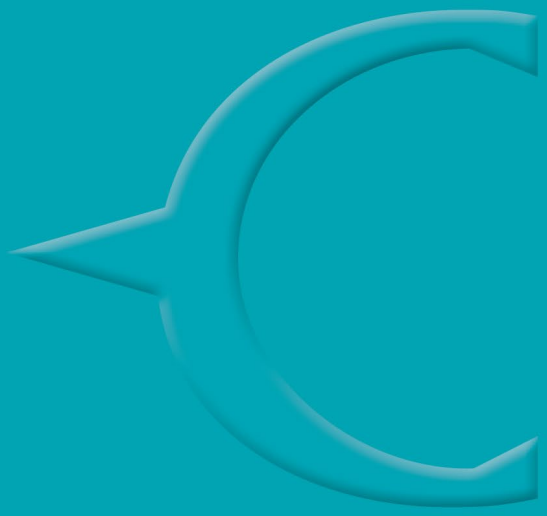
CHEIRON *Classic Values, Innovative Advice*



Contra Costa County Employees' Retirement Association

Replication Audit of the December 31, 2023 Actuarial Valuation and the December 31, 2020 Experience Study

Produced by Cheiron
September 2024

www.cheiron.us 1.877.CHEIRON (243.4766)

TABLE OF CONTENTS

Via Electronic Mail

September 3, 2024

Board of Retirement
Contra Costa County Employees' Retirement Association
1200 Concord Avenue, Suite 300
Concord, California 94520

Members of the Board:

Cheiron is pleased to present the results of our actuarial audit of the December 31, 2023 Actuarial Valuation for Contra Costa County Employees' Retirement Association (CCCERA) performed by Segal Consulting (Segal). We would like to thank Segal for providing us with information and explanations that facilitated the actuarial audit process and ensured that our findings are accurate and benefit CCCERA.

We direct your attention to the executive summary section of our report that highlights the key findings of our review. The balance of the report provides details in support of these findings along with supplemental data, background information, and discussion of the process used in the evaluation of the work performed by Segal.

In preparing our report, we relied on information (some oral and some written) supplied by CCCERA and Segal. This information includes, but is not limited to, actuarial assumptions and methods adopted by CCCERA, the plan provisions, employee data, and financial information.

We performed an informal examination of the obvious characteristics of the data for reasonableness in accordance with Actuarial Standard of Practice No. 23. A detailed description of all information provided for this review is provided in the body of our report.

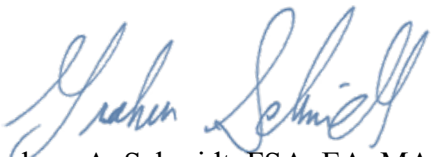
We trained and used a machine learning model developed by Dataiku to perform an independent analysis of the retirement rates proposed by Segal. We have relied on Dataiku as the developer of the model. We have reviewed the model and have a basic understanding of it and have used it in accordance with its original intended purpose. We have not identified any material inconsistencies in the assumptions or other output of the model that would affect this report.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared exclusively for the Contra Costa County Employees' Retirement Association for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other users.

Sincerely,
Cheiron

Anne D. Harper, FSA, EA, MAAA
Principal Consulting Actuary



Graham A. Schmidt, FSA, EA, MAAA, FCA
Principal Consulting Actuary

SECTION I – EXECUTIVE SUMMARY (Valuation Audit)

Scope of Assignment

Cheiron performed a complete independent replication of the CCCERA December 31, 2023 Actuarial Valuation. We reviewed the census data provided by CCCERA staff and compared it to the information used by Segal in their draft valuation report dated July 10, 2024. We then performed a full parallel valuation, including the calculation of the projected benefits, Actuarial Liability, and normal cost for all CCCERA members, as well as the employers and employee contribution rates and compared the results to those shown in Segal's actuarial valuation report.

This audit provides CCCERA confirmation that:

- The results reported by Segal can be relied upon,
- The actuarial methods comply with Actuarial Standards of Practice (ASOP), and
- The communication of the actuarial valuation results is complete and reasonable.

Key Findings and Recommendations

The liabilities and costs computed in the valuation as of December 31, 2023 are materially accurate and were computed in accordance with generally accepted actuarial principles. For the scope of this audit, materiality means the results in the aggregate are within industry standards of plus or minus 5%. Our replication of the measures of plan liabilities and costs is summarized in Table I-1 below. We note that all results are within 5% of Segal's calculation and that the key measurements – the comparison of the Present Value of Future Benefits and the total employer contribution rates – are within 1.5%.

Table I-1
Summary of Valuation Results as of December 31, 2023
($ in thousands)

	Segal	Cheiron	Ratio
Present Value of Future Benefits	$ 14,728,745	$ 14,687,517	100%
Actuarial Liability (AL)	$ 12,438,710	$ 12,381,570	100%
Valuation Value of Assets (VVA)	11,323,477	11,323,477	100%
Unfunded Actuarial Liability (UAL)	$ 1,115,233	$ 1,058,093	95%
Funded Percentage on VVA basis	91.0%	91.5%	100%
Contribution Rate by Component			
Net Employer Normal Cost Rate	15.07%	15.15%	100%
UAL Payment Rate	13.48%	13.01%	97%
Total Employer Contribution	28.55%	28.15%	99%

SECTION I – EXECUTIVE SUMMARY (Valuation Audit)

We have adjusted our calculations of the Present Value of Benefits and Actuarial Liabilities consistent with the asset transfers that occurred for members who have moved between cost groups as shown on pages 173-175 of Segal's December 31, 2023 actuarial valuation report.

In our audit of the December 31, 2018 valuation, we recommended that Segal modify their methodology for determining the entry age used to allocate costs between future normal costs and the actuarial liability for actives members. Segal had been including reciprocal service as service with CCCERA. With this approach, a member has an actuarial liability the moment they are hired at CCCERA if they have reciprocal service. As part of the prior audit we recommended *not* including reciprocal service in determining a member's entry age, and as part of the current audit we confirmed that Segal now uses this approach.

Also as part of the prior audit, we suggested that Segal include projections of the employer contribution rate and funded status in their report to help the CCCERA Board and stakeholders understand the dynamics of their actuarial funding policies and the impact of the new PEPRA benefit tiers on the future costs of the system. CCCERA staff provided us with Segal's post valuation letters from the December 31, 2022 valuation that show 5-year projected changes to the employer contribution rates for in total and by cost group. We commend Segal for providing these projections. However, we strongly suggest that Segal modify their projections to include an assumption of a transition to the PEPRA tiers, based on a level active population which is consistent with the level percentage of payroll amortization policy and their assumed payroll growth rate.

SECTION II – REVIEW OF ACTUARIAL VALUATION RESULTS

Valuation Procedures

Overall, we find that the December 31, 2023 actuarial valuation procedures applied in the reporting of the funded status and the determination of the funding requirements based on the current funding policies and adopted assumptions are reasonable and conform to the ASOPs. This conclusion is based on our review of: the valuation report, the census data used in the valuation, and our parallel valuation using the information described above.

Valuation Results

Our independent replication of the December 31, 2023 actuarial valuation found no material difference in calculations of plan liabilities, normal costs, Valuation Value of Assets, and overall contribution rates from the amounts calculated by Segal based on the adopted assumptions and methods. Consequently, we conclude that the valuation prepared by Segal for CCCERA as of December 31, 2023 is reasonable and can be relied on by the Board for its intended purpose.

Present Value of Future Benefits

The comparison of the present value of future benefits calculated by Segal and Cheiron indicates how closely we match the application of the assumptions to the census data in the valuation. To confirm that the match is close across all cost groups, a comparison of the Present Value of Benefits for each cost group is shown below in Table II-1. We note that all results are within 2% - a very close match and well below the 5% threshold.

Table II-1
Present Value of Benefits Comparison by Cost Group
($ in thousands)

	Segal	Cheiron	Ratio
General			
Cost Group 1 - County, Superior Court and Small Districts (Tier 1 and 4)	$ 1,467,319	$ 1,468,550	100%
Cost Group 2 - County, Superior Court and Small Districts (Tier 3 and 5)	6,972,123	6,935,912	99%
Cost Group 3 - Central Contra Costa Sanitary District	596,444	594,683	100%
Cost Group 4 - Contra Costa Housing Authority	91,718	91,436	100%
Cost Group 5 - Contra Costa County Fire Protection District	97,868	95,971	98%
Cost Group 6 - Small Districts (Non-Enhanced Tier 1 and 4)	11,564	11,457	99%
Safety			
Cost Group 7 - County (Tier A and D)	$ 2,455,518	$ 2,458,460	100%
Cost Group 8 - Contra Costa and East Fire Protection Districts	1,506,782	1,503,881	100%
Cost Group 9 - County (Tier C and E)	484,107	481,000	99%
Cost Group 10 - Moraga-Orinda Fire District	265,587	266,101	100%
Cost Group 11 - San Ramon Valley Fire District	653,057	653,408	100%
Cost Group 12 - Rodeo-Hercules Fire Protection District	67,503	67,027	99%

SECTION II – REVIEW OF ACTUARIAL VALUATION RESULTS

Actuarial Liability

The entry age actuarial cost method attributes the Present Value of Future Benefits between time periods. The portion attributed to periods before the valuation date is the Actuarial Liability and is used as a funding target in developing contribution rates. We note that the Actuarial Liability for each cost group is within 1% - a very close match and well below the 5% threshold.

