East Bay Municipal Utility District
Employees' Retirement System

Economic Assumptions Review

Review of Economic Actuarial Assumptions for the June 30, 2022 Actuarial Valuations

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Re: Review of Economic Actuarial Assumptions for the June 30, 2022 Pension Plan and Health Insurance Benefit (HIB) Plan Actuarial Valuations

Dear Sophia:

We are pleased to submit this report of our review of the June 30, 2022 economic actuarial assumptions for the East Bay Municipal Utility District Employees' Retirement System (EBMUDERS). This report includes our recommendations and the analysis supporting their development.

It has been the practice of the Retirement Board to review both economic and non-economic[1] actuarial assumptions every four years. The last quadrennial experience study was performed as of June 30, 2020. In line with recent practice, the Board has requested Segal to perform an interim review of the economic assumptions for the June 30, 2022 valuations. As the non-economic assumptions will not be reviewed until the next quadrennial experience study as of June 30, 2022, we will continue to apply the same non-economic assumptions used in the June 30, 2021 valuations for the June 30, 2022 valuations.

The undersigned is a member of the American Academy of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein.

We look forward to reviewing this report with you and answering any questions you may have.

Sincerely,

Andy Yeung

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

DNA/jl

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[1] The non-economic assumptions include rates of retirement, withdrawals, pre- and post-retirement mortality, merit and promotion salary increases, etc.

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1. Introduction, Summary, and Recommendations

To project the cost and liabilities of the Pension Fund, assumptions are made about all future events that could affect the amount and timing of the benefits to be paid and the assets to be accumulated. Each year actual experience is compared against the projected experience, and to the extent there are differences, the future contribution requirement is adjusted.

If assumptions are modified, contribution requirements are adjusted to take into account a change in the projected experience in all future years. There is a great difference in both philosophy and cost impact between recognizing the actuarial deviations as they occur annually and changing the actuarial assumptions. Taking into account one year's gains or losses without making a change in the assumptions means that year's experience is treated as temporary and that, over the long run, experience will return to what was originally assumed. For example, it is impossible to determine how and to what extent the economy will be affected by the COVID-19 pandemic.[2] Changing assumptions reflects a basic change in thinking about the future, and has a much greater effect on the current contribution requirements than recognizing gains or losses as they occur.

The use of realistic actuarial assumptions is important in maintaining adequate funding, while paying the promised benefit amounts to participants already retired and to those near retirement. The actuarial assumptions used do not determine the "actual cost" of the plan. The actual cost is determined solely by the benefits and administrative expenses paid out, offset by investment income received. However, it is desirable to estimate as closely as possible what the actual cost will be so as to permit an orderly method for setting aside contributions today to provide benefits in the future, and to maintain equity among generations of participants and rate payers.

This study was undertaken in order to review the economic actuarial assumptions. The study was performed in accordance with Actuarial Standard of Practice (ASOP) No. 27 "Selection of Economic Assumptions for Measuring Pension Obligations." This Standard of Practice provides guidance for the selection of the economic actuarial assumptions utilized in a pension plan actuarial valuation.

We are recommending changes to the inflation and investment return assumptions currently used by the Board.

Our recommendations for the economic actuarial assumptions for the June 30, 2022 actuarial valuations are as follows:

[2] An analysis of the ongoing impact of the COVID-19 pandemic is beyond the scope of the current economic assumptions study.

Pg #	Actuarial Assumption Categories	Recommendation
8	**Inflation:** Future increases in the Consumer Price Index (CPI) which drives investment returns and active member salary increases.	Reduce the inflation assumption from 2.75% to 2.50% per annum as discussed in Section (3)(A).
10	**Retiree Cost of Living Increases:** Future increases in the cost of living adjustments for retirees.	Maintain the retiree cost of living assumption at 2.75% per annum (based on our recommended inflation assumption of 2.50% plus a margin for adverse deviation of 0.25%) as discussed in Section (3)(A).
10	**Investment Return:** The estimated average future net rate of return on current and future assets of the System as of the valuation date. This rate is used to discount liabilities.	Reduce the investment return assumption from 7.00% to 6.75% per annum as discussed in Section (3)(B).
18	**Individual Salary Increases:** Increases in the salary of a member between the date of the valuation to the date of separation from active service. This assumption has three components: • Inflationary salary increases • Real "across the board" salary increases • Merit and promotion increases.	Reduce the current inflationary salary increase assumption from 2.75% to 2.50% and maintain the current real "across the board" salary increase assumption at 0.50%. This means that the combined inflationary and real "across the board" salary increases will decrease from 3.25% to 3.00%. The current merit and promotion increase assumption ranges from 6.25% to 0.75%. The merit and promotion increases will remain unchanged; they were reviewed in the last quadrennial experience study as of June 30, 2020 and will be reviewed again at the next quadrennial experience study as of June 30, 2024.

We have estimated the preliminary impact of the proposed assumption changes as if they were applied to the June 30, 2021 Pension Plan and HIB Plan actuarial valuations. In particular, if all of the recommended assumption changes were implemented, the preliminary aggregate employer rate would have increased by 2.93% of payroll for the Pension Plan and 0.14% of payroll for the HIB Plan, for a total of 3.07%.

