPERS, who are members of the American Academy of Actuaries and the Society of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

A handwritten signature in black ink, appearing to read "Daniel Miller".

DANIEL MILLER, ASA, MAAA
Associate Pension Actuary, CalPERS

A handwritten signature in black ink, appearing to read "Scott Terando".

Scott Terando, ASA, EA, MAAA, FCA, CFA
Chief Actuary, CalPERS

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Highlights and Executive Summary

Introduction

The 1959 Survivor program was designed to provide pre-retirement death benefits comparable to those provided by Social Security, formally the Federal Old Age and Survivor Insurance (OASI) program, to CalPERS' members not covered by Social Security.

Purpose of Report

This actuarial valuation of the 1959 Survivor Program for Public Agency 1st, 2nd, 3rd, 4th, and Indexed level, and the State and Schools 5th level pools within the California Public Employees' Retirement System (CalPERS) was performed by CalPERS staff actuaries as of June 30, 2018 in order to:

- Set forth the funded status of the program, reflecting the assets and funding liabilities of this program as of June 30, 2018.
- Establish the actuarially required premiums for all levels and employee premiums in the Indexed, and State and Schools 5th Level for the Fiscal Year July 1, 2019 through June 30, 2020; and
- Provide actuarial information as of June 30, 2018 to the CalPERS Board of Administration and other interested parties.

The use of this report for any other purposes may be inappropriate.

Funded Status of the Plan

Shown below are the Accrued Liability, Market Value of Assets (MVA), and Funded Ratio of all pools within the 1959 Survivor Benefit Program as of June 30, 2018.

Plan	Accrued Liability ¹	Market Value of Assets	Funded Ratio
State 5 th Level Pool	\$149,571,393	\$110,568,331	73.9%
Schools 5 th Level Pool	13,952,547	82,038,098	588.0%
PA 1 st Level Pool	2,908,667	52,177,082	1,793.8%
PA 2 nd Level Pool	2,428,704	12,307,348	506.7%
PA 3 rd Level Pool	30,510,650	120,740,841	395.7%
PA 4 th Level Pool	141,358,235	151,267,552	107.0%
PA Indexed Level Pool	20,261,829	25,933,332	128.0%
Total	\$360,992,025	\$555,032,585	153.8%

(1) By definition, under the Term Insurance Method, the present value of future benefits and the accrued liability are equal. Under the Entry Age Normal Method, which is being used to fund the benefit in the Indexed Pool, the accrued liability is defined as the difference between the present value of future benefits and the present value of future normal costs.

Highlights and Executive Summary (continued)

Required Employer and Employee Monthly Premiums

The actuarially required employer and employee monthly premiums per covered member per month for the 1959 Survivor Program for the Fiscal Year July 1, 2019 through June 30, 2020 are shown below. The results for Fiscal Year July 1, 2018 through June 30, 2019 are shown for comparison. Except for the Public Agency Indexed Level pool, these monthly premiums are determined using a Modified Term Insurance funding method. Monthly premiums for the Public Agency Indexed Level pool are determined using the Entry Age Normal funding method.

Required Monthly Premiums

Plan	2018-19 Premiums			2019-20 Premiums		
	Employer	Employee	Total	Employer	Employee	Total
State 5 th Level Pool ¹	\$5.35	\$5.35	\$10.70	\$5.40	\$5.40	\$10.80
Schools 5 th Level Pool ¹	\$0.00	\$2.00	\$2.00	\$0.00	\$2.00	\$2.00
PA 1 st Level Pool ²	\$0.00	\$2.00	\$2.00	\$0.00	\$2.00	\$2.00
PA 2 nd Level Pool ²	\$0.00	\$2.00	\$2.00	\$0.00	\$2.00	\$2.00
PA 3 rd Level Pool ²	\$0.00	\$2.00	\$2.00	\$0.00	\$2.00	\$2.00
PA 4 th Level Pool ²	\$4.70	\$2.00	\$6.70	\$4.80	\$2.00	\$6.80
PA Indexed Level Pool ¹	\$2.10	\$2.10	\$4.20	\$2.90	\$2.90	\$5.80

(1) Section 21581 of the California Public Employees' Retirement Law requires mandatory cost sharing when the total premium exceeds \$4.00. Mandatory \$2.00 member monthly premium required.

(2) Mandatory \$2.00 member monthly premium required.

The required employee premium for the State 5th level pool will change from \$5.35 to \$5.40 per member, per month (or from \$2.47 to \$2.49 for biweekly paid members) for Fiscal Year 2019-20. This is in accordance with Statute 21581(c), which specifies that when the total required premium (after amortization of surplus/unfunded liability) exceeds \$4.00, the employer and the member shall evenly share the required monthly premium.

The required employee premium for the Indexed level pool will change from \$2.10 to \$2.90 per member, per month (or from \$.97 to \$1.34 for biweekly paid members) for Fiscal Year 2019-20. This is in accordance with Statute 21581(b), which specifies that when the total required premium (after amortization of surplus/unfunded liability) exceeds \$4.00, the employer and the member shall evenly share the required monthly premium.

Employee required premiums for all of the other pools shall remain the same, \$2.00 per member, per month, as in the prior year.

Highlights and Executive Summary (continued)

Changes Since the Prior Year's Valuation

Actuarial Methods and Assumptions

On December 21, 2016, the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three year phase-in beginning with the June 30, 2016 actuarial valuations. The discount rate for this valuation is 7.00 percent. The decision to reduce the discount rate was primarily based on reduced capital market assumptions provided by external investment consultants and CalPERS investment staff. A complete description of the actuarial methods and assumptions used in the June 30, 2018 valuation may be found in Appendix A of this report.

Plan Provisions

No changes were made since the prior valuation. A complete description of the principal plan provisions used in the June 30, 2018 valuation may be found in Appendix B of this report.

Subsequent Changes

CalPERS recently adopted a Funding Risk Mitigation Policy that will reduce the funding risk over time. Under this policy, good investment performance that significantly outperforms the discount rate triggers adjustments to the discount rate, expected investment return and strategic asset allocation targets. In conjunction with the discount rate change described above, the Board also temporarily suspended the Funding Risk Mitigation Policy for a three year period. This has no impact on the current valuation results.

Assets

Reconciliation of the Market Value of Assets

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Assets

Reconciliation of the Market Value of Assets

Shown below are the changes in the market value of assets for the various pools.

State 5 th Level	June 30, 2017	June 30, 2018
Beginning Balance	\$104,309,600	\$107,536,929
Contributions (Employer and Employee) Received During Fiscal Year	9,214,562	9,337,492
Benefit Payments During Fiscal Year	(15,372,575)	(15,015,394)
Net Transfer of Assets Into and Out of this Pool	—	—
Investment Earnings Credited	9,385,342	8,709,304
Ending Balance	\$107,536,929	\$ 110,568,331
Fund Return for Year	9.27%	8.32%

Schools 5 th Level	June 30, 2017	June 30, 2018
Beginning Balance	\$70,543,063	\$76,938,556
Contributions (Employer and Employee) Received During Fiscal Year	218,016	220,138
Benefit Payments During Fiscal Year	(1,323,007)	(1,350,728)
Net Transfer of Assets Into and Out of this Pool	—	—
Investment Earnings Credited	7,500,484	6,230,132
Ending Balance	\$76,938,556	\$ 82,038,098
Fund Return for Year	10.72%	8.16%

Public Agency 1 st Level	June 30, 2017	June 30, 2018
Beginning Balance	\$43,713,899	\$48,304,912
Contributions (Employer and Employee) Received During Fiscal Year	176,737	175,857
Benefit Payments During Fiscal Year	(245,715)	(240,028)
Net Transfer of Assets Into and Out of this Pool	(1,080)	—
Investment Earnings Credited	4,661,071	3,936,341
Ending Balance	\$48,304,912	\$ 52,177,082
Fund Return for Year	10.67%	8.15%

Public Agency 2 nd Level	June 30, 2017	June 30, 2018
Beginning Balance	\$10,495,726	\$11,477,764
Contributions (Employer and Employee) Received During Fiscal Year	94,586	96,398
Benefit Payments During Fiscal Year	(207,455)	(198,697)
Net Transfer of Assets Into and Out of this Pool	—	—
Investment Earnings Credited	1,094,906	931,884
Ending Balance	\$11,477,764	\$ 12,307,348
Fund Return for Year	10.49%	8.16%

Public Agency 3 rd Level	June 30, 2017	June 30, 2018
Beginning Balance	\$104,701,900	\$113,940,781
Contributions (Employer and Employee) Received During Fiscal Year	1,044,727	1,067,705
Benefit Payments During Fiscal Year	(2,612,237)	(2,675,258)
Net Transfer of Assets Into and Out of this Pool	(76,387)	(812,421)
Investment Earnings Credited	10,882,778	9,220,034
Ending Balance	\$113,940,781	\$ 120,740,841
Fund Return for Year	10.48%	8.18%