Table II-2

Actuarial Liability Comparison by Cost Group
($ in thousands)

	Segal	Cheiron	Ratio
General			
Cost Group 1 - County, Superior Court and Small Districts (Tier 1 and 4)	$ 1,429,081	$ 1,430,146	100%
Cost Group 2 - County, Superior Court and Small Districts (Tier 3 and 5)	5,534,581	5,472,784	99%
Cost Group 3 - Central Contra Costa Sanitary District	517,533	516,349	100%
Cost Group 4 - Contra Costa Housing Authority	80,479	80,122	100%
Cost Group 5 - Contra Costa County Fire Protection District	79,591	78,586	99%
Cost Group 6 - Small Districts (Non-Enhanced Tier 1 and 4)	9,048	9,012	100%
Safety			
Cost Group 7 - County (Tier A and D)	$ 2,357,624	$ 2,361,326	100%
Cost Group 8 - Contra Costa and East Fire Protection Districts	1,287,697	1,289,547	100%
Cost Group 9 - County (Tier C and E)	211,574	211,217	100%
Cost Group 10 - Moraga-Orinda Fire District	237,282	237,963	100%
Cost Group 11 - San Ramon Valley Fire District	576,659	576,861	100%
Cost Group 12 - Rodeo-Hercules Fire Protection District	58,404	58,024	99%

SECTION II – REVIEW OF ACTUARIAL VALUATION RESULTS

Normal Costs

The Normal Cost represents the portion of the Present Value of Future Benefits that is attributed to the current year of service. Under the entry age method, it is designed to be a level percent of pay throughout an individual's career. We note that the Employer Normal Cost for each cost group in Table II-3 below is within 5%.

Table II-3
Employer Normal Cost Comparison by Cost Group

	Segal	Cheiron	Ratio
General			
Cost Group 1 - County, Superior Court and Small Districts (Tier 1 and 4)	15.2%	15.7%	104%
Cost Group 2 - County, Superior Court and Small Districts (Tier 3 and 5)	12.6%	12.5%	99%
Cost Group 3 - Central Contra Costa Sanitary District	15.2%	15.6%	103%
Cost Group 4 - Contra Costa Housing Authority	14.3%	14.6%	102%
Cost Group 5 - Contra Costa County Fire Protection District	15.9%	15.9%	100%
Cost Group 6 - Small Districts (Non-Enhanced Tier 1 and 4)	15.0%	14.7%	98%
Safety			
Cost Group 7 - County (Tier A and D)	29.8%	30.1%	101%
Cost Group 8 - Contra Costa and East Fire Protection Districts	25.3%	25.8%	102%
Cost Group 9 - County (Tier C and E)	19.5%	19.7%	101%
Cost Group 10 - Moraga-Orinda Fire District	26.5%	26.6%	101%
Cost Group 11 - San Ramon Valley Fire District	24.6%	25.5%	104%
Cost Group 12 - Rodeo-Hercules Fire Protection District	23.7%	24.6%	104%

Valuation Value of Assets

We reviewed the actuarial smoothing calculations based on the statement of changes in fiduciary net positions and related backup information and agree with the Valuation Value of Assets for each cost group.

Segal's asset smoothing method recognizes actuarial losses and gains on the market value of assets over a five-year period, which complies with the Actuarial Standards of Practice.

Employer Contributions

As part of our replication, we verified the calculations of the employer contribution rates by cost group and by employer. We reviewed CCCERA's new Actuarial Funding Policy adopted by the Board on May 1, 2024 and effective starting with the December 31, 2023 valuation. We determined that the new policy complies with Actuarial Standards of Practice (ASOP).

The policy resets the remaining amortization period for UAL layers established as of December 31, 2012 through December 31, 2018 to six years which minimizes the contribution rate volatility in future years. All future actuarial gains or losses and assumption or method changes will continue to be amortized over a closed 18-year period as a percentage of payroll.

SECTION II – REVIEW OF ACTUARIAL VALUATION RESULTS

Our replication of the employer contribution rates by cost group is shown below in Table II-4 and are all within 3% of Segal's.

Table II-4
Employer Contribution Rate Comparison by Cost Group

	Segal	Cheiron	Ratio
General			
Cost Group 1 - County, Superior Court and Small Districts (Tier 1 and 4)	24.00%	23.93%	100%
Cost Group 2 - County, Superior Court and Small Districts (Tier 3 and 5)	21.41%	20.73%	97%
Cost Group 3 - Central Contra Costa Sanitary District	17.80%	17.97%	101%
Cost Group 4 - Contra Costa Housing Authority	27.50%	27.30%	99%
Cost Group 5 - Contra Costa County Fire Protection District	39.81%	38.84%	98%
Cost Group 6 - Small Districts (Non-Enhanced Tier 1 and 4)	15.13%	14.86%	98%
Safety			
Cost Group 7 - County (Tier A and D)	59.75%	60.21%	101%
Cost Group 8 - Contra Costa and East Fire Protection Districts	60.55%	61.24%	101%
Cost Group 9 - County (Tier C and E)	49.46%	49.82%	101%
Cost Group 10 - Moraga-Orinda Fire District	91.22%	91.99%	101%
Cost Group 11 - San Ramon Valley Fire District	48.58%	49.54%	102%
Cost Group 12 - Rodeo-Hercules Fire Protection District	76.09%	76.09%	100%

SECTION II – REVIEW OF ACTUARIAL VALUATION RESULTS

Below in Tables II-5 and II-6, we show the employer contributions rate comparisons on a more granular level, by Tier, since discrepancies in the calculations can sometimes be masked when reviewing on the broader basis. Our results match Segal's within the 5% threshold for all Tiers.

Table II-5
Employer Contribution Rate Comparison by Tier - General

		Segal	Cheiron	Ratio
Cost Group 1	Tier 1 - Non-LAFCO	25.73%	26.08%	101%
	Tier 1 - LAFCO	21.03%	21.38%	102%
	Tier 4 (3% COLA) - Non LAFCO	21.66%	21.04%	97%
	Tier 4 (3% COLA) - LAFCO	16.96%	16.34%	96%
	Tier 4 (2% COLA)	20.03%	19.42%	97%
Cost Group 2	Tier 3 - Non IHSS	24.10%	23.13%	96%
	Tier 3 - IHSS	23.46%	22.50%	96%
	Tier 5 (3%/4% COLA) - Non IHSS	20.14%	19.75%	98%
	Tier 5 (3%/4% COLA) - IHSS	19.50%	19.11%	98%
	Tier 5 (2% COLA) - Non IHSS	19.23%	18.80%	98%
	Tier 5 (2% COLA) - IHSS	18.59%	18.16%	98%
Cost Group 3	Tier 1	19.97%	20.40%	102%
	Tier 4 (3% COLA)	14.12%	13.85%	98%
Cost Group 4	Tier 1	29.65%	29.77%	100%
	Tier 4 (3% COLA)	25.43%	24.98%	98%
Cost Group 5	Tier 1	43.72%	42.87%	98%
	Tier 4 (3% COLA)	39.05%	37.72%	97%
	Tier 4 (2% COLA)	36.30%	35.27%	97%
Cost Group 6	Tier 1	16.57%	16.31%	98%
	Tier 4 (3% COLA)	13.72%	13.49%	98%

Table II-6
Employer Contribution Rate Comparison by Tier - Safety

		Segal	Cheiron	Ratio
Cost Group 7	Tier A	60.53%	61.04%	101%
	Tier D	50.62%	50.61%	100%
Cost Group 8	Tier A	67.15%	68.18%	102%
	Tier D	53.57%	53.45%	100%
	Tier E	51.80%	52.13%	101%
Cost Group 9	Tier C	56.41%	56.52%	100%
	Tier E	47.49%	47.92%	101%
Cost Group 10	Tier A	93.94%	94.75%	101%
	Tier D	83.61%	84.26%	101%
Cost Group 11	Tier A	55.90%	57.61%	103%
	Tier D	40.54%	40.69%	100%
Cost Group 12	Tier A	78.60%	79.00%	101%
	Tier D	73.27%	72.81%	99%

SECTION II – REVIEW OF ACTUARIAL VALUATION RESULTS

Employee Contribution Rates

As part of the audit, we replicated the calculations of the individual member contribution rates based on the applicable provisions of the County Employees' Retirement Law (the CERL). For the non-PEPRA cost groups, we understand the member contribution rates are made up of the following components:

- A Basic rate providing for an annuity equal to:
  - General Tier 1 and Tier 3 (Non-Enhanced): Entry-age rates that provide for ½ of the 31676.11 benefit payable at 55, or
  - General Tier 1 and Tier 3 (Enhanced): 1/120th of One-Year Final Average Compensation at a retirement age of 60, or
  - Safety Tier A (Non-Enhanced): ½ of the 31664 benefit payable at age 50, or
  - Safety Tier A (Enhanced): 1/100th of One-Year Final Average Compensation at a retirement age of 50, or
  - Safety Tier C (Enhanced): 1/100th of Three-Year Final Average Compensation at a retirement age of 50
- A COLA rate providing for ½ of the cost of the COLA.

Pre-PEPRA Safety members with 30 or more years of service are exempt from paying member contributions.