Regarding member contribution rates, there would be no change in the total (Pension Plan plus HIB Plan) member contribution rate for 1955/1980 Plan members if the recommended assumption changes were implemented since the rate for these members has been set based on bargaining unit contract negotiations in 2013. On the other hand, pursuant to Section 7522.30(a) of the California Government Code, 2013 Tier members are required to contribute at least 50% of the normal cost rates. Furthermore, Section 7522.30(d) states that the 2013 Tier member contribution rates, "once established…shall not be adjusted on account of a change to the normal cost rate unless the normal cost rate increases or decreases by more than 1 percent of payroll above or below the normal cost rate in effect at the time the employee contribution rate is first established or, if later, the normal cost rate in effect at the time of the last adjustment to the employee contribution rate under this section."

Effective with the June 30, 2020 valuation, the total Normal Cost rate was determined to be 18.81%, which was a change of more than 1% of payroll compared to the rate of 17.56% that was determined in the first CalPEPRA valuation. This was the first time since the first CalPEPRA valuation that the change in the total Normal Cost rate exceeded the 1% of payroll

threshold. Consequently, the member contribution rate for 2013 Tier members was increased to 9.41%, which was 50% of the total Normal Cost rate. For the June 30, 2021 valuation, the 2013 Tier member contribution rate remained at 9.41% for the Pension Plan, because the total Normal Cost rate for this tier remained within 1% of payroll of the new 18.81% threshold noted above.

We have remeasured the total Normal Cost rate as of June 30, 2021 under the economic actuarial assumptions recommended in this report and have determined that the resulting preliminary total Normal Cost rate of 19.70% is less than 1% above the new 18.81% threshold. However, we caution that if the economic assumptions recommended herein are adopted by the Board, they will first be applied in the June 30, 2022 valuation in combination with the membership data supplied by EBMUDERS to perform that valuation, the CalPEPRA compensation limits for 2022, and other factors; and the final total Normal Cost rate will again be compared to the 18.81% threshold to determine if an increase in the employee contribution rate for 2013 Tier members will be necessary.

Section 2 provides some background on the basic principles and methodology used for the review of the economic actuarial assumptions. A detailed discussion of each assumption and reasons for the proposed changes are found in Section 3.

The cost impact of these recommended economic assumptions is detailed in Section 4.

2. Background and Methodology

For this study, we analyzed the "economic" assumptions only. The primary economic assumptions reviewed are inflation, cost-of-living adjustments, investment return, and the inflation and real "across-the-board" components of salary increases.

Economic Assumptions

The primary economic assumptions consist of:

- **Inflation:** Increases in the price of goods and services. The inflation assumption reflects the basic return that investors expect from securities markets. It also reflects the expected basic salary increase for active members and drives increases in the allowances of retired members.
- **Cost-of-Living Adjustments:** Maximum 3% annual increases in the benefit paid to retired employees that is increased to 5% when the System's funded ratio measured on a PBO basis is more than 85%.[3,4] This assumption is tied to the inflation assumption and the System's funded ratio measured on a PBO basis.
- **Investment Return:** Expected long-term rate of return on the System's investments after expenses. This assumption has a significant impact on contribution rates.
- **Salary Increases:** In addition to inflationary increases, it is assumed that salaries will also grow by "across the board" real pay increases in excess of price inflation. It is also assumed that members will receive raises above these average increases as they advance in their careers. These are commonly referred to as merit and promotional increases. Payments to amortize any Unfunded Actuarial Accrued Liability (UAAL) are assumed to increase each year by the price inflation rate plus any "across the board" real pay increases that are assumed.

The setting of these economic assumptions is described in Section 3.

[3] Effective October 1, 2000, when the System is 85% funded on a PBO basis and the cost-of-living is less than 4%, withdrawals from the accumulated COLA bank are made to allow cost-of-living increases up to 4%.

[4] We note that as of July 1, 2022, the amounts in the COLA banks range from 0.00% to 8.90%, with about 99% of the retirees and beneficiaries having a COLA bank of 0.00% as of that date. This is a result of most continuing retirees and beneficiaries receiving a COLA increase on July 1, 2022 that was greater than the 3.00% provision, thereby drawing down their July 1, 2021 COLA bank to 0.00% as of July 1, 2022.

3. Economic Assumptions

A. Inflation

Unless an investment grows at least as fast as prices increase, investors will experience a reduction in the inflation-adjusted value of their investment. There may be times when "riskless" investments return more or less than inflation, but over the long term, investment market forces will generally require an issuer of fixed income securities to maintain a minimum return which protects investors from inflation.