Assets (continued)

Reconciliation of the Market Value of Assets (continued)

Public Agency 4 th Level	June 30, 2017	June 30, 2018
Beginning Balance	\$138,750,170	\$145,771,600
Contributions (Employer and Employee) Received During Fiscal Year	5,337,366	6,162,979
Benefit Payments During Fiscal Year	(12,365,240)	(12,964,609)
Net Transfer of Assets Into and Out of this Pool	77,467	812,421
Investment Earnings Credited	13,971,837	11,485,161
Ending Balance	\$145,771,600	\$ 151,267,552
Fund Return for Year	10.33%	8.04%

Public Agency Indexed Level	June 30, 2017	June 30, 2018
Beginning Balance	\$22,719,925	\$24,443,312
Contributions (Employer and Employee) Received During Fiscal Year	702,383	888,612
Benefit Payments During Fiscal Year	(1,281,075)	(1,357,616)
Net Transfer of Assets Into and Out of this Pool	—	—
Investment Earnings Credited	2,302,079	1,959,024
Ending Balance	\$24,443,312	\$ 25,933,332
Fund Return for Year	10.26%	8.09%

Liabilities and Funding Requirements

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Liabilities and Funding Requirements

Comparison of Current and Prior Year Results

Shown below are the comparisons of key valuation results for the current valuation date compared to corresponding values from the prior valuation date.

State 5 th Level	June 30, 2017	June 30, 2018
Covered Active Members	76,638	77,362
Beneficiaries Included in the Valuation		
Deferred (eligible, but not yet receiving benefits)	305	298
Receiving Benefits	1,433	1,420
Total	1,738	1,718
Present Value of Benefits	\$148,606,323	\$149,571,393
Market Value of Assets (MVA)	107,536,929	110,568,331
Unfunded Liability/(Excess Assets)	41,069,394	39,003,062
Required Employer Monthly Premium Per Member		
Before Amortization of Unfunded Liability/(Excess Assets)	\$7.30	\$7.40
After Amortization of Unfunded Liability/(Excess Assets)	\$10.70	\$10.80
After Employer/Employee Premium Sharing	\$5.35	\$5.40
Funded Ratio Based on MVA	72.4%	73.9%
Schools 5 th Level	June 30, 2017	June 30, 2018
Covered Active Members	10,557	10,894
Beneficiaries Included in the Valuation		
Deferred (eligible, but not yet receiving benefits)	21	18
Receiving Benefits	143	148
Total	164	166
Present Value of Benefits	\$12,859,562	\$13,952,547
Market Value of Assets (MVA)	76,938,556	82,038,098
Unfunded Liability/(Excess Assets)	(64,078,994)	(68,085,552)
Required Employer Monthly Premium Per Member		
Before Amortization of Unfunded Liability/(Excess Assets)	\$4.30	\$4.20
After Amortization of Unfunded Liability/(Excess Assets)	\$0.00	\$0.00
After Employer/Employee Premium Sharing	\$0.00	\$0.00
Funded Ratio Based on MVA	598.3%	588.0%

Liabilities and Funding Requirements (continued)

Comparison of Current and Prior Year Results (continued)

Public Agency 1 st Level	June 30, 2017	June 30, 2018
Covered Active Members	7,488	7,349
Beneficiaries Included in the Valuation		
Deferred (eligible, but not yet receiving benefits)	27	25
Receiving Benefits	104	108
Total	131	133
Present Value of Benefits	\$2,822,582	\$2,908,667
Market Value of Assets (MVA)	48,304,912	52,177,082
Unfunded Liability/(Excess Assets)	(45,482,330)	(49,268,415)
Required Employer Monthly Premium Per Member		
Total Premium Required	\$1.40	\$1.40
Premium Required After Employee Contributions	\$0.00	\$0.00
Employer Premium After Amortization of Unfunded Liability/(Excess Assets)	\$0.00	\$0.00
Funded Ratio Based on MVA	1,711.4%	1,793.8%
Public Agency 2 nd Level	June 30, 2017	June 30, 2018
Covered Active Members	4,071	4,076
Beneficiaries Included in the Valuation		
Deferred (eligible, but not yet receiving benefits)	18	18
Receiving Benefits	77	76
Total	95	94
Present Value of Benefits	\$2,388,895	\$2,428,704
Market Value of Assets (MVA)	11,477,764	12,307,348
Unfunded Liability/(Excess Assets)	(9,088,869)	(9,878,644)
Required Employer Monthly Premium Per Member		
Total Premium Required	\$1.80	\$1.80
Premium Required After Employee Contributions	\$0.00	\$0.00
Employer Premium After Amortization of Unfunded Liability/(Excess Assets)	\$0.00	\$0.00
Funded Ratio Based on MVA	480.5%	506.7%
Public Agency 3 rd Level	June 30, 2017	June 30, 2018
Covered Active Members	46,004	45,694
Beneficiaries Included in the Valuation		
Deferred (eligible, but not yet receiving benefits)	182	184
Receiving Benefits	567	581
Total	749	765
Present Value of Benefits	\$29,473,240	\$30,510,650
Market Value of Assets (MVA)	113,940,781	120,740,841
Unfunded Liability/(Excess Assets)	(84,467,541)	(90,230,191)
Required Employer Monthly Premium Per Member		
Total Premium Required	\$2.80	\$2.70
Premium Required After Employee Contributions	\$0.80	\$0.70
Employer Premium After Amortization of Unfunded Liability/(Excess Assets)	\$0.00	\$0.00
Funded Ratio Based on MVA	386.6%	395.7%

Liabilities and Funding Requirements (continued)

Comparison of Current and Prior Year Results (continued)

Public Agency 4 th Level	June 30, 2017	June 30, 2018
Covered Active Members	72,467	72,362
Beneficiaries Included in the Valuation		
Deferred (eligible, but not yet receiving benefits)	223	216
Receiving Benefits	971	1,004
Total	1,194	1,220
Present Value of Benefits	\$134,547,904	\$141,358,235
Market Value of Assets (MVA)	145,771,600	151,267,552
Unfunded Liability/(Excess Assets)	(11,223,696)	(9,909,316)
Required Employer Monthly Premium Per Member		
Total Premium Required	\$7.50	\$7.40
Premium Required After Employee Contributions	\$5.50	\$5.40
Employer Premium After Amortization of Unfunded Liability/(Excess Assets)	\$4.70	\$4.80
Funded Ratio Based on MVA	108.3%	107.0%

Public Agency Indexed Level	June 30, 2017	June 30, 2018
Covered Active Members	11,033	10,858
Beneficiaries Included in the Valuation		
Deferred (eligible, but not yet receiving benefits)	18	21
Receiving Benefits	118	114
Total	136	135
Present Value of Benefits	\$19,330,537	\$20,261,829
Market Value of Assets (MVA)	24,443,312	25,933,332
Unfunded Liability/(Excess Assets)	(5,112,775)	(5,671,503)
Required Employer Monthly Premium Per Member		
Before Amortization of Unfunded Liability/(Excess Assets)	\$7.20	\$8.70
After Amortization of Unfunded Liability/(Excess Assets)	\$4.20	\$5.80
After Employer/Employee Premium Sharing	\$2.10	\$2.90
Funded Ratio Based on MVA	126.4%	128.0%

Liabilities and Funding Requirements (continued)

Development of Funding Requirements

The following table develops the annual premiums required for 2019-20 for the State 5th and Schools 5th Level Pools.

June 30, 2018	State 5 th Level	Schools 5 th Level
1) Development of Unfunded Liability		
a) Present Value of Future Survivor Benefits	\$149,571,393	\$13,952,547
b) Market Value of Assets	110,568,331	82,038,098
c) Unfunded Accrued Liability/(Excess Assets) [(1a) - (1b)]	\$39,003,062	(\$68,085,552)
2) Development of Normal Cost		
a) Present Value of Benefits for 2014 - 2017 Deaths	\$27,744,091	\$1,890,231
b) Number of 2014 - 2017 Member Months	3,595,680	499,116
c) Total Per Member, Per Month 2018/2019 Term Insurance Normal Cost	\$7.30	\$4.30
d) Total Per Member, Per Month 2019/2020 Term Insurance Normal Cost [.25 * (2a) / (2b) + .75 * (2c)], rounded to nearest \$0.10	\$7.40	\$4.20
3) 2019 Projected Unfunded Liability		
a) 2018 Unfunded Accrued Liability/(Excess Assets) as of June 30, 2019 [(1c) * 1.07]	\$41,733,276	(\$72,851,540)
b) Projected Normal Cost Accrual 2018-2019 with Interest	7,338,595	595,468
c) Projected Employer Contributions 2018-2019 with Interest	5,128,833	—
d) Projected Employee Contributions 2018-2019 with Interest	5,128,833	274,251
e) Total Projected UAL/(Excess Assets) as of June 30, 2019 [(3a) + (3b) - (3c) - (3d)]	\$38,814,204	(\$72,530,323)
4) 2019/2020 Required Contribution		
a) Required Normal Cost Per Member, Per Month [(2d)]	\$7.40	\$4.20
b) Projected Active Members as of 6/30/2019	77,100	11,200
c) Required Normal Cost Contribution [12 * (4a) * (4b) * (1.07) ^{1/2}]	\$7,082,054	\$583,903
d) Amortization of the UAL/(Excess Assets) ¹	2,945,186	(583,903)
e) Total Required Contribution Per Member, Per Month [((4c) + (4d)) / ((4b)*12)], Rounded to Nearest \$0.10	\$10.80	\$0.00
f) Amortization Period	see table on pg 16	N/A
5) 2019/2020 Required Employer and Employee Premiums with Cost Sharing Provision		
a) Required Employee Premium Per Member, Per Month [maximum (\$2, (4e) / 2)]	\$5.40	\$2.00
b) Required Employer Premium Per Member, Per Month [maximum (\$0, (4e) - (5a))]	\$5.40	\$0.00