We have verified the calculations of the member contribution rates based on the applicable provisions of the CERL for sample ages and have found these rates to be correct. Our Basic (non-COLA) rates were well within 1% of Segal's rates for General Tiers 1 and 3, and Safety Tiers A and C.

We have verified the calculations of the COLA member rates for all 12 cost groups, and the resulting total member contribution rates are within 5% of Segal's calculations for all cost groups. The total contribution rates – Basic plus COLA – are all within 5%.

For the PEPRA members, the member contributions rates are equal to 50% of the total normal cost rates. Our comparison of the PEPRA member rates is shown in Table II-7 on the next page.

SECTION II – REVIEW OF ACTUARIAL VALUATION RESULTS

Table II-7
PEPR Member Rates by Tier

	Segal	Cheiron	Ratio
General			
Cost Group 1 - Tier 4 (3% COLA) - Non LAFCO	12.8%	12.8%	100%
Cost Group 1 - Tier 4 (3% COLA) - LAFCO	12.8%	12.8%	100%
Cost Group 1 - Tier 4 (2% COLA)	11.2%	11.2%	100%
Cost Group 2- Tier 5 (3%/4% COLA) - Non IHSS	11.3%	11.5%	102%
Cost Group 2 - Tier 5 (3%/4% COLA) - IHSS	11.3%	11.5%	102%
Cost Group 2 - Tier 5 (2% COLA) - Non IHSS	10.4%	10.6%	102%
Cost Group 2 - Tier 5 (2% COLA) - IHSS	10.4%	10.6%	102%
Cost Group 3 - Tier 4 (3% COLA)	11.5%	11.5%	100%
Cost Group 4 - Tier 4 (3% COLA)	12.2%	12.3%	101%
Cost Group 5 - Tier 4 (3% COLA)	15.1%	14.8%	98%
Cost Group 5 - Tier 4 (2% COLA)	12.4%	12.3%	100%
Cost Group 6 - Tier 4 (3% COLA)	13.6%	13.4%	98%
Safety			
Cost Group 7 - County Safety - Tier D	20.7%	20.5%	99%
Cost Group 8 - Contra Costa Fire Protection District - Tier D	18.3%	18.0%	99%
Cost Group 8 - Contra Costa Fire Protection District - Tier E	16.5%	16.7%	101%
Cost Group 9 - County Safety - Tier E	17.5%	17.8%	101%
Cost Group 10 - Moraga-Orinda Fire District - Tier D	18.8%	18.9%	100%
Cost Group 11 - San Ramon Valley Fire District - Tier D	16.5%	16.6%	101%
Cost Group 12 - Rodeo-Hercules Fire Protection District - Tier D	20.9%	21.4%	102%

We have also calculated a weighted-average member contribution rate for each cost group and compared the results to Segal's average member rates for consistency. The comparison is shown below in Table II-8 and all results are within 2% of Segal's, well within the 5% threshold.

Table II-8
Average Member Contribution Rate Comparison by Cost Group

	Segal	Cheiron	Ratio
General			
Cost Group 1 - County, Superior Court and Small Districts (Tier 1 and 4)	11.62%	11.70%	101%
Cost Group 2 - County, Superior Court and Small Districts (Tier 3 and 5)	10.68%	10.84%	102%
Cost Group 3 - Central Contra Costa Sanitary District	11.55%	11.52%	100%
Cost Group 4 - Contra Costa Housing Authority	11.71%	11.85%	101%
Cost Group 5 - Contra Costa County Fire Protection District	11.85%	11.83%	100%
Cost Group 6 - Small Districts (Non-Enhanced Tier 1 and 4)	13.23%	13.18%	100%
Safety			
Cost Group 7 - County (Tier A and D)	18.66%	18.65%	100%
Cost Group 8 - Contra Costa and East Fire Protection Districts	17.60%	17.73%	101%
Cost Group 9 - County (Tier C and E)	17.06%	17.24%	101%
Cost Group 10 - Moraga-Orinda Fire District	18.19%	18.21%	100%
Cost Group 11 - San Ramon Valley Fire District	17.46%	17.58%	101%
Cost Group 12 - Rodeo-Hercules Fire Protection District	16.54%	16.74%	101%

SECTION II – REVIEW OF ACTUARIAL VALUATION RESULTS

Census Data

The CCCERA Staff and Segal provided us with the data that was used in the December 31, 2023 actuarial valuation. We reviewed the information in both files and find that the data used in the valuation is valid, complete, and contain the necessary data elements for purposes of performing the actuarial valuation of CCCERA.

We also find that the methods and requirements provided in the Actuarial Standard of Practice No. 23 *Data Quality* have been adhered to, to the extent applicable for the valuation of pension plan obligations.

In Table II-9 below, we compare the raw December 31, 2023 data file provided by CCCERA to Segal's processed data file and found only minor differences between the files.

Table II-9
Summary of Member Data Comparison as of December 31, 2023

	Segal	Cheiron	Ratio
Active Members			
Total Number	10,349	10,349	100.0%
Average Age	46.1	46.1	99.9%
Average Service	9.9	9.9	100.1%
Projected Compensation	$1,155,129,563	$1,163,147,749	100.7%
Average Compensation	$111,618	$112,392	100.7%
Account Balances	$1,441,357,620	$1,441,357,620	100.0%
Service Retirees			
Total Number	8,407	8,418	100.1%
Average Age	71.3	71.3	100.0%
Average Monthly Benefit	$4,720	$4,704	99.7%
Disabled Retirees			
Total Number	872	882	101.1%
Average Age	68.3	68.0	99.6%
Average Monthly Benefit	$5,846	$5,765	98.6%
Beneficiaries			
Total Number	1,526	1,497	98.1%
Average Age	73.1	73.4	100.4%
Average Monthly Benefit	$3,266	$3,300	101.1%
Vested Terminated Members			
Total Number	4,109	4,111	100.0%
Average Age	46.5	46.5	100.0%

SECTION II – REVIEW OF ACTUARIAL VALUATION RESULTS

Review of Actual Benefit Calculations

CCCERA provided several retirement, disability and death benefit calculations for members with dates of retirement after December 31, 2023. We reviewed these calculations compared to the expected pension benefits from the December 31, 2023 valuation results. The actual benefit calculations were consistent with the projected benefits from our valuation software which verifies the accuracy of the census data and our liability modeling.

Plan Provisions

We compared the summary of plan provisions shown in Section 4, Exhibit 2 of Segal's December 31, 2023 Valuation Report to the benefits in the County Employees' Retirement Law of 1937 (CERL). The plan provisions shown in Segal's exhibit match understanding of the applicable sections of the CERL, and based on our close match of the Segal liabilities as part of our parallel valuation, we conclude that Segal has appropriately reflected these provisions in the actuarial valuation.

SECTION III – CONTENTS OF THE REPORT

Contents of the Reports

We find the actuarial valuation report to be in compliance with Actuarial Standards of Practice. However, for clarity, we suggest Segal explain how the non-refundability factors shown on page 170 of their report are used and why they are developed.

Projections

CCCERA staff provided us with Segal's post valuation letters from the December 31, 2022 valuation that show 5-year projected changes to the employer contribution rates in total and by cost group. We understand that these additional letters are provided every year and we support the production of these disclosures. However, we strongly suggest that Segal modify their projections to include an assumption of a transition to the PEPRA tiers, based on a level active population which is consistent with the level percentage of payroll amortization policy and their assumed payroll growth rate.

The impact of the new PEPRA benefit tiers on the future costs of the system is not immaterial. For example, for General Cost Group #2, the Tier 3 employer normal cost rate is 15.25% compared to the PEPRA Tier 5 (2% COLA) employer normal cost rate of 10.38% (page 35 of Segal's December 31, 2023 valuation report). The same dynamic is true for the Safety Cost Group #8, where Tier A's employer normal cost is 31.87% compared to the PEPRA Tier E employer normal cost rate of 16.52% (page 39). Thus, the active population shift from the legacy to PEPRA tiers will have a significant impact on the average employer normal cost rate. Furthermore, the employer normal cost rate is currently more than 50% the total employer contribution rate - and projected to become a greater proportion when the UAAL payments begin to decline starting with the December 31, 2026 valuation - so any changes to the normal cost rates will have a material impact on the projected employer contribution rate.

SECTION IV – EXECUTIVE SUMMARY (Experience Study Audit)

Summary of Findings

Overall, we found the recommendations made by Segal in the Actuarial Experience Study covering the period from January 1, 2018 to December 31, 2020 to be reasonable, and mostly agree with the rationales and processes that led to their recommendations. The actuarial assumptions recommended are in compliance with acceptable standards of actuarial practice. As part of our audit and review, we examined the raw demographic data provided by CCCERA, and found that our independent analysis of the Plan's experience matched Segal's within a reasonable range, and generally supported their proposed assumptions.