The inflation assumption is long term in nature, so our analysis begins with a review of historical information. Following is an analysis of 15-year and 30-year moving averages of historical inflation rates:

Historical Consumer Price Index – 1930 to 2021[5]
(U.S. City Average - All Urban Consumers)

	25th Percentile	Median	75th Percentile
15-year moving averages	2.4%	3.3%	4.4%
30-year moving averages	2.9%	3.7%	4.8%

There has been a spike in inflation that started in the second calendar quarter of 2021 that has been continued to the second calendar quarter of 2022. However, the rate of inflation has been relatively steady since the Federal Reserve began to increase interest rates starting at the end of the first calendar quarter of 2022. Again, with the exception of the spike in inflation in late 2021, the average inflation rates for the 15-year averages during the above period are lower than the 30-year averages because they do not include the high inflation years of the mid-1970s and early 1980s.[6]

Based on information found in the Public Plans Database, which is produced in partnership with the National System of State Retirement Administrators (NASRA), the median inflation assumption used by 188 large public retirement funds in their 2020 fiscal year valuations was 2.50%.[7] In California, CalSTRS and eleven 1937 Act CERL systems use an inflation assumption of 2.75%,[8] nine 1937 Act CERL systems use an inflation assumption of 2.50%[9] and CalPERS uses an inflation assumption of 2.30%.

[5] Source: Bureau of Labor Statistics – Based on annual-to-annual CPI for All Items in U.S. city average, all urban consumers, not seasonally adjusted (Series ID: CUUR0000SA0).

[6] We note that the above averages are based on the U.S. City Average and that the inflation for the San Francisco-Oakland-Hayward Area (Bay Area) has been higher than the U.S. City Average. For instance, over the last 15 years ended June 30, 2022, inflation in the Bay Area has averaged 2.87% per year compared to the U.S. City Average of 2.38%, based on the increases in the June CPIs.

[7] Among 209 large public retirement funds, the 2020 fiscal year inflation assumption was not available for 21 of the public retirement funds in the survey data as of March 2022.

[8] We note that out of the nine 1937 Act CERL Systems, six of those are served by Segal and we would generally expect to recommend 2.50% as the inflation assumption in their next experience study.

[9] Four of these 1937 Act CERL systems use a 2.50% inflation assumption with a 2.75% COLA assumption.

EBMUDERS' investment consultant, Meketa, anticipates an annual inflation rate of 2.10% over a 20-year horizon, while the average inflation assumption provided by Meketa and four other investment advisory firms retained by Segal's California public sector clients, as well as Segal's investment advisory division (Segal Marco Advisor), [10] was 2.29%. Note that, in general, investment consultants use a time horizon for this assumption that is shorter than the time horizon we use for the actuarial valuation.[11]

To find a forecast of inflation based on a longer time horizon, we referred to the Social Security Administration's (SSA) 2021 report on the financial status of the Social Security program.[12] The projected average increase in the Consumer Price Index (CPI) over the next 75 years under the intermediate cost assumptions used in that report was 2.40%. The SSA report also includes alternative projections using lower and higher inflation assumptions of 1.80% and 3.00%, respectively.

We also compared the yields on the thirty-year inflation indexed U.S. Treasury bonds to comparable traditional U.S. Treasury bonds.[13] As of October 2022, the difference in yields is about 2.33% which provides a measure of market expectations of inflation. It is worth noting that this market expectation for long term inflation can be quite volatile and has dropped from the high of 2.55% over the last 12 months, which is illustrated in the table below.

Difference in Yields on the Thirty-Year Inflation Indexed U.S. Treasury Bonds to Comparable Traditional U.S. Treasury Bonds

Observation Month	Difference in Yields	Observation Month	Difference in Yields
November 2021	2.38%	May 2022	2.47%
December 2021	2.27%	June 2022	2.47%
January 2022	2.24%	July 2022	2.21%
February 2022	2.18%	August 2022	2.29%
March 2022	2.49%	September 2022	2.27%
April 2022	2.55%	October 2022	2.33%

Based on all of the above information, we recommend reducing the annual inflation assumption from 2.75% to 2.50%.

The setting of the inflation assumption using the information outlined above is a somewhat subjective process, and Segal does not apply a specific weight to each of the metrics in determining our recommended inflation assumption. Based on a consideration of all of the above metrics, beginning in 2021 we are generally recommending the same 2.50% inflation assumption in our experience studies for our California public retirement system clients.

[10] We note that this is the first time we have included inflation and real rate of return assumptions used by Segal Marco Advisor in our review of economic assumptions.

[11] The time horizon used by the six investment consultants included in our review generally ranges from 10 years to 30 years, with Meketa using a 20 year-horizon.

[12] Source: Social Security Administration: The 2021 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds

[13] Source: Board of Governors of the Federal Reserve System.

Retiree Cost of Living Increases

The annual cost of living increase in the benefit paid to retired members and beneficiaries is dependent on inflation. Up to a 3.00% annual adjustment will be made and that adjustment is increased to 5.00% when the Retirement Board determines that the System is more than 85% funded on a Projected Benefit Obligation (PBO) basis using market value of assets. Effective October 1, 2000, when the System is 85% funded on a PBO basis and the cost of living is less than 4.00%, withdrawals from the accumulated COLA bank are made to allow cost of living increases up to 4.00%. (As we noted in the footnote at the bottom of Section 2, about 99% of retirees and beneficiaries had no COLA bank as of July 1, 2022, due to the draw down of their July 1, 2021 COLA bank to receive a July 1, 2021 COLA above the 3.00% provision.)