(1) See amortization schedule on Page 16

Liabilities and Funding Requirements (continued)

Development of Funding Requirements (continued)

The following table develops the annual premiums required for 2019-20 for the Public Agency 1st, 2nd, 3rd, and 4th Level Pools.

June 30, 2018	Public Agency 1 st Level	Public Agency 2 nd Level	Public Agency 3 rd Level	Public Agency 4 th Level
1) Development of Unfunded Liability				
a) Present Value of Future Survivor Benefits	\$2,908,667	\$2,428,704	\$30,510,650	\$141,358,235
b) Market Value of Assets	52,177,082	12,307,348	120,740,841	151,267,552
c) Unfunded Accrued Liability/(Excess Assets) [(1a) – (1b)]	(\$49,268,415)	(\$9,878,644)	(\$90,230,191)	(\$9,909,316)
2) Development of Normal Cost				
a) Present Value of Benefits for 2014 – 2017 Deaths ¹	\$9,004,419	\$11,255,523	\$17,508,592	\$47,523,320
b) Number of 2014 – 2017 Member Months ¹	6,570,564	6,570,564	6,570,564	6,570,564
c) Total Per Member, Per Month 2018/2019 Term Insurance Normal Cost	\$1.40	\$1.80	\$2.70	\$7.40
d) Total Per Member, Per Month 2019/2020 Term Insurance Normal Cost [.25 * (2a) / (2b) + .75 * (2c)], rounded to nearest \$0.10	\$1.40	\$1.80	\$2.70	\$7.40
3) 2019 Projected Unfunded Liability				
a) 2018 Unfunded Accrued Liability as of June 30, 2019 [(1c) * 1.07]	(\$52,717,204)	(\$10,570,149)	(\$96,546,305)	(\$10,602,968)
b) Projected Normal Cost Accrual 2018-2019 with Interest	131,680	94,473	1,592,599	6,858,922
c) Projected Employer Contributions 2018-2019 with Interest	—	—	—	4,211,084
d) Projected Employee Contributions 2018-2019 with Interest	181,837	101,488	1,140,671	1,791,951
e) Total Projected UAL as of June 30, 2019 [(3a) + (3b) - (3c) - (3d)]	(\$52,767,361)	(\$10,577,164)	(\$96,094,377)	(\$9,747,081)
4) 2019/2020 Required Contribution				
a) Required Normal Cost Per Member, Per Month [(2d)]	\$1.40	\$1.80	\$2.70	\$7.40
b) Projected Active Members as of 6/30/2019	7,300	4,100	46,200	72,000
c) Required Normal Cost Contribution [12 * (4a) * (4b) * (1.07) ^{1/2}]	\$126,860	\$91,607	\$1,548,385	\$6,613,591
d) Amortization of the UAL/(Excess Assets)	(126,860)	(91,607)	(1,548,385)	(759,354)
e) Total Required Contribution Per Member, Per Month [((4c) + (4d)) / ((4b)*12)], Rounded to Nearest \$0.10	\$0.00	\$0.00	\$0.00	\$6.80
f) Amortization Period	N/A	N/A	N/A	30-year
5) 2019/2020 Required Employer and Employee Premiums				
a) Required Employee Premium Per Member, Per Month	\$2.00	\$2.00	\$2.00	\$2.00
b) Required Employer Premium Per Member, Per Month [maximum (\$0, (4e) – (5a))]	\$0.00	\$0.00	\$0.00	\$4.80

(1) Mortality experience and survivor distribution are assumed to be homogeneous across all Public Agency pools and are added together to develop normal costs in order to improve credibility of the data. This is further explained in the Actuarial Funding Methods section.

Liabilities and Funding Requirements (continued)

Development of Funding Requirements (continued)

The following table develops the annual premiums required for 2019-20 for the Public Agency Indexed Level Pool.

June 30, 2018	Public Agency Indexed Level
1) Development of Unfunded Liability	
a) Present Value of Future Benefits for Active Members	\$12,272,438
b) Present Value of Future Benefits for Current Survivors	15,938,089
c) Total Present Value of Future Benefits [(1a) + (1b)]	\$28,210,527
d) Present Value of Future Normal Costs	\$7,948,698
e) Entry Age Normal Total Accrued Liability [(1c) - (1d)]	\$20,261,829
f) Market Value of Assets	\$25,933,332
g) Unfunded Accrued Liability/(Excess Assets) [(1e) - (1f)]	(\$5,671,503)
2) Development of Normal Cost	
a) Required Entry Age Normal Cost	\$1,137,577
b) Active Members as of June 30, 2018	10,858
c) Total Per Member, Per Month Entry Age Normal Cost [(2a) / (2b) * 12], Rounded to Nearest \$0.10	\$8.70
3) 2019 Projected Unfunded Liability	
a) 2018 Unfunded Accrued Liability/(Excess Assets) as of June 30, 2019 [(1g) * 1.07]	(\$6,068,508)
b) Projected Normal Cost Accrual 2018-2019 with Interest	1,220,593
c) Projected Employer Contributions 2018-2019 with Interest	284,887
d) Projected Employee Contributions 2018-2019 with Interest	284,887
e) Total Projected UAL/(Excess Assets) as of June 30, 2019 [(3a) + (3b) - (3c) - (3d)]	(\$5,417,690)
4) 2019/2020 Required Contribution	
a) Required Normal Cost Per Member, Per Month [(2c)]	\$8.70
b) Projected Active Members as of 6/30/2019	11,000
c) Required Normal Cost Contribution [12 * (4a) * (4b) * (1.07) ^{1/2}]	\$1,187,914
d) Amortization of the UAL/(Excess Assets)	(422,070)
e) Total Required Contribution Per Member, Per Month [((4c) + (4d)) / ((4b)*12)], Rounded to Nearest \$0.10	\$5.80
f) Amortization Period	30-year
5) 2019/2020 Required Employer and Employee Premiums with Cost Sharing Provision	
a) Required Employee Premium Per Member, Per Month [maximum (\$2, (4e) / 2)]	\$2.90
b) Required Employer Premium Per Member, Per Month [maximum (\$0, (4e) - (5a))]	\$2.90

Liabilities and Funding Requirements (continued)

Schedule of Amortization Bases

The schedule below shows the development of the required payments on the Amortization Bases in accordance with the Amortization Policy. In accordance with Board policy, a plan with a funding excess will have their funding excess amortized over a minimum of 30 years.

State 5th Level Pool

	Date Established	Remaining Period	Projected Balance 6/30/2018	Payment 2018-19	Projected Balance 6/30/2019	Payment 2019-20	Projected Balance 6/30/2020	Projected Payment 2020-21
Unfunded Liability	6/30/2013	25	\$36,141,358	\$3,019,464	\$35,547,895	\$2,948,917	\$34,985,865	\$2,948,917
Experience (Gain)/Loss	6/30/2014	26	(15,104,713)	(1,042,034)	(15,084,154)	(1,272,858)	(14,823,390)	(1,272,858)
Experience (Gain)/Loss	6/30/2015	27	10,921,236	575,216	11,090,715	748,820	11,092,479	936,025
Assumption Change	6/30/2016	18	1,528,375	69,397	1,563,577	102,180	1,567,332	136,239
Experience (Gain)/Loss	6/30/2016	28	8,854,858	321,762	9,141,865	470,679	9,294,921	627,572
Assumption Change	6/30/2017	19	1,597,568	38,005	1,670,085	74,496	1,709,932	111,744
Experience (Gain)/Loss	6/30/2017	29	(2,603,580)	(49,796)	(2,734,321)	(96,980)	(2,825,408)	(145,469)
Assumption Change	6/30/2018	20			3,048,505	71,110	3,203,142	142,219
Experience (Gain)/Loss	6/30/2018	30			(5,429,962)	(101,178)	(5,705,399)	(202,356)
Total			\$41,335,102	\$2,932,014	\$38,814,204	\$2,945,186	\$38,484,675	\$3,282,033

(Gain)/Loss Analysis 06/30/17 – 06/30/18

The following table develops the asset and demographic gains and losses between June 30, 2017 and June 30, 2018 for the State and Schools 5th Level Pools.