The following summarizes our key observations and recommendations (described in detail in this report), which we offer for Segal and CCCERA to consider in performing the next experience study:

- We recommend that Segal disclose exposures, actual and expected decrements, and calculate the actual to expected (A/E) ratios for retirement, termination, and disability. We commend Segal for showing the A/E ratios in total for the different types of mortality experience.
- We recommend that Segal consider how much credibility to assign to mortality experience in developing proposed adjustments to the standard base tables, in particular for General disabled members.
- We suggest Segal consider reducing the retirement rates if the experience continues to warrant the decrease.
- We suggest using at least six years of experience for termination experience. The most recent study was impacted by the pandemic while the upcoming study covers the period called "the great resignation" where significant numbers of the members either left the workforce or changed jobs at historically high rates. Reviewing the experience for either one of these 3-year periods independently may result in skewed results.
- We suggest using at least six years of disability experience in the next study to mitigate impact of the disability processing delays.
- We suggest that Segal closely monitor the percentage married assumption that determines the number of future retirees who will elect a 60% joint-and-survivor benefit compared to a single life annuity or its actuarial equivalent and perform the analysis using a benefits-weighted approach.

Scope of Assignment

Cheiron performed a full replication audit of the assumptions recommended by Segal in the Actuarial Experience Study during the period from January 1, 2018 to December 31, 2020. For the demographic assumptions, we collected the same data used by Segal in their analysis and independently determined the number of actual decrements by type and the number of exposures to those decrements. Next, we compared this experience to the current and proposed assumptions to assess whether or not the recommended assumptions are reasonable.

SECTION IV – EXECUTIVE SUMMARY (Experience Study Audit)

This review provides CCCERA confirmation that:

- Segal's analysis of the experience study data was accurate and we replicated their work within a reasonable tolerance level.
- Segal's recommendations comply with Actuarial Standards of Practice (ASOPs).

SECTION V – DEMOGRAPHIC ASSUMPTIONS

This section summarizes our review of Segal's Actuarial Experience Study report and our recommendations.

Demographic Assumptions

The first part of our analysis is simply to compare the number of actual decrements and exposures for each type of decrement as well as the average rate of decrement. If our independent analysis matches Segal's analysis within a reasonable range, CCCERA can be confident that the basis on which assumptions are proposed is valid.

There will inevitably be differences between our calculations and those produced by Segal. For actual decrements, some are clear-cut, but there are always data issues where, for example, an active member one year is reported as inactive the next year and the type of decrement is not clear. There are also members who are eligible for retirement, but decrement as a termination instead of a service retirement. The treatment of these different situations in the data can vary, resulting in differences in the determination of the actual decrements used in the experience analysis. Similar differences in the number of members exposed to each decrement can lead to differences in the number of expected decrements.

For the demographic assumptions, we determined the ratio of the actual number of decrements for each membership group compared to the expected number of decrements (A/E ratio or actual-to-expected ratio). If the assumption perfectly predicts the overall number of decrements, this ratio will be 100%. Otherwise, any recommended assumption change should generally move from the current A/E ratio towards 100% unless future experience is expected to be different than the experience during the period of study.

In the second part of our analysis, we use the observed rates from our independent analysis to develop a 90% confidence interval around the observed rate. The true rate during the study period falls within this range with 90% confidence. In general, we believe the assumption should fall within the 90% confidence interval unless there is reason to believe that the future experience will vary from the experience during the study period. Consequently, we compare the current and proposed assumptions to the confidence intervals to assess whether or not they are reasonable.

For some of the assumptions, we explore whether a different or more refined structure to the assumption may be appropriate, such as measuring the experience not just based on the number of individuals decrementing for a given cause (i.e., a headcount-based analysis) but rather by weighting the experience by some of other measure (such as the benefit amounts).

Finally, for the review of one of the assumptions – General member retirement rates – we developed and trained a machine learning (ML) model help inform our analysis and provide additional insights.

SECTION V – DEMOGRAPHIC ASSUMPTIONS

Mortality

Based on our independent analysis of the experience data, we believe the mortality assumptions proposed by Segal are reasonable. The base mortality rates were analyzed separately by gender and job classification for healthy retirees, disabled retirees, and active employees. The table below shows the comparison of the benefit-weighted actual, expected, and proposed deaths, and actual-to-expected ratios (A/E ratios) determined by Segal to the same statistics determined in our independent analysis. These ratios all appeared reasonable.

	Segal Results					Cheiron Results				
	Benefit-Weighted Deaths			A/E Ratios		Benefit-Weighted Deaths			A/E Ratios	
	Actual	Expected	Proposed	Expected	Proposed	Actual	Expected	Proposed	Expected	Proposed
Healthy Retirees										
General Males	$25.98	$25.78	$25.83	101%	101%	$25.99	$25.56	$25.58	102%	102%
General Females	26.43	25.94	25.95	102%	102%	26.44	25.76	25.78	103%	103%
Safety Males	17.04	16.53	16.54	103%	103%	17.04	16.38	16.38	104%	104%
Safety Females	0.75	1.38	1.31	54%	57%	0.75	1.37	1.30	55%	57%
Disabled Retirees										
General Males	$2.48	$2.29	$2.29	108%	108%	$2.45	$2.26	$2.26	108%	108%
General Females	3.51	3.45	3.44	102%	102%	3.51	3.42	3.42	103%	103%
Safety Males	6.50	6.36	6.36	102%	102%	6.50	6.31	6.31	103%	103%
Safety Females	0.22	0.31	0.31	71%	71%	0.22	0.31	0.31	71%	71%
Beneficiaries										
General Males	$3.09	$2.59	$2.60	119%	119%	$2.93	$2.46	$2.46	119%	119%
General Females	15.93	14.58	14.62	109%	109%	12.40	11.37	11.39	109%	109%
Actives										
General Males	$2.95	$3.25	$3.27	91%	90%	$3.66	$3.13	$3.14	117%	117%
General Females	3.62	4.06	4.04	89%	90%	4.15	3.97	3.98	105%	104%
Safety Males	1.13	1.11	1.13	102%	100%	1.21	1.05	1.06	115%	114%
Safety Females	0.00	0.14	0.14	0%	0%	0.00	0.13	0.13	0%	0%

Segal recommended the continued use of Pub-2010 mortality tables as published by the Society of Actuaries, which are based on large, aggregated amounts of data from public plan sponsors across the United States. To these published tables, their report recommends the following adjustments:

- For Safety healthy retirees, a factor of 105% applied to the published tables for males and a factor of 95% applied to the published tables for females. This was a change from the prior existing assumption for females.
- For all beneficiaries and disabled male retirees, a factor of 105% applied to the appropriate sex-distinct published tables. This was a continuation of the existing assumption.

SECTION V – DEMOGRAPHIC ASSUMPTIONS

Segal recommended using the Pub-2010 Continent Survivor mortality table only for survivors and contingent beneficiaries after the member has died. We agree with this approach since it is consistent with how the published table was developed, using only data of surviving beneficiaries once the member died. Typically, beneficiaries have higher mortality rates after their spouses' death, sometimes referred to as the "widower" effect.

We support Segal's recommendation to use the MP-2021 mortality improvement scale on a generational basis, replacing the MP-2018 improvement scale.

Benefit Weighting

Because higher income individuals also typically have higher pension benefit amounts, it is important for a pension plan to use assumptions that are based on data that has been weighted by benefit amount to properly reflect the relative impact on liability. Otherwise, the mortality assumptions could accurately predict the number of deaths at each age, but still underestimate the liabilities, as members with higher benefits have an outsized effect on liabilities.

Segal took this factor into account by recommending standard tables that were developed using benefit-weighting and by using a benefit-weighted approach to analyze CCCERA's data, both of which we strongly support.

Credibility

Very few pension plans have sufficient experience to develop their own mortality tables. Most plans instead adjust a standard table. However, with approximately 1,000 deaths necessary for full credibility under a standard approach (defined by a 90% probability that the observed rate is within 5% of the true rate) and actual mortality rates quite low at most ages, many plans lack sufficient data to perform a full adjustment to a standard table (i.e., adjust the tables so the A/E ratio based on the plan's data is close or equal to 100%).

In general, Segal's adjustments to the standard tables seem reasonable. However, there does not appear to be credible experience among Safety and General male disabled retirees to support the proposed magnitude of adjustment to the standard mortality tables. Based on our calculations, the credibility we would have assigned to the data was fairly limited, with our calculated rate (based on the parameters described above) for the Safety disabled males at 22% and General disabled males at 19%. Under a partial credibility approach, this would have resulted in adjustments of 101.8% and 1.028%, respectively. Segal's adjustments were 105% and are close to our calculations, and still reasonable given CCCERA's experience. However, we recommend in the next experience study that Segal consider credibility when recommending adjustments to the standard tables.

SECTION V – DEMOGRAPHIC ASSUMPTIONS

Retirement

Segal proposed rates that vary by age, service, and class (General and Safety). We support this approach, as it can help capture the impact of differences of behavior based on benefit levels determined by the different plan provisions and the members' demographics. The retirement experience was analyzed using six years of data covering 2015-2020.

The exhibit below shows the comparison of Segal's retirement rate analysis for the General members compared to Cheiron's analysis. The actual retirement rates are reasonably close for all groups which confirms that the basis on which assumptions were proposed is valid.