In our last economic assumptions study report dated September 12, 2018, consistent with the 2.75% annual inflation assumption as recommended and adopted by the Board, the Board reduced the assumed 3.00% retiree cost of living adjustment to 2.75%. (The long-term annual average assumption of 2.75% is still currently used to approximate the liabilities before and after the System is expected to exceed the 85% funded ratio.) However, we observed in the table below that during the most recent 5-year, 10-year, and 20-year periods ended December 31, 2021, the changes in the annual CPI based on the San Francisco-Oakland-Hayward as used by the Board to set COLAs have exceeded those of the annual CPI for the U.S. City Average.

	Change in Annual CPI for San Francisco – Oakland – Hayward Area	Change in Annual CPI for U.S. City Average
5-Year Period	3.06%	2.46%
10-Year Period	2.87%	1.88%
20-Year Period	2.48%	2.15%

In order to reflect this experience and to mitigate actuarial losses which may arise from future COLA increases greater than the inflation assumption, we believe it is reasonable for the Board to consider adopting an extra margin above the general price inflation in anticipating future COLAs. **Accordingly, for retired members and beneficiaries our recommended COLA assumption is 2.75%, which includes a 0.25% margin above our recommended inflation assumption, which leaves the COLA assumption unchanged.**

B. Investment Return

The investment return assumption is comprised of two primary components, inflation and real rate of investment return, with adjustments for expenses and risk.

Real Rate of Investment Return

This component represents the portfolio's incremental investment market returns over inflation. Generally, when an investor takes on greater investment risk, the return on the investment is expected to also be greater, at least in the long run. This additional risk and return is expected to vary by asset class and empirical data supports that expectation. For that reason, the real rate of return assumptions are developed by asset class. Therefore, the real rate of return

assumption for a retirement system's portfolio will vary with the Board's asset allocation among asset classes.

The System's current target asset allocation and the assumed real rate of return assumptions by asset class are shown in the following table. The first column of real rate of return assumptions are determined by reducing Meketa's total or "nominal" 2022 return assumptions over a 20-year horizon by their assumed 2.10% inflation rate. The second column of returns (except for Covered Calls) represents the average of a sample of real rate of return assumptions. The sample includes the expected annual real rate of return provided to us by Meketa and four other investment advisory firms retained by Segal's public sector clients, as well as Segal's investment advisory division. We believe these averages are a reasonable consensus forecast of long-term future market returns in excess of inflation.[14]

The System's Target Asset Allocation and Assumed Arithmetic Real Rate of Return Assumptions by Asset Class and for the Portfolio

Asset Class	Percentage of Portfolio[15]	Meketa's Assumed Real Rate of Return[16]	Average Assumed Real Rate of Return from a Sample of Consultants to Segal's California Public Sector Clients[17]
Domestic Large Cap Equity	21.75%	7.18%	5.60%
Domestic Small Cap Equity	3.25%	8.75%	6.63%
Developed Int'l Large Cap Equity	17.50%	8.40%	6.39%
Emerging Market Equity	7.50%	9.60%	8.34%
Core Bonds	20.00%	1.83%	0.59%
High Yield Bonds	2.50%	5.50%	3.22%
Bank Loans	2.50%	4.96%	2.76%
Real Estate	5.00%	7.00%	5.00%
Covered Calls	20.00%	5.07%	5.07%[18]
Total	**100.00%**	**6.03%**	**4.71%**

The above are representative of "indexed" returns and do not include any additional returns ("alpha") from active management. This is consistent with the ASOP No. 27, Section 3.6.3.d, which states:

[14] Note that, just as for the inflation assumption, in general the time horizon used by the investment consultants in determining the real rate of return assumption is shorter than the time horizon encompassed by the actuarial valuation.

[15] The System's target allocation has not changed since the last experience study which recommended economic and non-economic actuarial assumptions for the 2020 valuations. However, the estimated breakdowns of domestic equity between large cap and small cap (or 25% of the portfolio in total) and of international equity between developed international large cap and emerging market (another 25% of the portfolio in total) as provided by Meketa has changed between the prior and current study.

[16] Derived by reducing Meketa's nominal return assumptions by their 2.10% inflation assumption over a 20-year horizon.

[17] These are based on the projected arithmetic returns provided by Meketa and four other investment advisory firms serving 14 city and county retirement systems in California, as well as Segal's investment advisory division. These return assumptions are gross of any applicable investment expenses. Furthermore, the returns provided by Meketa have been updated to reflect their latest expectation as of June 30, 2022, whereas for the other investment advisory firms, their rates are generally those provided in the early part of 2022.

[18] For this asset class, Meketa's assumption is applied in lieu of the average because there is a larger disparity in return for this asset class among the firms surveyed and using Meketa's assumption should more closely reflect the underlying investment made specifically for the System.