	State 5 th Level	Schools 5 th Level
Amounts as of 6/30/2017		
1) Present Value of Benefits	\$148,606,323	\$12,859,562
2) Market Value of Assets	107,536,929	76,938,556
3) Unfunded Liability/(Excess Assets) [(1) - (2)]	\$41,069,394	(\$64,078,994)
Amounts During the Period 6/30/2017 - 6/30/2018		
4) Expected Claims for the Fiscal Year	\$6,717,480	\$550,862
5) Employer and Employee Premiums Collected	9,337,492	220,138
6) Benefit Payments	(15,015,394)	(1,350,728)
7) Net Liabilities Transferred into the Level Pool	—	—
8) Net Assets Transferred into the Level Pool	—	—
Expected Amounts as of 6/30/2018		
9) Change in Accrued Liability due to Assumption Change	\$3,048,505	\$265,235
10) Expected Present Value of Benefits [(1) * 1.0725 + ((4) + (6) + (7)) * (1.0725) ^{1/2} + (9)]	153,835,336	13,228,761
11) Expected Market Value of Assets [(2) * 1.0725 + ((5) + (6) + (8)) * (1.0725) ^{1/2}]	109,453,231	81,345,745
12) Expected Unfunded Liability/(Excess Assets) [(10) - (11)]	\$44,382,105	(\$68,116,984)
Amounts as of 6/30/2018		
13) Present Value of Benefits	\$149,571,393	\$13,952,547
14) Market Value of Assets	110,568,331	82,038,098
15) Unfunded Liability/(Excess Assets) [(13) - (14)]	\$39,003,062	(\$68,085,552)
(Gain)/Loss for the Period 6/30/2017 - 6/30/2018		
16) Liability (Gain)/Loss [(13) - (10)]	(\$4,263,943)	\$723,785
17) Asset (Gain)/Loss [(11) - (14)]	(1,115,100)	(692,354)
18) Total (Gain)/Loss [(16) + (17)]	(\$5,379,043)	\$31,432

Liabilities and Funding Requirements (continued)

(Gain)/Loss Analysis 06/30/17 – 06/30/18 (continued)

The following table develops the asset and demographic gains and losses between June 30, 2017 and June 30, 2018 for the Public Agency 1st, 2nd, 3rd, and 4th Level Pools.

	Public Agency 1 st Level	Public Agency 2 nd Level	Public Agency 3 rd Level	Public Agency 4 th Level
Amounts as of 6/30/2017				
1) Present Value of Benefits	\$2,822,582	\$2,388,895	\$29,473,240	\$134,547,904
2) Market Value of Assets	48,304,912	11,477,764	113,940,781	145,771,600
3) Unfunded Liability/(Excess Assets) [(1) - (2)]	(\$45,482,330)	(\$9,088,869)	(\$84,467,541)	(\$11,223,696)
Amounts During the Period 6/30/2017 - 6/30/2018				
4) Expected Claims for the Fiscal Year	\$125,521	\$86,032	\$1,507,515	\$6,456,477
5) Employer and Employee Premiums Collected	175,857	96,398	1,067,705	6,162,979
6) Benefit Payments	(240,028)	(198,697)	(2,675,258)	(12,964,609)
7) Net Liabilities Transferred into the Level Pool	—	—	(132,805)	360,469
8) Net Assets Transferred into the Level Pool	—	—	(812,421)	812,421
Expected Amounts as of 6/30/2018				
9) Change in Accrued Liability due to Assumption Change	\$59,888	\$48,865	\$637,284	\$2,935,246
10) Expected Present Value of Benefits [(1)*1.0725 + ((4)+(6)+(7))*(1.0725) ^{1/2} +(9)]	2,968,522	2,494,277	30,900,467	140,871,257
11) Expected Market Value of Assets [(2) * 1.0725 + ((5) + (6) + (8)) * (1.0725) ^{1/2}]	51,740,561	12,203,958	119,695,325	150,137,522
12) Expected Unfunded Liability/(Excess Assets) [(10) - (11)]	(\$48,772,039)	(\$9,709,681)	(\$88,794,858)	(\$9,266,265)
Amounts as of 6/30/2018				
13) Present Value of Benefits	\$2,908,667	\$2,428,704	\$30,510,650	\$141,358,235
14) Market Value of Assets	52,177,082	12,307,348	120,740,841	151,267,552
15) Unfunded Liability/(Excess Assets) [(13) - (14)]	(\$49,268,415)	(\$9,878,644)	(\$90,230,191)	(\$9,909,316)
(Gain)/Loss for the Period 6/30/2017 - 6/30/2018				
16) Liability (Gain)/Loss [(13) - (10)]	(\$59,856)	(\$65,573)	(\$389,817)	\$486,979
17) Asset (Gain)/Loss [(11) - (14)]	(436,520)	(103,390)	(1,045,517)	(1,130,030)
18) Total (Gain)/Loss [(16) + (17)]	(\$496,376)	(\$168,963)	(\$1,435,333)	(\$643,051)

Liabilities and Funding Requirements (continued)

(Gain)/Loss Analysis 06/30/17 – 06/30/18 (continued)

The following table develops the asset and demographic gains and losses between June 30, 2017 and June 30, 2018 for the Public Agency Indexed Level Pool.

	Public Agency Indexed Level
Amounts as of 6/30/2017	
1) Accrued Liability	\$19,330,537
2) Market Value of Assets	24,443,312
3) Unfunded Liability/(Excess Assets) [(1) - (2)]	(\$5,112,775)
Amounts During the Period 6/30/2017 - 6/30/2018	
4) Expected Claims for the Fiscal Year	\$957,512
5) Employer and Employee Premiums Collected	888,612
6) Benefit Payments	(1,357,616)
7) Net Liabilities Transferred into the Level Pool	—
8) Net Assets Transferred into the Level Pool	—
Expected Amounts as of 6/30/2018	
9) Change in Accrued Liability due to Assumption Change	\$640,227
10) Expected Present Value of Benefits [(1) * 1.0725 + ((4) + (6) + (7)) * (1.0725) ^{1/2} + (9)]	20,957,874
11) Expected Market Value of Assets [(2) * 1.0725 + ((5) + (6) + (8)) * (1.0725) ^{1/2}]	25,729,744
12) Expected Unfunded Liability/(Excess Assets) [(10) - (11)]	(\$4,771,870)
Amounts as of 6/30/2018	
13) Accrued Liability	\$20,261,829
14) Market Value of Assets	25,933,332
15) Unfunded Liability/(Excess Assets) [(13) - (14)]	(\$5,671,503)
(Gain)/Loss for the Period 6/30/2017 - 6/30/2018	
16) Liability (Gain)/Loss [(13) - (10)]	(\$696,045)
17) Asset (Gain)/Loss [(11) - (14)]	(203,588)
18) Total (Gain)/Loss [(16) + (17)]	(\$899,633)

Risk Analysis

20 Analysis of Future Investment Return Scenarios

21 Analysis of Discount Rate Sensitivity

Risk Analysis

Analysis of Future Investment Return Scenarios

The following analysis looks at what the 2020-21 contributions would be under four different investment return scenarios. This type of analysis can give the reader a sense of the short-term risk to the contributions.

The first scenario is what one would expect if the markets were to give us a 5th percentile return without considering we are already at an approximate return of 1.65 percent so far for the 2018-19 Fiscal Year (thru February 20, 2019). The 5th percentile return corresponds to a negative 10 percent return for the 2018-19 Fiscal Year. The second scenario assumes an approximate return of 1.5 percent, the rate of return attained so far this fiscal year. The third scenario assumed the return would be our assumed 7 percent. The last scenario is what one would expect if the markets were to give us a 95th percentile return notwithstanding the 1.5 percent year-to-date return for the current fiscal year. This 95th percentile return is equivalent to around 26 percent. A 26 percent return would trigger a reduction in the discount rate by 0.25 percent in accordance with the Risk Mitigation Policy but with the temporary suspension of the Risk Mitigation Policy, this reduction has not been reflected under that scenario.

The tables below shows 2020-21 projected employee and employer contributions under the return scenarios mentioned above.