Comparison of General Retirements, Exposures, and Rates

	Segal Data			Cheiron Data		
	Actual	Exposures	Rate	Actual	Exposures	Rate
Tier 1 Enhanced						
Less than 30 Years of Service	139	1,273	10.9%	136	1,272	10.7%
30 or more Years of Service	31	239	13.0%	30	240	12.5%
Tier 3 Enhanced						
Less than 30 Years of Service	1,047	11,045	9.5%	1,046	11,051	9.5%
30 or more Years of Service	121	829	14.6%	121	827	14.6%
PEPRA Tiers 4 and 5	35	396	8.8%	35	399	8.8%

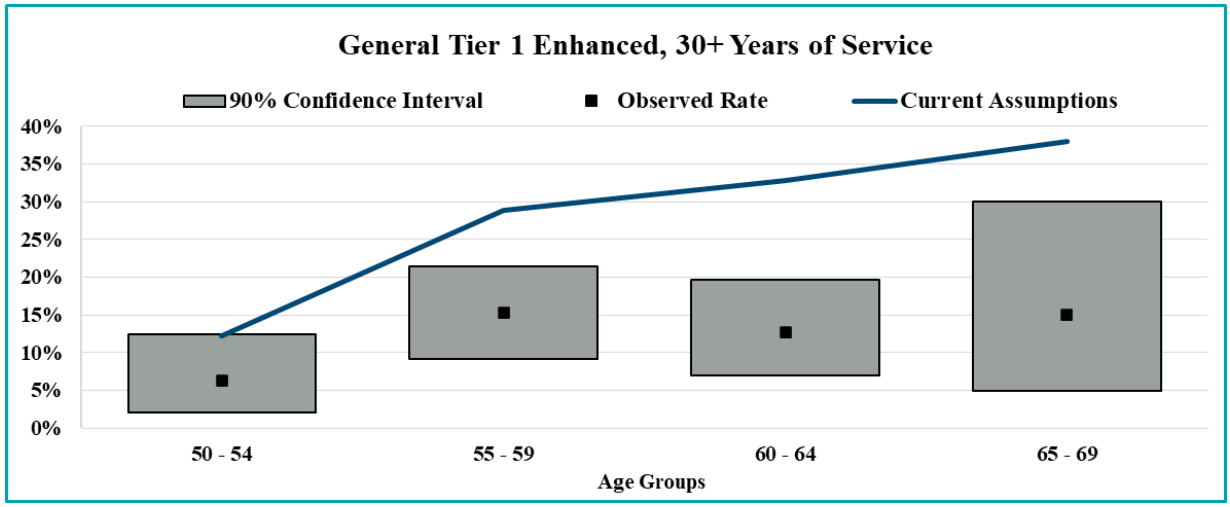
The next exhibit shows how the actual retirements compared to the previous and current assumptions. Overall, the actual retirement rates were much lower than expected during the six-year period over which the retirement experience was studied. Segal recommended decreases to these assumptions, but the new rates still produced A/E ratios well below 100%.

General Retirement Assumptions

	Retirement Rates				
		Assumptions		A/E Ratios	
	Actual	Previous	Current	Previous	Current
Tier 1 Enhanced					
Less than 30 Years of Service	10.9%	15.7%	14.0%	70%	78%
30 or more Years of Service	13.0%	27.6%	23.1%	47%	56%
Tier 3 Enhanced					
Less than 30 Years of Service	9.5%	12.1%	11.5%	78%	82%
30 or more Years of Service	14.6%	16.6%	16.4%	88%	89%
PEPRA Tiers 4 and 5	8.8%	14.4%	13.6%	61%	65%

SECTION V – DEMOGRAPHIC ASSUMPTIONS

The graph below shows the detailed retirement experience for the General Tier 1 Enhanced group for members who had 30 are more years of service. The current assumptions that Segal proposed in the last experience study were well outside the 90% confidence interval ranges for ages 55-69. CCCERA staff informed us that there were significant increases in retirements in 2022, about 35% above the 5-year average. However, even considering these large increases, the current assumptions for this group would only result in an A/E ratio of 76%.



The relatively robust amount of retirement data available for the General members over a six-year period allowed us to use a different approach for generating retirement rate predictions. Using a subset of the data - specifically, a random selection of 80% of the member records for *those* who were eligible for a service retirement during 2015-2020 – we trained a Machine Learning (ML) model[1] to predict the expected likelihood of retirement given a number of factors: age, service, gender, Tier and compensation.

After training the model, we developed a set of predictions for the remaining randomly selected 20% of the records (the "test" data). The model produced a probability of retirement for each record, which was then used to develop an expected number of overall retirements for the test population. From these results we calculated an Actual to Expected ratio for the selected data from each year of the experience study, and compared the ratios to those that would have been generated for the selected population using Segal's proposed assumptions, as shown in the following table.

[1] A machine learning model is a type of Artificial Intelligence that uses algorithms to learn patterns in data and make predictions about a previously unseen dataset. The specific algorithm used in this analysis was the Extreme Gradient Boosting (XGB) algorithm.

SECTION V – DEMOGRAPHIC ASSUMPTIONS

Comparison of Actual/Expected Ratios for Randomly Selected 20% of Retirement-Eligible General Members					
		Segal Assumptions		Machine-Learning Model	
Year	Actual	Expected	A/E Ratio	Expected	A/E Ratio
2015	32	40.4	79.2%	32.0	100.2%
2016	39	43.8	89.1%	36.5	93.5%
2017	38	48.3	78.7%	40.4	106.2%
2018	54	57.6	93.8%	50.1	92.8%
2019	41	56.2	73.0%	46.9	114.4%
2020	53	61.0	86.9%	50.7	95.6%
Total	257	307.2	83.7%	256.6	99.8%

Several things are notable from this table. The predictions produced by the Machine Learning model were considerably more accurate than those based on Segal's assumptions for the overall selected data set, and were also more accurate for the randomly selected records from each year except one (2018), when the differences between the actual and expected number of retirements were very similar (3.6 for Segal vs. 3.9 for the ML model). This is notable because data used to *test* the ML model's predictions was not included in the data to *train* the model, whereas Segal's assumptions were developed using all of the experience, including that of the selected records.

Also, the ML model slightly underpredicted the number of retirements in some years (i.e., A/E ratios greater than 100%) and overpredicted the number in other years, which indicates an unbiased assumption, whereas the Segal assumptions overpredicted the number of retirements in all years. This provides additional support for our suggestion that Segal seriously consider reducing the retirement rates in the next experience study if the data continues to support this conclusion.

SECTION V – DEMOGRAPHIC ASSUMPTIONS

The exhibit below shows the comparison of Segal's retirement rate analysis for the Safety members compared to Cheiron's analysis. The actual retirement rates are reasonably close for all groups which confirms that the basis on which assumptions were made is valid.

Comparison of Safety Retirements, Exposures and Rates

	Segal Data			Cheiron Data		
	Actual	Exposures	Rate	Actual	Exposures	Rate
Tier A Enhanced						
Less than 30 Years of Service	208	1,657	12.6%	198	1,648	12.0%
30 or more Years of Service	15	60	25.0%	14	60	23.3%
Tier A Non-Enhanced/ PEPRA Tiers D and E	3	47	6.4%	3	46	6.5%

The next exhibit shows how the actual retirements compared to the previous and current assumptions. Overall, the actual retirement rates were much lower than expected during the six-year period over which the retirement experience was studied. Segal did recommend overall decreases to the rates, except for the Tier A Non-Enhanced/PEPRA Tiers D and E, but the recommendations produced A/E ratios well below 100%. In addition, Segal recommended overall rate increases for the PEPRA tiers that moved the A/E ratio further from 100%.

Safety Retirement Assumptions

	Retirement Rates			A/E Ratios	
		Assumptions			
	Actual	Previous	Current	Previous	Current
Tier A Enhanced					
Less than 30 Years of Service	12.6%	19.6%	17.2%	64%	73%
30 or more Years of Service	25.0%	30.0%	28.0%	83%	89%
Tier A Non-Enhanced PEPRA Tiers D and E	6.4%	9.6%	10.0%	67%	64%

Similar to our suggestion for the General retirement rates, we strongly suggest Segal consider decreasing the retirement rates in the next experience study if the data continues to warrant the reductions. We note that we did not use the Machine Learning modeling approach for the Safety members, because of the smaller amount of data available to train the data.

SECTION V – DEMOGRAPHIC ASSUMPTIONS

Disabilities

Segal provided us their determination of exposures to disability retirement and the actual number of disability retirements by age for General and Safety members during the three-year study period. The table below compares the actual disability retirements, exposures, and the average disability retirement rate determined by Segal to the same statistics determined in our independent analysis.

Based on our independent analysis of disability retirement rates as summarized below, we believe Segal's assumptions are reasonable and our results are reasonably close which confirms that the basis on which assumptions were made is valid. Our A/E ratios are somewhat lower than Segal's. However, this is due to differences in the calculation of only one to two actual disabilities and a limited amount of experience, which skews the ratios.

Segal slightly decreased the disability rates for General Tiers 3 and 5, increasing the A/E ratio. We support that the overall rate increases were not significant enough to bring the A/E ratio even closer to 100%, since large adjustment would not be warranted in this case based on the low number of actual disabilities. We also support the slight increase in disability rates for the Safety members given the experience.

Comparison of Disabilities, Exposures, and Rates

	Segal Results					Cheiron Results				
				A/E Ratios					A/E Ratios	
	Actual	Exposures	Rate	Previous	Current	Actual	Exposures	Rate	Previous	Current
General										
Tiers 1 and 4	9	2,033	0.44%	107%	107%	7	2,027	0.35%	83%	83%
Tiers 3 and 5	11	23,704	0.05%	37%	42%	10	23,644	0.04%	34%	39%
Safety	59	4,418	1.34%	111%	104%	58	4,408	1.32%	108%	101%

In the next study, we strongly suggest that Segal analyze the disability assumptions using more years of data, at least six years, to capture the variability in experience within each study cycle and to better capture the lag between when a member leaves employment and actually is granted a disability benefit.