"Investment Manager Performance - Anticipating superior (or inferior) investment manager performance may be unduly optimistic (or pessimistic). The actuary should not assume that superior or inferior returns will be achieved, net of investment expenses, from an active investment management strategy compared to a passive investment management strategy unless the actuary has reason to believe, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the long term."

The following are some observations about the returns provided above:

1. The investment consultants to our California public sector clients, as well as Segal's investment advisory division, have each provided us with their expected real rates of return for each asset class, over various future periods of time. However, in general, the returns available from investment consultants are projected over time periods that are shorter than the durations of a retirement plan's liabilities.

2. Using a sample average of expected real rate of returns allows EBMUDERS' investment return assumption to reflect a broader range of capital market information and should help reduce year to year volatility in the investment return assumption.

3. Therefore, we recommend that the 4.71% portfolio real rate of return be used to determine EBMUDERS' investment return assumption. This is 0.07% higher than the return that was used two years ago in the experience study that recommended the investment return assumption for the June 30, 2020 valuations.

   The difference is due to changes in the real rate of return assumptions provided to us by the investment advisory firms (+0.01% under the 2020 asset allocation) and changes in the System's estimated breakdown of the target asset allocation between various asset classes (+0.06%) as provided by Meketa.

System's Expenses

For funding purposes, the real rate of return assumption for the portfolio needs to be adjusted for administrative expenses and investment expenses expected to be paid from investment income. The following table provides these expenses in relation to the average market value of assets for the five years ending June 30, 2022.

Administrative and Investment Expenses as a Percentage of Average Market Value of Assets (Dollars in 000's)

Year Ending June 30	Average Market Value of Assets Weighted by Cash Flow	Administrative Expenses	Investment Expenses[19]	Administrative %	Investment %	Total %
2018	$1,608,543	$1,551	$4,037	0.10	0.25	0.35
2019	1,747,231	1,510	4,993	0.09	0.29	0.38
2020	1,825,599	1,487	4,864	0.08	0.27	0.35
2021	1,847,353	1,922	4,609	0.10	0.25	0.35
2022	2,320,788	1,921	3,533	0.08	0.15	0.23
Five-Year Average				**0.09**	**0.24**	**0.33**
Current Assumption				**0.09**	**0.25**	**0.34**
Recommendation				**0.09**	**0.16**	**0.25**

In our prior review of economic actuarial assumptions for the June 30, 2018 actuarial valuations, Segal understood at that time that the Board had adopted a more passively managed portfolio and as such, our recommendation was to lower the total expense assumption to 0.16% of the Market Value of Assets Weighted by Cash Flow. However, when we performed the last experience study which developed economic and non-economic actuarial assumptions for the June 30, 2020 actuarial valuations, the reductions in the aggregate investment fees did not materialize to the extent Segal had anticipated. Consequently, we recommended an increase in the total expense assumption to 0.34% in that experience study. Based on a recent conversation Segal had with EBMUDERS, we understand that over the last 18 months or so, EBMUDERS has replaced some of the investment managers with higher fees and has moved to a more passively managed portfolio over that time, and that the current group of investment managers is considered stable for the time being. This can be observed in the table above wherein the investment fees for fiscal year ending June 30, 2022 decreased by over $1 million compared to the prior fiscal year. Based on the investment fees for the third quarter of 2022, EBMUDERS indicated that the investment expenses extrapolated for fiscal year 2022/2023 would again likely be in the $3.5 million range. **Based on all of this information, we recommend that the System's future expense assumption be decreased from 0.34% to 0.25%.**

Note that we have not performed a detailed analysis to measure how much of the investment expenses paid to active managers might have been offset by additional returns ("alpha") earned by that active management,[20] but we do not believe that such a review would have a significant impact on the recommended investment return assumption using the above expense assumption, especially considering that EBMUDERS has moved to a more passively managed portfolio over the last 18 months or so. As cited in our analysis of the System's real rate of investment return, according to Section 3.6.3.d of ASOP No. 27 the effect of an active

[19] Net of securities lending expenses. Because we do not assume any additional net return for this program, we effectively assume that any securities lending expenses will be offset by related income.

[20] We understand that as of the beginning of November 2022, fees associated with active management represent about 90% of the total investment expenses.

investment management strategy "should not assume that superior or inferior returns will be achieved, net of investment expenses…unless the actuary has reason to believe, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the long term."

For this study, we have continued to use the current approach that any "alpha" that may be identified, including any alpha to cover investment expenses, would be treated as an increase in the risk adjustment and corresponding confidence level. For example, a full 0.25% of alpha would increase the confidence level by 3% (see discussions that follow on definitions of risk adjustment and confidence level).

Based on above experience, we have decreased the future expense assumption from 0.34% to 0.25%. This assumption will be re-examined in subsequent assumption reviews as new data becomes available.

Risk Adjustment

The real rate of return assumption for the portfolio is adjusted to reflect the potential risk of shortfalls in the return assumptions. The System's asset allocation determines this portfolio risk, since risk levels are driven by the variability of returns for the various asset classes and the correlation of returns among those asset classes. This portfolio risk is incorporated into the real rate of return assumption through a risk adjustment.