(10%) Return

	2020-21 Employer Monthly Premium	2020-21 Employee Monthly Premium
State 5 th Level	\$5.50	\$5.50
Schools 5 th Level	0.00	2.00
PA 1 st Level	0.00	2.00
PA 2 nd Level	0.00	2.00
PA 3 rd Level	0.00	2.00
PA 4 th Level	7.30	2.00
PA Indexed Level	4.20	4.20

1.5% Return

	2020-21 Employer Monthly Premium	2020-21 Employee Monthly Premium
State 5 th Level	\$5.40	\$5.40
Schools 5 th Level	0.00	2.00
PA 1 st Level	0.00	2.00
PA 2 nd Level	0.00	2.00
PA 3 rd Level	0.00	2.00
PA 4 th Level	5.50	2.00
PA Indexed Level	3.30	3.30

7% Return

	2020-21 Employer Monthly Premium	2020-21 Employee Monthly Premium
State 5 th Level	\$5.35	\$5.35
Schools 5 th Level	0.00	2.00
PA 1 st Level	0.00	2.00
PA 2 nd Level	0.00	2.00
PA 3 rd Level	0.00	2.00
PA 4 th Level	4.80	2.00
PA Indexed Level	2.90	2.90

26% Return

	2020-21 Employer Monthly Premium	2020-21 Employee Monthly Premium
State 5 th Level	\$5.10	\$5.10
Schools 5 th Level	0.00	2.00
PA 1 st Level	0.00	2.00
PA 2 nd Level	0.00	2.00
PA 3 rd Level	0.00	2.00
PA 4 th Level	2.20	2.00
PA Indexed Level	0.90	2.00

Risk Analysis (continued)

Analysis of Discount Rate Sensitivity

The following analysis looks at what the 2019-20 contributions would be under two different discount rate scenarios. We determined the required contributions using discount rates that are 1 percent lower and 1 percent higher than the valuation discount rate of 7 percent. This analysis will give an indication of the potential required contributions if the PERF had investment returns of 6 percent or 8 percent over the long-term.

This type of analysis can give employers a sense of the long-term risk to the contributions.

6% Discount Rate (-1%)

	2019-20 Employer Monthly Premium	2019-20 Employee Monthly Premium
State 5 th Level	\$5.95	\$5.95
Schools 5 th Level	0.00	2.00
PA 1 st Level	0.00	2.00
PA 2 nd Level	0.00	2.00
PA 3 rd Level	0.00	2.00
PA 4 th Level	6.40	2.00
PA Indexed Level	4.50	4.50

Increase in Contribution

	2019-20 Employer Monthly Premium	2019-20 Employee Monthly Premium
State 5 th Level	\$0.55	\$0.55
Schools 5 th Level	0.00	0.00
PA 1 st Level	0.00	0.00
PA 2 nd Level	0.00	0.00
PA 3 rd Level	0.00	0.00
PA 4 th Level	1.60	0.00
PA Indexed Level	1.60	1.60

8% Discount Rate (+1%)

	2019-20 Employer Monthly Premium	2019-20 Employee Monthly Premium
State 5 th Level	\$5.00	\$5.00
Schools 5 th Level	0.00	2.00
PA 1 st Level	0.00	2.00
PA 2 nd Level	0.00	2.00
PA 3 rd Level	0.00	2.00
PA 4 th Level	3.00	2.00
PA Indexed Level	1.00	2.00

Decrease in Contribution

	2019-20 Employer Monthly Premium	2019-20 Employee Monthly Premium
State 5 th Level	(\$0.40)	(\$0.40)
Schools 5 th Level	0.00	0.00
PA 1 st Level	0.00	0.00
PA 2 nd Level	0.00	0.00
PA 3 rd Level	0.00	0.00
PA 4 th Level	(1.80)	0.00
PA Indexed Level	(1.90)	(0.90)

Appendices

A-1 Appendix A – Statement of Actuarial Methods and Assumptions

B-1 Appendix B – Summary of Principal Plan Provisions

C-1 Appendix C – Demographic and Experience Information

D-1 Appendix D – 1959 Survivor Deaths Per Year

E-1 Appendix E – Glossary of Actuarial Terms

Appendix A – Statement of Actuarial Methods and Assumptions

Actuarial Funding Method for Public Agency 1st, 2nd, 3rd, and 4th Level, and State and Schools 5th Level Pools

The actuarial funding method used, as provided in State statute for Public Agency 1st, 2nd, 3rd, and 4th level, and State and Schools 5th level pools, is called the Term Insurance method. This is a terminal funding arrangement with no pre-funding of the survivor benefits payable on account of deaths expected to occur beyond those in the coming year.

The Normal Cost for the year is equal to the Expected Claims (present value of benefits arising from deaths) that will occur in the coming fiscal year. The expected claims for the coming fiscal year is determined as the expected claim per member, per month multiplied by the expected member months for the coming fiscal year. The Normal Cost (or Expected Claims) per member, per month for the coming fiscal year is equal to a weighted average of the prior year and current year Normal Cost. Specifically, the current year's Normal Cost is calculated as the present value of member deaths for the past 4 years divided by the total number of members exposed to the death benefit over the same period. Then the Normal Cost (Expected Claims) for the coming year is simply 25 percent of the current year's Normal Cost and 75 percent of the prior year's Normal Cost. The reason for this methodology is that when new deaths occur each year, it is often unknown which benefit will ultimately apply (i.e. 1957 Survivor, Industrial Death, Pre-Retirement Option 2 or 1959 Survivor). Many times, new deaths are initially placed under the 1959 Survivor roll, but ultimately are reclassified to another roll some time later. This can create extreme volatility in the Normal Cost calculation between valuation years, especially for smaller pools.

The consequence of this approach is that less weight is given to the most recent year's data and more weight is given to previous years. In fact, as this methodology matures or reaches a steady state, all data from the past would have some impact on the calculated Normal Cost. The following matrix shows ultimate weights for the past ten year's data as the methodology approaches its steady state:

Data 't' Years Ago	Weights
0	6.3%
1	10.9%
2	14.5%
3	17.1%
4	12.8%
5	9.6%
6	7.2%
7	5.4%
8	4.1%
9	3.0%
10	6.3%

For Public Agency 1st, 2nd, 3rd, and 4th Levels, the Present Value of Benefits for 2014-2017 Deaths for each level are calculated as if all members of all four levels who died from 2014-2017 were members of that particular level.

The Accrued Liability is equal to the Present Value of Benefits payable to current survivors. If the Accrued Liability exceeds the Market Value of Assets, the difference is called the Unfunded Liability. On the other hand, if the Market Value of Assets exceeds the Accrued Liability, the difference is called Excess Assets.

Appendix A - Statement of Actuarial Methods and Assumptions (continued)

Actuarial Funding Method for Public Agency 1st, 2nd, 3rd and 4th Level, and State and Schools 5th Level Pools (continued)

The required employer monthly premium is the total required monthly premium less the \$2.00 per month member contributions as required by State Statute Section 21581. For all levels, existing excess assets in the pool will be amortized and directly used to offset required employer contributions. However, for the State and Schools 5th Level pools, if the total required monthly premium after amortization of excess assets exceeds \$4.00, the member and the employer shall evenly share the required monthly premium. For the current valuation date, the unfunded liability for the State 5th Level pool was amortized using CalPERS amortization policy. Excess assets for the Schools 5th Level pool, and Public Agency 1st, 2nd, and 3rd Level pools were sufficient to offset required employer contributions indefinitely, based on June 30, 2018 data and assumptions. Excess assets for the Public Agency 4th Level were amortized over a 30-year period, and are not sufficient to fully offset the required employer contribution. The resulting employer contribution for the 4th Level is \$4.80 per covered member per month.

Actuarial Funding Method for Public Agency Indexed Level Pool

The funding method used for the Public Agency Indexed Level pool is the Entry Age Normal method. Under this method, projected benefits are determined for all members and the associated liabilities are spread in a manner that produces an annual cost that increases by approximately 2 percent in each year.

The Normal Cost for the Public Agency Indexed Level pool is the portion of the total Entry Age Normal Cost, as described in the preceding paragraph that is allocated to the current fiscal year. Since there is no cost allocated to the current fiscal year for those already receiving benefits or are in a deferred status, only active members have a Normal Cost. The population demographics, excluding population growth, are assumed to remain stable for purposes of projecting the Normal Cost to the year for which the contribution requirement is being determined.

The Accrued Liability is equal to the Present Value of Future Benefits for both current survivors and active members, less the Present Value of Future Normal Costs.

The total required monthly premium is the sum of the individual Normal Costs divided by the number of member months. The required employer monthly premium is the total required monthly premium less the \$2.00 per month member contributions as required by State Statute Section 21581. Existing excess assets in the pool will be amortized and directly used to offset required employer contributions. However, if the total required monthly premium after amortization of excess assets exceeds \$4.00, the member and the employer shall evenly share the required monthly premium. Excess assets for the Public Agency Indexed Level are amortized over a 30-year period. The resulting employer contribution for the Indexed Level is \$2.90 per covered member per month.