SECTION V – DEMOGRAPHIC ASSUMPTIONS

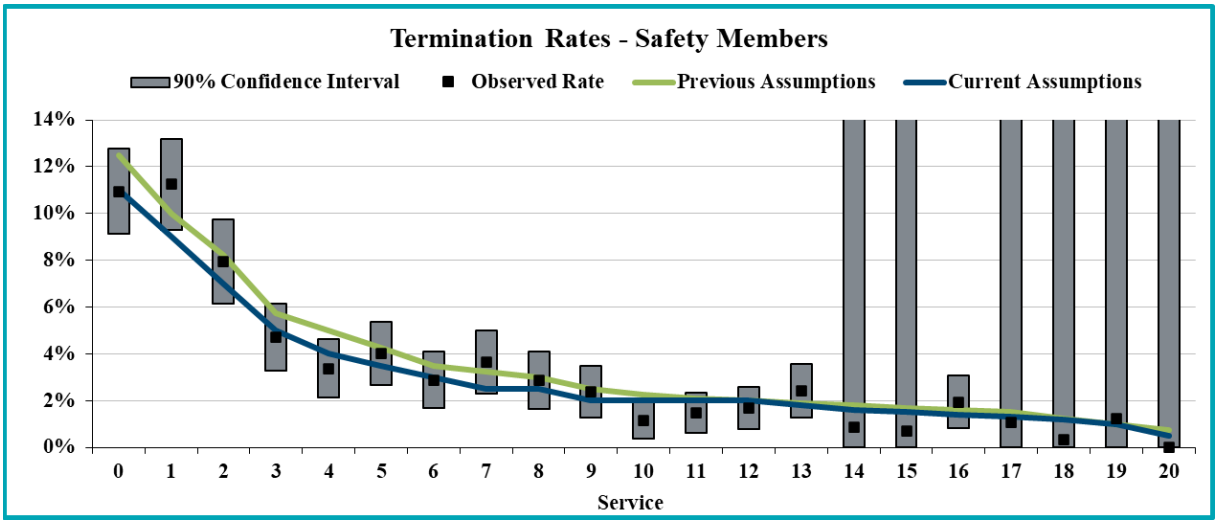
Terminations

Segal provided us their determination of terminations by General and Safety members and by service for the three-year study period. Based on our independent analysis of the termination rates as summarized below, we believe Segal's assumptions are reasonable and our results are very close which confirms that the basis on which assumptions were made is valid.

Comparison of Terminations, Exposures, and Rates

	Segal Results					Cheiron Results				
				A/E Ratios					A/E Ratios	
	Actual	Exposures	Rate	Previous	Current	Actual	Exposures	Rate	Previous	Current
General	1,238	18,185	6.8%	101%	100%	1,268	18,176	7.0%	103%	102%
Safety	82	3,371	2.4%	54%	63%	84	3,426	2.5%	55%	63%

Based only on the last three years' experience, the current termination assumptions for Safety members are much higher than the actual experience with an Actual to Expected (A/E) ratio of only 63%. However, the experience since 2012, illustrated in the graph below, shows that the current assumptions are reasonable. The actual termination rate for the Safety members during 2012-2017 was 4.8%, double the rate during 2018-2020, based on the 2015-2017 and 2012-2014 data Segal provided Cheiron as part of the 2018 audit. The General member termination experience has been very consistent since 2012, with an overall termination rate around 7%, for members not yet eligible for retirement.



We strongly suggest that Segal use more than three years of data when analyzing the termination assumptions, particularly for studies that cover periods that included unusual experience or significant events, such as the COVID pandemic and the related "Great Resignation", where significant numbers of the members either left the workforce or changed jobs at historically high rates.

SECTION V – DEMOGRAPHIC ASSUMPTIONS

Miscellaneous Demographic Assumptions

Merit Salary Increases: The service-based assumptions for active members are reasonable based on our review of the experience. We also believe the recommendation to use an assumption equal to the wage growth assumption plus the ultimate assumed merit increase for the respective class is reasonable for members working for a reciprocal employer.

We suggest that Segal continues to monitor the salary merit increase for Safety members who have 13 or more years of service. These salary increases were slightly increased for the 2020 study, but are still below the actual experience shown in Segal's report on page 25 during the last three years and the last six years. Liabilities are more sensitive to salary merit increases later in an active members' career than in the first few years after they were hired.

Reciprocity: Segal used the data for all deferred vested members in the December 31, 2020 valuation to determine the percentage that went on to be covered by a reciprocal retirement system. Their analysis showed that 41% of General and 72% of Safety deferred members went to a reciprocal system. The current assumptions are 40% for General and 70% for Safety, which are reasonable and consistent with other '37 Act plans.

However, our experience with other '37 Act clients confirms that members with reciprocity sometimes do not report their service with another system until they file for retirement, which could result in underreporting of reciprocity to the original system; CCCERA appears to have reasonably robust information regarding deferred members with reciprocity since using the current deferred member population results in relatively high reciprocity rates.

Probability of Eligible Survivor Under the Unmodified Option: Segal's analysis showed 63% of male retirees and 52% of female retirees had an eligible spouse or domestic partner and chose the Unmodified benefit option. Based on this analysis, the percent married assumptions (65% for males and 50% for females) are reasonable but low when compared to other '37 Act systems.

However, our analysis of the data showed a slightly higher percentage for males at 68%. In addition to a headcount-weighted analysis, we also performed a benefits-weighted analysis – similar to that used for the mortality analysis - and the resulting percentages married were 75% for males and 56% for females, which are more consistent with other '37 Act systems. This assumption is used to predict how many active members will choose an Unmodified benefit with the "free" 60% joint-and-survivor annuity instead of the single life annuity or another actuarial equivalent benefit option. The more members who elect the Unmodified joint-and-survivor option, the more valuable the benefits are, resulting in higher Actuarial Liabilities.

We suggest that Segal closely monitor this assumption in the next experience study, comparing CCCERA's experience to other 37 Act systems and performing the analysis on a benefits-weighted basis.

SECTION V – DEMOGRAPHIC ASSUMPTIONS

Survivor Age Difference: The current assumptions are reasonable based on Segal's disclosed analysis and our independent analysis of the data.

Assumed Commencement Age for Deferred Vested Members: These assumptions are reasonable based on Segal's analysis. We support the separate consideration of vested members with reciprocity, and recommend Segal continue to separately review this experience as available.

The experience for Safety deferred vested members without reciprocity showed that the average retirement age was 51.8 and Segal recommended an increase in the assumed retirement age for this group from 50 to 51. This is a reasonable recommendation for the Safety members who do not have the 3% at age 50 benefit formula: Tier A (Non-Enhanced), Tier D, and Tier E.

However, for Tier A (Enhanced) and Tier C who have the 3% at age 50 benefit formula, there is no incentive for an inactive member to wait an additional year to start receiving their benefit (i.e., at age 51 rather than age 50) since their initial retirement benefit would be the same as at age 51 as at age 50. In fact, they would miss out on one full year of benefit payments and an annual COLA if they retire at age 51.

We suggest that Segal carefully review this assumption in the next study, including reviewing the data to determine whether any of the members who retired from deferral status after age 50 had a specific reason for doing so that would not apply to most deferred members, such as a service-based eligibility provision that had not yet been met.

Leave Cashouts: The current assumptions by cost group are reasonable based on Segal's disclosed analysis and our independent analysis of the data.

Service from Unused Sick Leave: The current assumptions by healthy and disabled retirees and by General and Safety groups are reasonable based on Segal's disclosed analysis and our independent analysis of the data.

SECTION VI – ECONOMIC ASSUMPTIONS

Economic Assumptions

Overall, we believe Segal's recommendations with respect to the economic assumptions were reasonable given the data and conditions at the time of the study. Segal's Actuarial Experience Study report was issued on April 5, 2022 and our review is based on the economic environment at that time.

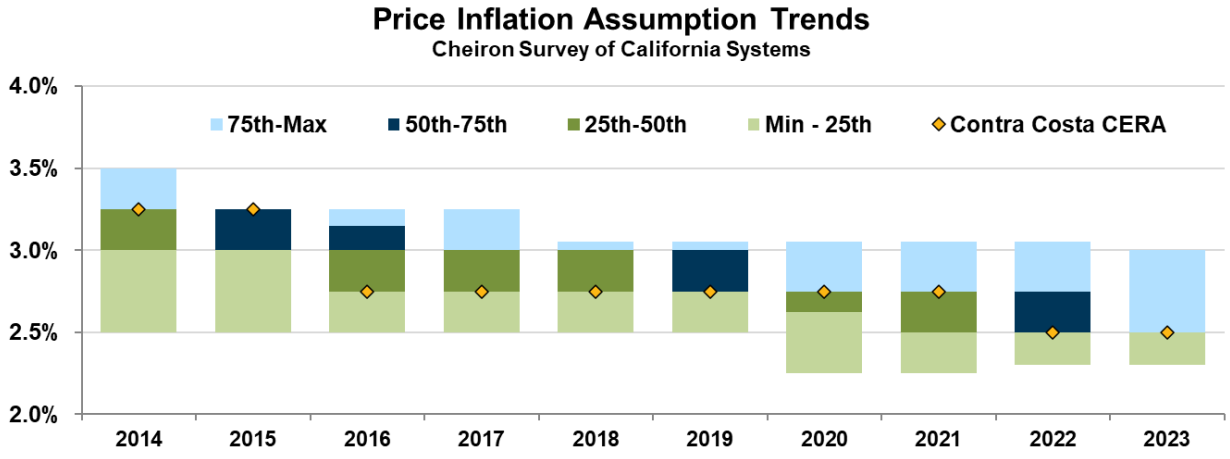
The inflation assumption, which is the building block of all other economic assumptions, was reduced from 2.75% to 2.50%. The decrease in inflation precipitated reductions in the all the other economic assumptions except for the post-retirement cost-of-living adjustments which remained unchanged.