The purpose of the risk adjustment (as measured by the corresponding confidence level) is to increase the likelihood of achieving the actuarial investment return assumption in the long term.[21] This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not.

The 4.71% expected real rate of return developed earlier in this report was based on expected mean or average arithmetic returns. In our model, the confidence level associated with a particular risk adjustment represents the relative likelihood that future investment earnings would equal or exceed the assumed earnings over a 15-year period on an expected value basis.[22] The 15-year time horizon represents an approximation of the "duration" of the fund's liabilities, where the duration of a liability represents the sensitivity of that liability to interest rate variations. Note that, based on the investment return assumptions recently adopted by systems that have been analyzed under this model, we observe a confidence level in the range of 50% to 55%.

Two years ago, the Board adopted an investment return assumption of 7.00%. That return implied a risk adjustment of 0.05%, reflecting a confidence level of 51% that the actual average return over 15 years would not fall below the assumed return, assuming that the distribution of returns over that period follows the normal statistical distribution.[23]

[21] This type of risk adjustment is referred to in the Actuarial Standards of Practice as a "margin for adverse deviation."

[22] If a retirement system uses the expected arithmetic average return as the discount rate in the funding valuation, that retirement system is expected to have no surplus or asset shortfall relative to its expected obligations assuming all actuarial assumptions are met in the future.

[23] Based on an annual portfolio return standard deviation of 10.02% provided by Meketa. Strictly speaking, future compounded long-term investment returns will tend to follow a log-normal distribution. However, we believe the Normal distribution assumption is reasonable for purposes of setting this type of risk adjustment.

If we use the same 51% confidence level from our last study to set this year's risk adjustment, based on the current long-term portfolio standard deviation of 12.50% provided by Meketa, the corresponding risk adjustment would be 0.06%. Together with the other investment return components, this would result in an investment return assumption of 6.90%, which is 0.10% lower than the current assumption of 7.00%.

However, based on the general practice of using one-quarter percentage point increments for economic assumptions, together with the System's historical risk adjustment and confidence levels adopted by the Board in setting the investment return assumption, we recommend lowering the current net investment return assumption of 7.00% to 6.75%, which would have a risk adjustment of 0.21% and corresponds to a little higher confidence level of 53%.

The table below shows the System's recommended investment return assumption, the risk adjustment and confidence level compared to the historical values for prior studies.

Historical Investment Return Assumptions, Risk Adjustments and Confidence Levels based on Assumptions Adopted by the Board

Year Ending June 30	Investment Return	Risk Adjustment	Corresponding Confidence Level
2012	7.75%	0.10%	51%
2014	7.50%	0.09%	51%
2016	7.25%	0.44%	55%
2018	7.00%	0.12%	51%
2020	7.00%	0.05%	51%
2022	6.75%	0.21%	53%

As we have discussed in prior experience studies, the risk adjustment model and associated confidence level is most useful as a means for comparing how the System has positioned themselves relative to risk over periods of time.[24] The use of expected returns with a 53% confidence level under Segal's model should be considered in context with other factors, including:

- As noted above, the confidence level is more of a relative measure than an absolute measure, and so can be reevaluated and reset for future comparisons.
- The confidence level is based on the standard deviation of the portfolio that is determined and provided to us by Meketa. The standard deviation is a statistical measure of the future volatility of the portfolio and so is itself based on assumptions about future portfolio volatility and can be considered somewhat of a "soft" number.
- A confidence level of 53% is consistent with the range of about 50% to 55% confidence levels that correspond to the risk adjustments currently used by most of Segal's other California public retirement system clients.

[24] In particular, it would not be appropriate to use this type of risk adjustment as a measure of determining an investment return rate that is "risk-free."

- We have not taken into account any additional returns ("alpha") that might be earned on active management. This means that if active management generates enough alpha to cover its related expenses, this would increase returns. This aspect of Segal's model is further evaluated below.

- As with any model, the results of the risk adjustment model should be evaluated for reasonableness and consistency. This is discussed in the later section on "Comparisons with Other Public Retirement Systems".

Taking into account the factors above, we recommend the Board lower the 7.00% assumption to 6.75% that includes a 0.21% risk adjustment, with a corresponding confidence level of 53%.

Recommended Investment Return Assumption

The following table summarizes the components of the investment return assumption developed in the previous discussion. For comparison purposes, we have also included similar values from prior studies.

Assumption Component	June 30, 2022 Recommended	June 30, 2020 Adopted	June 30, 2018 Adopted
Inflation	2.50%	2.75%	2.75%
Plus Portfolio Real Rate of Return	4.71%	4.64%	4.53%
Minus Expense Adjustment	(0.25)%	(0.34)%	(0.16)%
Minus Risk Adjustment	(0.21)%	(0.05)%	(0.12)%
Total	**6.75%**	**7.00%**	**7.00%**
Confidence Level	**53%**	**51%**	**51%**

Assumption Component	June 30, 2016 Adopted	June 30, 2014 Adopted	June 30, 2012 Adopted
Inflation	3.00%	3.00%	3.25%
Plus Portfolio Real Rate of Return	5.14%	5.07%	5.05%
Minus Expense Adjustment	(0.45)%	(0.48)%	(0.45)%
Minus Risk Adjustment	(0.44)%	(0.09)%	(0.10)%
Total	**7.25%**	**7.50%**	**7.75%**
Confidence Level	**55%**	**51%**	**51%**

Based on this analysis, we recommend that the investment return assumption be lowered to 6.75% per annum.