Asset Valuation Method

Commencing with the June 30, 2013 valuation, assets were and continue to be valued on a Market Value basis.

Method for Projecting Active Counts

In the past, actuarial staff has found that two particular methods have worked well in predicting future active member counts for the pools. Projected counts are necessary to determine employer premiums. The two methods that are normally used are linear trend or autoregressive models. For this valuation year, we will continue to use these models for the Public Agency Pools. They model a stable pool with little growth or shrinkage in the 1st, 2nd, and 3rd Level pools and modest declines for the 4th and Indexed pools. This is indicative of a decline in the migration from the lower levels to the higher ones.

These methods when applied to the State and Schools Pools are also predicting small growth for State and stable enrollments for Schools. This is consistent with current hiring practices of the State and the fact that new migration into and out of these pools do not take place.

Appendix A - Statement of Actuarial Methods and Assumptions (continued)

Actuarial Assumptions

The actuarial assumptions used in this valuation include the investment return rate and the mortality rates for current beneficiaries. These assumptions are shown below. Actual mortality rates for active members of all pools combined are shown in Appendix D and are used in the calculation of the annual normal costs, except for the Public Agency Indexed Level.

Economic Assumptions

Investment Return 7% compounded annually (net of administrative expenses)

Demographic Assumptions:

The mortality assumptions are based on mortality rates resulting from the most recent CalPERS Experience Study adopted by the CalPERS Board. For purposes of the mortality rates, the revised rates include 15 years of projected on-going mortality improvement using 90 percent of Scale MP 2016 published by the Society of Actuaries. For more details, please refer to the experience study report that can be found on the CalPERS website.

Sample post-retirement mortality rates are shown in the following table:

Attained Age	Healthy Recipients	
	Male	Female
35	0.00049	0.00027
40	0.00064	0.00037
45	0.00080	0.00054
50	0.00372	0.00346
55	0.00437	0.00410
60	0.00671	0.00476
65	0.00928	0.00637
70	0.01339	0.00926
75	0.02316	0.01635
80	0.03977	0.03007
85	0.07122	0.05418
90	0.13044	0.10089
95	0.21658	0.17698
100	0.32222	0.28151
105	0.46691	0.43491
110	1.00000	1.00000

Appendix A - Statement of Actuarial Methods and Assumptions (continued)

Economic Assumptions

The Public Agency Indexed Level's Accrued Liability and Entry Age Normal cost for active members are calculated based on the actuarial assumptions for our Public Agency miscellaneous 2% @ 55 and police 2% @ 50 pension plans. The final valuation results equals the sum of the results valued on the basis of a miscellaneous 2% @ 55 plan plus the results valued on the basis of a police 2% @ 50 plan, where all miscellaneous employees of plans contracting for the Public Agency Indexed Level of 1959 Survivor benefits are valued using miscellaneous 2% @ 55 assumptions, and all safety employees of plans contracting for the Public Agency Indexed Level of 1959 Survivor benefits are valued using police 2% @ 50 assumptions.

The actuarial assumptions for each of these plans are as follows:

Eligible Survivor Status

For active members of both the Miscellaneous and Safety plans, the probability of having eligible survivor(s) at the date of death is assumed according to the following table:

Age at Death	Percent Having Eligible Survivor(s)
Age 20 and Under	30%
Between Ages 21 and 24	50%
Between Ages 25 and 29	70%
Between Ages 30 and 39	90%
Between Ages 40 and 49	95%
Between Ages 50 and 54	90%
Age 55 and Above	85%

Average claims are developed at every age using actual experience from the program. These average claims are then multiplied by the percentages in the above table. The results are used to estimate expected claims in the active population.

Benefit amounts and Present Value of benefits were based on average claim experience. A sample of the average claim experience is shown in the table below:

Age at Death	Present Value of Average Claim ¹ at the Time of Death ²	Age at Death	Present Value of Average Claim ¹ at the Time of Death ²
Age 20 and Under	\$34,494	55	\$74,956
25	108,021	60	68,012
30	148,744	65	65,522
35	142,233	70	65,459
40	133,958	75	64,271
45	114,749	Age 80 and Above	56,876
50	91,960		

(1) Average claims were calculated using actual experience from the 1959 Survivor program and smoothed using a polynomial regression model.

(2) Values are based on an initial benefit of \$500/\$1,000/\$1,500 for one, two, or three survivors, respectively. This was the benefit level on June 30, 2000, when the Indexed Level first became effective. The valuation program increases these amounts by 2 percent per year up to the current valuation year.

Appendix A - Statement of Actuarial Methods and Assumptions (continued)

Additional Actuarial Assumptions Applicable to the Public Agency Indexed Level (continued)

Public Agency Miscellaneous 2% @ 55

Non-Industrial (Not Job-Related) Death and Non-Industrial (Not Job-Related) Disability

Rates vary by age and sex. See sample rates in table below.

Attained Age	Non-Industrial (Not Job-Related)			
	Male		Female	
	Death	Disability	Death	Disability
20	0.000216	0.000170	0.000069	0.000100
25	0.000289	0.000170	0.000109	0.000100
30	0.000379	0.000190	0.000155	0.000240
35	0.000491	0.000390	0.000270	0.000710
40	0.000637	0.001020	0.000366	0.001350
45	0.000795	0.001510	0.000543	0.001880
50	0.001161	0.001580	0.000794	0.001990
55	0.001717	0.001580	0.001204	0.001490
60	0.002550	0.001530	0.001657	0.001050

Service Retirement

Rates vary by age and sex. See sample rates in table below.

Attained Age	Years of Service						
	5	10	15	20	25	30	35
50	0.008	0.013	0.018	0.021	0.022	0.033	0.050
51	0.009	0.016	0.020	0.023	0.026	0.036	0.050
52	0.015	0.018	0.020	0.021	0.025	0.030	0.050
53	0.016	0.020	0.024	0.028	0.031	0.035	0.050
54	0.018	0.022	0.026	0.030	0.034	0.038	0.050
55	0.040	0.040	0.056	0.093	0.109	0.154	0.210
56	0.034	0.050	0.066	0.092	0.107	0.138	0.200
57	0.042	0.048	0.058	0.082	0.096	0.127	0.168
58	0.046	0.054	0.062	0.090	0.106	0.131	0.171
59	0.045	0.055	0.066	0.097	0.115	0.144	0.178
60	0.058	0.075	0.093	0.126	0.143	0.169	0.207
61	0.065	0.088	0.111	0.146	0.163	0.189	0.231
62	0.136	0.118	0.148	0.190	0.213	0.247	0.258
63	0.130	0.133	0.174	0.212	0.249	0.285	0.313
64	0.113	0.129	0.165	0.196	0.223	0.249	0.275
65	0.145	0.173	0.201	0.233	0.266	0.289	0.316
66	0.170	0.199	0.229	0.258	0.284	0.306	0.324
67	0.250	0.204	0.233	0.250	0.257	0.287	0.317
68	0.227	0.175	0.193	0.215	0.240	0.262	0.270
69	0.200	0.180	0.180	0.198	0.228	0.246	0.250
70	0.150	0.171	0.192	0.239	0.304	0.330	0.330
71	0.150	0.171	0.192	0.239	0.304	0.330	0.330
72	0.150	0.171	0.192	0.239	0.304	0.330	0.330
73	0.150	0.171	0.192	0.239	0.304	0.330	0.330
74	0.150	0.171	0.192	0.239	0.304	0.330	0.330
75 - 79	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Appendix A - Statement of Actuarial Methods and Assumptions (continued)

Additional Actuarial Assumptions Applicable to the Public Agency Indexed Level (continued)

Public Agency Miscellaneous 2% @ 55 (continued)

Termination with Refund

Rates vary by entry age and sex. See sample rates in tables below.

Duration of Service	Termination with Refund					
	Entry Age					
	20	25	30	35	40	45
0	0.17420	0.16740	0.16060	0.15370	0.14680	0.14000
1	0.15450	0.14770	0.14090	0.13390	0.12710	0.12030
2	0.13480	0.12800	0.12120	0.11420	0.10740	0.10060
3	0.11510	0.10830	0.10150	0.09450	0.08770	0.08090
4	0.09540	0.08860	0.08180	0.07480	0.06800	0.06120
5	0.02120	0.01930	0.01740	0.01550	0.01360	0.01160
10	0.01380	0.01210	0.01040	0.00880	0.00710	0.00550
15	0.00600	0.00510	0.00420	0.00320	0.00230	0.00140
20	0.00370	0.00290	0.00210	0.00130	0.00050	0.00010
25	0.00170	0.00110	0.00050	0.00010	0.00010	0.00010
30	0.00050	0.00010	0.00010	0.00010	0.00010	0.00010

Termination with Vested Deferred Benefits

Rates vary by entry age and sex. See sample rates in tables below.