Inflation

Segal concluded that a 2.50% inflation assumption would be appropriate, based on a variety of factors including CCCERA's investment consultant's (Verus) long-term inflation expectation of 2.30% and a median assumption of 2.50% for large retirement systems in the Public Plans Database as of June 6, 2024. We concur that a 2.50% inflation assumption is reasonable.

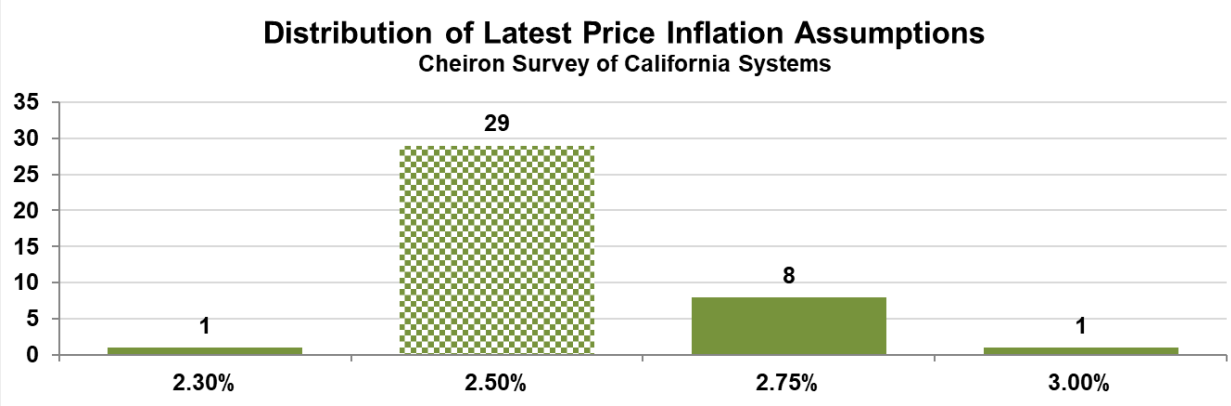
We also agree that the inflation forecasts derived from 30-year Treasury bonds (2.2%) as of February 2022 and the rate in the Social Security Administration's 2021 Trustees Report intermediate scenario (2.4%) are all compatible with the inflation assumption recommended Segal.

Cheiron annually performs a survey of 39 large retirement systems in California, including all the '37 Act Counties. The graph below shows the distribution of inflation assumptions for the last 10 years and the gold diamond in each year represents CCCERA's inflation assumption. The years shown at the bottom represent January 1 (or December 31 of the previous year) and July 1.



SECTION VI – ECONOMIC ASSUMPTIONS

The distribution of inflation assumptions from the most recent actuarial valuations is shown below. The median and most common inflation assumption in California is 2.50%.



Post-Retirement Cost-of-Living Adjustments (COLA)

Segal recommended maintaining the COLA assumptions for the three difference COLA groups, 2.00% for groups with a maximum COLA of 2.00% and 2.75% for groups with a maximum COLA of 3.00% or 4.00%.

We find these assumptions reasonable even though the inflation assumption decreased from 2.75% to 2.50%, since California typically has higher inflation than the U.S. average. We agree with a small margin of conservatism in anticipating future COLAs.

Wage Growth

Segal recommended maintaining an assumption that wages will grow at a rate of 0.50% above price inflation over the long term. This assumption is used to project across-the-board wage growth for individuals. In addition, individual wages are projected to increase for merit, longevity, and other career-path based reasons. Overall, we concur with the recommended assumption as well as the rationale and process that led to the recommendation.

Segal cites one projection – from the Office of the Chief Actuary of the Social Security Administration – that indicates a significantly higher estimate (1.2% per year) of the ultimate long-term wage growth above price inflation than reflected in the current 0.50% assumption. However, we note that the Social Security Administration (SSA) assumption is based on increases in mean wages, which have consistently exceeded increases in median wages, due to the excess wage gains experienced by individuals at the highest levels of the U.S. wage scale, which is not likely to include CCCERA members. Based on Social Security data from 1991 to 2021, mean wages grew by an average of 0.4% per year more than median wages.

SECTION VI – ECONOMIC ASSUMPTIONS

Payroll Growth

Segal recommended continuing to use the same assumption for projected payroll growth as for wage growth (3.00%). We find this assumption to be reasonable.

Moreover, Segal notes that over time, the effect of the PEPRA wage cap may cause pensionable compensation/payroll to grow less quickly than wages. This is because the PEPRA cap is limited to increasing with changes in the CPI-U (2.50% based on Segal's assumption). Although the pensionable wage cap currently has a limited impact on the level of overall payroll growth due to the number of people affected, over time it should be expected that more members will be affected by the cap, if the cap continues to grow slower than wages as expected.

Segal noted (and we concur) that the impact on future payroll growth should be monitored going forward.

Administrative Expenses

The current assumption is reasonable based on Segal's disclosed analysis using the actual administrative expenses for the prior year as a percentage of payroll for the prior year.

Investment Rate of Return Assumption

The recommended assumed rate of investment return of 6.75%, net of investment expenses, was reasonable in April 2022 and remains reasonable in today's economic environment. Segal uses average expected arithmetic return with a "risk adjustment". They also included a comparison with an alternative model that incorporates forward looking expected geometric returns (which are lower than arithmetic returns) based on the capital market assumptions in the 2021 Horizon Survey. Cheiron and other actuaries working with California public plans typically use the expected geometric returns. Our understanding is that Segal has been transitioning to the geometric approach with their recent 1937 Act experience studies; we would support this change as well for CCCERA. Overall, we agree that both approaches are reasonable and lead to comparable outcomes.

On the next page is Cheiron's analysis of the expected return on CCCERA's portfolio in 2022 based on Verus' 2022 Capital Market Assumptions; and the expected return on the Newly Adopted Asset Allocation (on page 2 of Timothy Price's memo from the August 28, 2024 Board Packet) using Verus' 2024 Capital Market Assumptions. We understand that the Board adopted a Resolution at its August 28, 2024 meeting to set new investment asset allocation targets contained in the memo. However, the higher return expectations in 2024 are mostly due to overall increases in the capital market assumptions since 2022, rather than due to changes in the target portfolio.

SECTION VI – ECONOMIC ASSUMPTIONS

CCCERA Portfolio Return Expectations

Source	Nominal Geometric	Inflation	Real
2022 Asset Allocation/ Capital Market Assumptions			
Verus (10-year)	6.7%	2.5%	4.2%
Verus (30-year)	7.0%	2.3%	4.7%
2024 Asset Allocation/ Capital Market Assumptions			
Verus (10-year)	7.7%	2.5%	5.2%
Verus (30-year)	7.8%	2.4%	5.4%
Current CCCERA Assumptions	**6.75%**	**2.50%**	**4.25%**

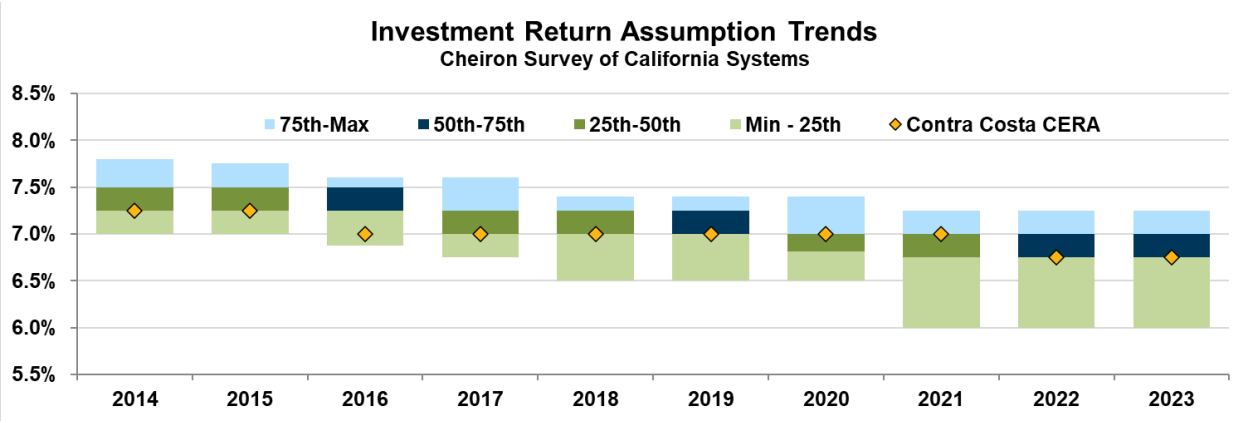
Our calculations show that the likelihood of achieving CCCERA's 6.75% return or higher were 53% in 2022 using Verus's 30-year capital market assumptions. In the current economic environment, the likelihood has increased to over 60%.