Comparison with Alternative Model used to Review Investment Return Assumption

Since our appointment as actuary for EBMUDERS in 2007, we have consistently reviewed investment return assumptions based on our model that incorporates expected arithmetic real returns for the different asset classes and for the entire portfolio as one component of that model.[25] The use of "forward looking expected arithmetic returns" is one of the approaches discussed for use in the Selection of Economic Assumptions for measuring Pension Obligations under Actuarial Standards of Practice (ASOP) No. 27.

Besides using forward looking expected arithmetic returns, ASOP No. 27 also discusses setting investment return assumptions using an alternative "forward looking expected geometric returns" approach.[26] Even though expected geometric returns are lower than expected arithmetic returns, public retirement systems that have set investment return assumptions using this alternative approach have in practice adopted investment return assumptions that are generally comparable to those adopted by the Board for EBMUDERS. This is because under the model used by those retirement systems, their investment return assumptions are not reduced to anticipate future investment expenses.[27]

For comparison, we evaluated the recommended 6.75% assumption based on the expected geometric return for the entire portfolio, but net only of the administrative expenses. Under that model, over a 15-year period, there is a 43% likelihood that future average geometric returns may meet or exceed 6.75%.[28] We note that this is substantially less than the 53% likelihood that we observed when we reviewed the results using this model at the last experience study for the June 30, 2020 actuarial valuations. The current 43% likelihood result is less than the mean (or 50% likelihood) for this assumption and is driven by lower expected real rates of return used by Horizon Actuarial Services in 2022, compared to the information used in their prior study performed in 2020.[29]

Because we wanted to confirm that the 6.75% investment return assumption we are recommending to EBMUDERS is reasonable, we have applied EBMUDERS' target asset allocation to the investment return assumptions for the various asset classes developed by our investment consultants (Segal Marco). The long term expected real rates of return developed by Segal Marco that we have used are based on a 20-year time horizon and are net of their 2.30% inflation assumption. Also, these returns over the 20-year horizon were further adjusted to reflect an anticipated rising trend of future short-term interest rates. Based on this information,

[25] Again, as discussed in the footnote in the "Risk Adjustment" subsection, if a retirement system uses the expected arithmetic average return as the discount rate in the funding valuation, that retirement system is expected to have no surplus or asset shortfall relative to its expected obligations assuming all actuarial assumptions are met in the future.

[26] If a retirement system uses the expected geometric average return as the discount rate in the funding valuation, that retirement system is expected to have an asset value that generally converges to the median accumulated value as the time horizon lengthens assuming all actuarial assumptions are met in the future.

[27] This means that if that model were to be applied to EBMUDERS, the expected geometric return would not be adjusted for the approximately 0.25% expenses paid by EBMUDERS.

[28] We performed this stochastic simulation using the capital market assumptions included in the 2022 survey prepared by Horizon Actuarial Services. That simulation was performed using 10,000 trial outcomes of future market returns, using assumptions for 20-year arithmetic returns adjusted by 0.09% for administrative expenses, standard deviations, and correlation coefficients from 40 investment advisors, as found in the 2022 survey.

[29] The lower expected real rates of return used by Horizon Actuarial Services is a result of lower expected future capital market return assumptions combined with a 0.28% increase in their inflation assumption.

there is about a 51% likelihood that future average geometric returns may meet or exceed 6.75%.

We would continue to monitor results evaluated under this model and advise the Board on whether an adjustment to our recommended assumption would be warranted at the next review of this assumption.

Comparisons with Other Public Retirement Systems

One final test of the recommended investment return assumption is to compare it against those used by other public retirement systems, both in California and nationwide.

We note that an investment return of 6.75% or lower is becoming more common among California public sector retirement systems. In particular, of the twenty 1937 Act CERL systems, eight use a 7.00% investment return assumption, seven use 6.75%, two use 6.50% and one uses 6.25%. The remaining two 1937 Act CERL systems currently use a 7.25% earnings assumption. Furthermore, CalSTRS currently uses a 7.00% earnings assumption and CalPERS uses a 6.80% earnings assumptions.

The following table compares EBMUDERS' recommended net investment return assumption against those of the 207 large public retirement funds in their 2021 fiscal year valuations based on information found in the Public Plans Database, which is produced in partnership with NASRA:[30]

		Public Plans Data[31]		
Assumption	**EBMUDERS**	**Low**	**Median**	**High**
Net Investment Return	6.75%	4.25%	7.00%	8.25%

The detailed survey results show that more than 80% of the systems have an investment return assumption in the range of 6.75% to 7.50%. Also, over half of the systems have reduced their investment return assumption from 2017 to 2021. State systems outside of California tend to change their economic assumptions less frequently and so may lag behind emerging practices in this area.