Duration of Service	Termination with Vested Deferred Benefits				
	Entry Age				
	20	25	30	35	40
5	0.04220	0.04220	0.03930	0.03640	0.03440
10	0.02780	0.02780	0.02710	0.02630	0.02150
15	0.01920	0.01920	0.01740	0.01560	0.01200
20	0.01390	0.01390	0.01090	0.00790	0.00470
25	0.00830	0.00830	0.00480	0.00140	0.00070
30	0.00150	0.00150	0.00070	0.00000	0.00000

Public Agency Police 2% @ 50

Non-Industrial (Not Job-Related) Death and Non-Industrial (Not Job-Related) Disability

Rates vary by age and sex. See sample rates in table below.

Attained Age	Non-Industrial (Not Job-Related)			
	Male		Female	
	Death	Disability	Death	Disability
20	0.000216	0.000100	0.000069	0.000100
25	0.000289	0.000100	0.000109	0.000100
30	0.000379	0.000200	0.000155	0.000200
35	0.000491	0.000300	0.000270	0.000300
40	0.000637	0.000400	0.000366	0.000400
45	0.000795	0.000500	0.000543	0.000500
50	0.001161	0.000800	0.000794	0.000800
55	0.001717	0.001300	0.001204	0.001300
60	0.002550	0.002000	0.001657	0.002000

Appendix A - Statement of Actuarial Methods and Assumptions (continued)

Additional Actuarial Assumptions Applicable to the Public Agency Indexed Level (continued)

Public Agency Police 2% @ 50 (continued)

Industrial (Job-Related) Death and Industrial (Job-Related) Disability

Rates vary by age and sex. See sample rates in table below.

Attained Age	Industrial (Job-Related)			
	Male		Female	
	Death	Disability	Death	Disability
20	0.000040	0.000020	0.000040	0.000020
25	0.000060	0.001650	0.000060	0.001650
30	0.000070	0.004760	0.000070	0.004760
35	0.000090	0.007880	0.000090	0.007880
40	0.000100	0.011000	0.000100	0.011000
45	0.000120	0.014120	0.000120	0.014120
50	0.000130	0.018460	0.000130	0.018460
55	0.000150	0.047850	0.000150	0.047850
60	0.000160	0.060240	0.000160	0.060240

Service Retirement

Rates vary by age and sex. See sample rates in table below.

Attained Age	Years of Service						
	5	10	15	20	25	30	35
50	0.050	0.050	0.050	0.050	0.050	0.100	0.110
51	0.040	0.040	0.040	0.040	0.058	0.094	0.139
52	0.040	0.040	0.040	0.040	0.061	0.087	0.139
53	0.040	0.040	0.040	0.040	0.082	0.123	0.305
54	0.040	0.040	0.040	0.046	0.098	0.158	0.350
55	0.072	0.072	0.072	0.096	0.141	0.255	0.408
56	0.066	0.066	0.066	0.088	0.129	0.228	0.363
57	0.060	0.060	0.060	0.080	0.118	0.213	0.320
58	0.080	0.080	0.080	0.088	0.138	0.228	0.350
59	0.080	0.080	0.080	0.092	0.140	0.228	0.400
60	0.150	0.150	0.150	0.150	0.150	0.228	0.350
61	0.144	0.144	0.144	0.144	0.144	0.170	0.264
62	0.150	0.150	0.150	0.150	0.150	0.213	0.330
63	0.150	0.150	0.150	0.150	0.150	0.213	0.400
64	0.150	0.150	0.150	0.150	0.150	0.319	0.525
65 - 79	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Appendix A - Statement of Actuarial Methods and Assumptions (continued)

Additional Actuarial Assumptions Applicable to the Public Agency Indexed Level (continued)

Public Agency Police 2% @ 50 (continued)

Termination with Refund

Rates vary by entry age and sex. See sample rates in tables below.

Duration of Service	Termination with Refund					
	Entry Age					
	20	25	30	35	40	45
0	0.10130	0.10130	0.10130	0.10130	0.10130	0.10130
1	0.06360	0.06360	0.06360	0.06360	0.06360	0.06360
2	0.02710	0.02710	0.02710	0.02710	0.02710	0.02710
3	0.02580	0.02580	0.02580	0.02580	0.02580	0.02580
4	0.02450	0.02450	0.02450	0.02450	0.02450	0.02450
5	0.00860	0.00860	0.00860	0.00860	0.00860	0.00860
10	0.00530	0.00530	0.00530	0.00530	0.00530	0.00530
15	0.00270	0.00270	0.00270	0.00270	0.00270	0.00270
20	0.00170	0.00170	0.00170	0.00170	0.00170	0.00170
25	0.00120	0.00120	0.00120	0.00120	0.00120	0.00120
30	0.00090	0.00090	0.00090	0.00090	0.00090	0.00090

Termination with Vested Deferred Benefits

Rates vary by entry age and sex. See sample rates in tables below.

Duration of Service	Termination with Vested Deferred Benefits				
	Entry Age				
	20	25	30	35	40
5	0.01630	0.01630	0.01630	0.01630	0.01630
10	0.01260	0.01260	0.01260	0.01260	0.00000
15	0.00820	0.00820	0.00820	0.00000	0.00000
20	0.00650	0.00650	0.00000	0.00000	0.00000
25	0.00580	0.00000	0.00000	0.00000	0.00000
30	0.00000	0.00000	0.00000	0.00000	0.00000

Appendix B – Summary of Principal Plan Provisions

The 1959 Survivor program was designed to provide pre-retirement death benefits comparable to those provided by Social Security, formally the Federal Old Age and Survivor Insurance (OASI) program, to CalPERS' members not covered by Social Security.

Eligibility

The benefit is available only to those members not covered by Social Security OASI benefits. For public agencies, this benefit is provided by contract with CalPERS. Only those public agencies that contract for the 1st, 2nd, 3rd, 4th, or Indexed level of the program are eligible for the benefits valued in this report. Public Agency 1st and 2nd levels have been closed since January 1, 1994 and 3rd level has been closed since July 1, 2001. For State and Schools members, the 5th level benefit is provided by State statute to certain groups of employees. Members who are eligible for the benefit are given a one-time option to join at the time of contract. Members hired subsequent to the time of contract are automatically enrolled in the program.

Spousal or Domestic Partner Benefit

The benefit is a monthly payment to eligible surviving spouses or domestic partners age 62 or older for Public Agency 1st, 2nd, and 3rd Levels and age 60 or older for all other levels. The benefit is also payable under these deferred ages for spouses or partners that have care of children under the age of 22. As an example, assume an agency contracts for the 3rd Level benefit and an active member dies and leaves behind a 35 year old spouse and 2 children, ages 5 and 15. The following table describes how the benefit would be paid over the course of time.

Event	Monthly Benefit Paid
Member Death	\$840
1 st Child Turns 22	\$700
2 nd Child Turns 22 ¹	\$0
Spouse Turns 62 ²	\$350

(1) At this time, the spouse would be 52 years old and would not receive any benefit until age 62.

(2) Spouse would continue to receive this benefit until his/her death.

Child Benefit

Children are eligible if they are not married or in a registered domestic partnership and are under the age of 22 whether or not a spouse or domestic partner exists. For 3 or more children, the 3 survivor benefit is paid; for 2 children, the 2 survivor benefit is paid and so forth (see tables below). In all cases, unless a child is disabled, the benefit stops at age 22. If a child is disabled, the benefit is paid until the disability ceases.

Parental Benefits

If there is no eligible spouse or domestic partner or children, parent(s) dependent for at least half of their support from the deceased member may be eligible for benefits. The parent(s) must be over age 62 for Public Agency 1st, 2nd, and 3rd Levels and over age 60 for all other levels.

Appendix B - Summary of Principal Plan Provisions (continued)

Monthly Benefit Amounts

The monthly benefit amount depends upon the coverage level within the program.

1st, 2nd, and 3rd Level (For Members of Public Agencies who Contract)

	1 st Level	2 nd Level	3 rd Level
Spouse or Domestic Partner with Two or More Eligible Children; or Three or More Eligible Children	\$430	\$538	\$840
Spouse with One Eligible Child; or Two Eligible Children Only	360	450	700
Spouse Age 62 or Older; or One Eligible Child Only; or Eligible Dependent parents	180	225	350

4th Level and Indexed Level (For Members of Public Agencies who Contract) and 5th Level (State and Schools Members)

	4 th Level	Indexed Level	State and Schools 5 th Level
Spouse or Domestic Partner with Two or More Eligible Children; or Three or More Eligible Children	\$2,280	\$2,185 ¹	\$1,800
Spouse with One Eligible Child; or Two Eligible Children Only	1,900	1,457 ¹	1,500
Spouse Age 60 or Older; or One Eligible Child Only; or Eligible Dependent parents	950	728 ¹	750

(1) These figures indicate calendar year benefit amounts for the Indexed Level in effect for calendar year 2019. Benefit amounts will increase by 2 percent each January 1.