Likelihood of Achieving Average Nominal Returns Over a 10-Year Period

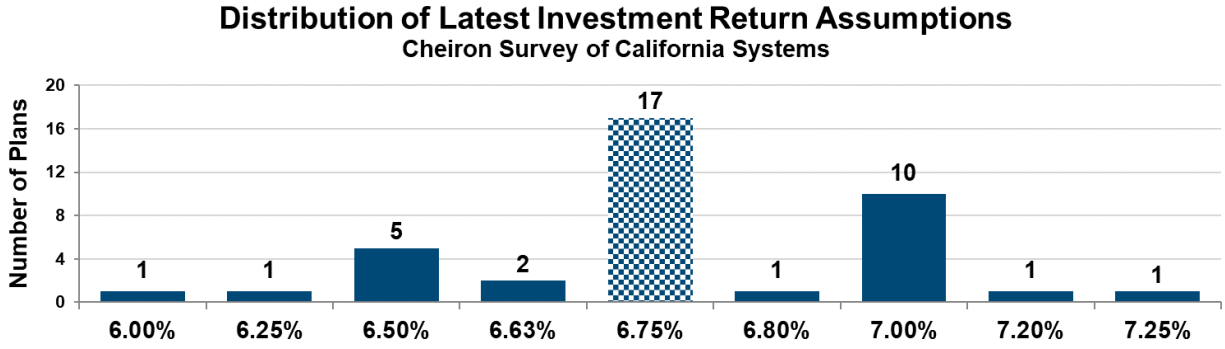
	2022 Asset Allocation/CMAs			2024 Asset Allocation/CMAs		
	7.25%	7.00%	6.75%	7.25%	7.00%	6.75%
Verus (10-yr)	44%	47%	49%	55%	58%	61%
Verus (30-yr)	48%	50%	53%	56%	59%	62%

The following charts show a series of comparisons of the CCCERA return assumption based on Cheiron's survey of 39 large public pension plans in California, including all 20 of the 1937 Act Systems. The first chart shows the trend in the assumed rate of investment return from this survey. Prior to 2019, CCCERA' assumed rate of return has been on the lower end of the range, below the 50th percentile, of California systems. The last five years CCCERA's investment return assumption has been equal to the median.

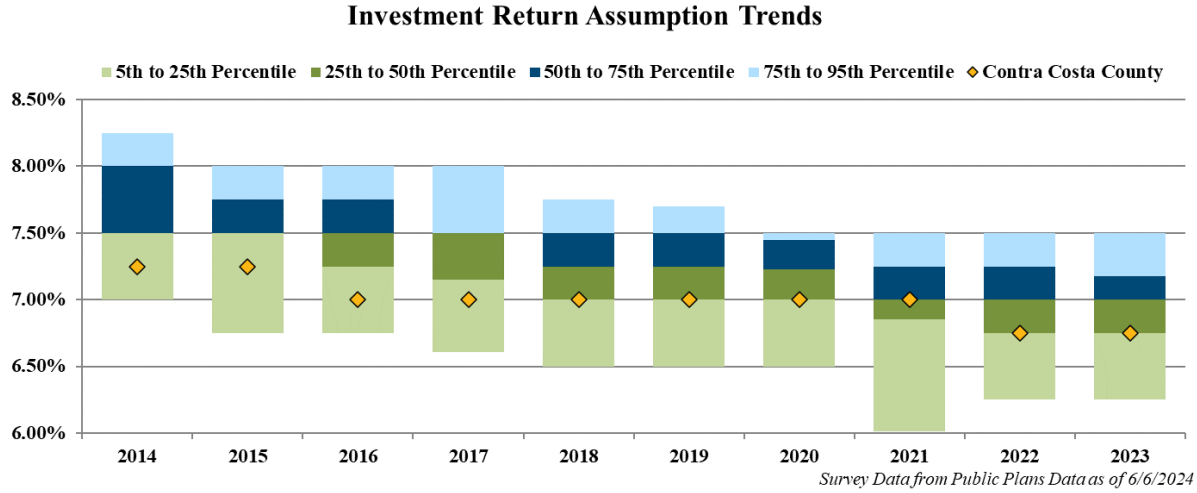
SECTION VI – ECONOMIC ASSUMPTIONS



The chart below shows the distribution of the latest investment return assumptions, mostly from June 30, 2023 or January 1, 2023/December 31, 2022 actuarial valuations. The median and most common assumption for California systems is 6.75%, CCCERA's current assumption.



The chart below shows the trends in the assumed rate of return for over 200 public retirement systems nationwide. Over the last decade, CCCERA has been in the lowest 5th-25th percentile, with the exception of 2021.



SECTION VII – EXECUTIVE SUMMARY (GASB 68 Review)

GAS 68

As part of the actuarial audit, we have performed a review of Segal's Government Accounting Standard Board Statement 68 (GAS 68) Actuarial Valuation, based on the December 31, 2022 Measurement Date for Employer Reporting as of June 30, 2023. Our review included a review of the following items from Segal's report:

- The calculation of the Total Pension Liability (TPL), including the roll-forward of the liability from the valuation date to the measurement date;
- The calculation of the discount rate;
- The Schedule of Changes in Net Pension Liability, including the calculation of the service cost, assumption changes, and differences between expected and actual experience;
- The calculation of the actuarially determined Pension Expense (Income), Deferred Outflows of Resources, and Deferred Inflows of Resources, both for CCCERA as a whole and for the individual employers;
- The calculations of the Net Pension Liability using a discount rate that is one percentage point higher and one percentage point lower than the stated rate used;
- The calculations of the proportionate shares for the participating employers; and
- All other actuarial calculations necessary for full compliance with GASB Statement No. 68, including a review of the employers' schedule

As part of our review process, we confirmed that the measurements for the items listed above as of the beginning of the measurement period were consistent with Segal's prior GAS 68 report (based on the December 31, 2021) measurement date. We then reviewed the roll-forward of the TPL from the valuation date to the measurement date for consistency with the December 31, 2021 actuarial funding valuation (upon which the roll-forward was based), and the Plan Fiduciary Net Position (PNFP) for consistency with the December 31, 2022 actuarial funding valuation and the supplementary asset schedules provided by CCCERA. Finally, we reviewed the schedules referenced above, based on the TPL and PFNP measurements and additional information provided by CCCERA, such as the payroll and contributions by employer.

Our review found that all items were calculated appropriately, and are consistent with prior GAS 68 reports, the actuarial funding reports, and the information provided by CCCERA.

APPENDIX A - GLOSSARY OF TERMS

1. Actuarial Assumptions

Estimates of future experience with respect to rates of mortality, disability, turnover, retirement, investment income, and salary increases. Demographic assumptions (rates of mortality, disability, turnover, and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

2. Actuarial Gain (Loss)

The difference between actual experience and actuarial assumption anticipated experience during the period between two actuarial valuation dates, as determined in accordance with a particular actuarial funding method.

3. Actuarial Liability

The Actuarial Liability is the present value of all benefits accrued as of the valuation date using the methods and assumptions of the valuation. It is also referred to by some actuaries as the "accrued liability" or "actuarial accrued liability."

4. Actuarial Present Value

The amount of funds currently required to provide a payment or series of payments in the future. It is determined by discounting future payments at predetermined rates of interest, and by probabilities of payment.

5. Actuarial Value of Assets

The Actuarial Value of Assets equals the Market Value of Assets adjusted according to the smoothing method. The smoothing method is intended to smooth out the short-term volatility of investment returns in order to stabilize contribution rates and the funded status.

6. Actuarial Cost Method

A mathematical budgeting procedure for allocating the dollar amount of the "actuarial present value of future plan benefits" between the actuarial present value of future normal costs and the Actuarial Liability. It is sometimes referred to as the "actuarial funding method."

7. Funded Status

The Actuarial Value of Assets divided by the Actuarial Liability. The funded status can also be calculated using the Market Value of Assets.

8. Governmental Accounting Standards Board

The Governmental Accounting Standards Board (GASB) defines the accounting and financial reporting requirements for governmental entities. GASB Statement No. 67 defines the plan accounting and financial reporting for governmental pension plans, and GASB Statement No. 68 defines the employer accounting and financial reporting for participating in a governmental pension plan.

9. Market Value of Assets

The fair value of the Plan's assets assuming that all holdings are liquidated on the measurement date.

10. Normal Cost

The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. It is sometimes referred to as "current service cost." Any payment toward the Unfunded Actuarial Liability is not part of the normal cost.

11. Present Value of Projected Benefits

The estimated amount of assets needed today to pay for all benefits promised in the future to current members of the Plan, assuming all actuarial assumptions are met.

12. Present Value of Future Normal Costs

The actuarial present value of retirement association benefits allocated to future years of service.

13. Unfunded Actuarial Liability (UAL)

The difference between the Actuarial Liability and the Actuarial Value of Assets. This is sometimes referred to as the "unfunded accrued liability."

Classic Values, Innovative Advice