Comparison of Social Security and CalPERS 1959 Survivor Benefits

The following tables compare current Social Security survivor benefits with current benefit levels paid under the 1959 Survivor Program.

Social Security

Survivor Group	Low	Average	High
Three Survivors	\$1,570	\$2,790	\$4,106
Two Survivors	1,568	2,334	3,520
One Survivor	784	1,167	1,760

Unlike the 1959 Survivor Benefit (with the exception of the Indexed level), federal Social Security benefits normally receive an automatic cost-of-living adjustment every year. Also, unlike the 1959 Survivor Benefit, Social Security benefits are based on a worker's actual earnings up to the maximum covered. The values shown assume death at age 45 (benefits slightly higher at lower ages, lower at higher ages), and steady earnings. "Low" is 2019 salary of \$25,000, "Average" is \$50,000, and "High" is \$90,000.

CalPERS 1959 Survivor Benefit

Survivor Group	1 st Level	2 nd Level	3 rd Level	4 th Level	Indexed Level ¹	State and Schools 5 th Level
Three Survivors	\$430	\$538	\$840	\$2,280	\$2,185	\$1,800
Two Survivors	360	450	700	1,900	1,457	1,500
One Survivor	180	225	350	950	728	750

(1) Amounts effective January 1, 2019

Summary of Plan Changes

Existing public agency employers joining the Public Agency 4th or Indexed Level Pool during the 2019-20 Fiscal Year are required to pay only the Unfunded Liability based on their own membership (amortized over a period of five years) which exists at the time they join plus the agency's normal cost for all members at the new benefit level for the first five years. If they have excess assets, the excess assets will be amortized over five years and used to offset the agency's normal cost for each year.

Appendix C – Demographic and Experience Information

Current and Deferred Beneficiaries – All Levels of the 1959 Survivor Program for Public Agencies, State and Schools

Currently, there are 4,231 cases where liability exists. These cases include surviving spouses or domestic partners in deferred status even though presently there are no benefits being paid. There are 9 possible beneficiary combinations that can be associated with each case. The combinations presented below are given as of the date of the valuation, for all levels of the 1959 Survivor program.

Status	Number	Percent
Surviving Spouse or Domestic Partner Deferred	780	18.4%
Surviving Spouse or Domestic Partner Only Receiving	2,620	61.9%
Surviving Spouse or Domestic Partner with One Child	310	7.3%
Surviving Spouse or Domestic Partner with Two or More Children	283	6.7%
One Child	154	3.6%
Two Children	47	1.1%
Three or More Children	21	0.5%
One Parent	11	0.3%
Two Parents	5	0.1%
Totals	4,231	100.0%¹

(1) Percentages may not sum to 100% due to rounding.

Beneficiary Combinations at Date of Death – All Levels of the 1959 Survivor Program for Public Agencies, State and Schools

There exist 7,897 cases of death associated with the 1959 Survivor program since its inception where 1959 Survivor benefits became payable. With this data, a historical account of each combination can be made. Further, probabilities can be approximated with respect to these combinations when a member dies. Below is a list of all combinations on record, numbers and associated percentages as of the time of death, for all levels of the 1959 Survivor program.

Status	Number	Percent
Surviving Spouse or Domestic Partner Deferred	2,258	28.6%
Surviving Spouse or Domestic Partner Only Receiving	1,140	14.4%
Surviving Spouse or Domestic Partner with One Child	1,302	16.5%
Surviving Spouse or Domestic Partner with Two or More Children	2,147	27.2%
One Child	459	5.8%
Two Children	339	4.3%
Three or More Children	217	2.7%
One Parent	27	0.3%
Two Parents	8	0.1%
Totals	7,897	100.0%¹

(1) Percentages may not sum to 100% due to rounding.

Appendix D – 1959 Survivor Deaths Per Year

1959 Survivor Deaths Per Year

Displayed below is a year-by-year account of the number of deaths under the program and the death rate each year for the last 35 years for public agencies, State, and Schools. Deaths given in the exhibit are on a calendar year basis and may change from previous valuations due mainly to reclassification of the benefit that ultimately gets paid to the beneficiary. Counts represent mid-year active exposure. The historic covered active counts may not match those reported in the prior year's valuation. This is due to the fact that in some cases there is a time gap between a member's death and the determination of which type of death benefit that member will receive.

Calendar Year	Public Agency			State			Schools		
	Deaths	Mid-Year Active Counts	Death Rate	Deaths	Mid-Year Active Counts	Death Rate	Deaths	Mid-Year Active Counts	Death Rate
2017	80	141,063	0.06%	57	76,638	0.07%	3	10,557	0.03%
2016	83	139,581	0.06%	57	75,782	0.08%	5	10,259	0.05%
2015	79	134,879	0.06%	62	74,372	0.08%	5	10,490	0.05%
2014	66	132,024	0.05%	52	72,848	0.07%	3	10,287	0.03%
2013	77	129,796	0.06%	57	71,180	0.08%	4	9,944	0.04%
2012	93	132,754	0.07%	52	71,759	0.07%	6	10,123	0.06%
2011	109	134,255	0.08%	57	77,714	0.07%	8	9,811	0.08%
2010	86	138,470	0.06%	54	79,587	0.07%	7	10,203	0.07%
2009	98	143,207	0.07%	60	82,434	0.07%	6	10,562	0.06%
2008	104	144,828	0.07%	50	81,369	0.06%	8	10,550	0.08%
2007	105	140,012	0.07%	70	76,902	0.09%	5	10,131	0.05%
2006	85	137,095	0.06%	68	71,742	0.09%	13	9,469	0.14%
2005	102	133,510	0.08%	65	70,193	0.09%	7	9,402	0.07%
2004	95	131,633	0.07%	59	64,252	0.09%	3	9,325	0.03%
2003	91	129,620	0.07%	69	68,791	0.10%	6	9,390	0.06%
2002	84	129,355	0.06%	47	65,558	0.07%	5	9,195	0.05%
2001	83	116,161	0.07%	58	64,309	0.09%	5	7,884	0.06%
2000	78	121,538	0.06%	57	60,349	0.09%	7	8,338	0.08%
1999	90	118,850	0.08%	58	59,406	0.10%	3	7,444	0.04%
1998	85	112,389	0.08%	57	55,435	0.10%	6	6,956	0.09%
1997	69	102,475	0.07%	59	55,084	0.11%	4	6,794	0.06%
1996	82	100,494	0.08%	53	51,746	0.10%	6	6,726	0.09%
1995	72	99,235	0.07%	51	47,689	0.11%	10	6,751	0.15%
1994	68	98,088	0.07%	56	47,323	0.12%	11	6,653	0.17%
1993	74	97,752	0.08%	52	46,872	0.11%	3	6,776	0.04%
1992	83	95,840	0.09%	45	48,872	0.09%	8	6,823	0.12%
1991	95	91,574	0.10%	41	47,708	0.09%	7	7,752	0.09%
1990	86	86,196	0.10%	59	45,502	0.13%	7	7,942	0.09%
1989	66	82,046	0.08%	60	44,069	0.14%	6	6,899	0.09%
1988	72	84,808	0.08%	50	41,980	0.12%	9	7,100	0.13%
1987	60	69,340	0.09%	51	40,315	0.13%	11	6,200	0.18%
1986	64	68,500	0.09%	40	39,391	0.10%	8	6,500	0.12%
1985	69	66,927	0.10%	80	39,175	0.20%	5	6,842	0.07%
1984	74	65,480	0.11%	64	38,488	0.17%	4	7,104	0.06%
1983	77	59,917	0.13%	68	37,186	0.18%	8	7,685	0.10%

Appendix E – Glossary of Actuarial Terms

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

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

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

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

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

Generally, in an actuarial valuation, the separate bases consist of changes in unfunded liability due to actuarial assumption changes, actuarial methodology changes, and/or experience gains and losses. Amortization methodology is determined by Board policy.

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

Entry Age Normal Cost Method: An actuarial cost method designed to fund a member's total plan benefit over the course of his or her career. This method is designed to yield a rate expressed as a level percentage of payroll.

(The assumed retirement age less the entry age is the amount of time required to fund a member's total benefit. Generally, the older a member on the date of hire, the greater the entry age normal cost. This is mainly because there is less time to earn investment income to fund the future benefits.)

Normal Cost: The portion of the actuarial present value of projected benefits that is allocated to a period, typically twelve months, under the actuarial cost method. The normal cost may include a provision for expenses.

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

Appendix E – Glossary of Actuarial Terms (continued)

Present Value of Benefits (PVB): The total dollars needed as of the valuation date to fund all benefits earned in the past or expected to be earned in the future for current members.

Term Insurance Method: An actuarial cost method designed such that contributions are made to the plan to meet benefit payments expected to fall due within the year for which the contribution is made.

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

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