In summary, we believe that the recommended assumption of 6.75% provides for an appropriate risk margin within the risk adjustment model and is consistent with the System's current practice relative to other public systems.

C. Salary Increase

Salary increases impact plan costs in two ways: (i) by increasing members' benefits (since benefits are a function of the members' highest average pay) and future normal cost collections; and (ii) by increasing total active member payroll which in turn generates lower UAAL contribution rates as a percent of payroll. These two impacts are discussed separately below.

[30] Among 209 large public retirement funds, the 2021 fiscal year investment return assumption was not available for 2 of the public retirement funds in the Public Plans Database as of March 2022.

[31] Public Plans Data website – Produced in partnership with the National Association of State Retirement Administrators (NASRA)

As an employee progresses through his or her career, increases in pay are expected to come from three sources:

1. **Inflation:** Unless pay grows at least as fast as consumer prices grow, employees will experience a reduction in their standard of living. There may be times when pay increases lag or exceed inflation, but over the long term, labor market forces may require an employer to maintain its employees' standards of living.

   As discussed earlier in this report, we recommend reducing the annual inflation assumption from 2.75% to 2.50%. This inflation component is used as part of the salary increase assumption.

2. **Real "Across the Board" Pay Increases:** These increases are typically termed productivity increases since they are considered to be derived from the ability of an organization or an economy to produce goods and services in a more efficient manner. As that occurs, at least some portion of the value of these improvements can provide a source for pay increases. These increases are typically assumed to extend to all employees "across the board". The State and Local Government Workers Employment Cost Index produced by the Department of Labor provides evidence that real "across the board" pay increases have averaged about 0.5% – 0.8% annually during the last ten to twenty years.

   We also referred to the annual report on the financial status of the Social Security program published in August 2021. In that report, real "across the board" pay increases are forecast to be 1.2% per year under the intermediate assumptions.

   The real pay increase assumption is generally considered a more "macroeconomic" assumption that is not necessarily based on individual plan experience. However, recent salary experience with public systems in California as well as anecdotal discussions with plans and plan sponsors indicate lower future real wage growth expectations for public sector employees. We note that for EBMUDERS' active members, the actual average inflation plus "across the board" increase (i.e., wage inflation) over the five-year period ending June 30, 2021 was 3.17%.

Valuation Date	Actual Average Increase[32]	Actual Change in CPI[33]
June 30, 2017	(0.20)%	3.48%
June 30, 2018	8.90%	3.91%
June 30, 2019	3.94%	3.22%
June 30, 2020	2.73%	1.62%
June 30, 2021	0.50%	3.15%
Five-Year Average	**3.17%**	**3.08%**

[32] Reflects the increase in average salary for members at the beginning of the year versus those at the end of the year. It does not reflect the average salary increases received by members who worked the full year.

[33] Based on the change in the June CPI for the San Francisco-Oakland-Hayward Areas compared to the prior year. (Note that for determining the annual retiree COLA increases, EBMUDERS uses the change in the annual average CPI for the San Francisco-Oakland-Hayward Area.)

Even though the actual average salary increase was just slightly higher than the average change in the CPI over the five-year period ending June 30, 2021, this was in part due to the results for the years ended June 30, 2017 and June 30, 2021.[34] Considering our other recommendation to lower the inflation assumption by 0.25%, we recommend maintaining the real "across the board" salary increase assumption at 0.50%. This means that the combined inflation and "across the board" salary increase assumption will decrease from 3.25% to 3.00%.

3. **Merit and Promotion Increases:** As the name implies, these increases come from an employee's career advances. This form of pay increase differs from the previous two, since it is specific to the individual. For EBMUDERS, there are merit and promotion increases based on time from hire. The assumed increases range from 6.25% to 0.75%. Generally, we review this merit and promotion component as part of the quadrennial experience study.

   We recommend maintaining the merit and promotion assumptions discussed above in the June 30, 2022 actuarial valuations.

Active Member Payroll

Projected active member payrolls are used to develop the UAAL contribution rate. Future values are determined as a product of the number of employees in the workforce and the average pay for all employees. The average pay for all employees increases only by inflation and real "across the board" pay increases. The merit and promotion increases are not an influence, because this average pay is not specific to an individual.

Under the Board's current practice, the UAAL contribution rate is developed by assuming that the total payroll for all active members will increase annually over the amortization periods at the same assumed rates of inflation plus real "across the board" salary increase assumptions as are used to project the members' future benefits.

Consistent with the combined recommended inflation and real "across the board" salary increase assumptions, we recommend reducing the payroll growth assumption from 3.25% to 3.00% annually.

[34] We understand there were generally no pay increases for the years ended June 30, 2017 and June 30, 2021. However, we understand pay increases were granted during the years following those valuations (although the June 30, 2022 valuation has not yet been performed and the actual average pay increase from that valuation is not yet available).

4. Cost Impact

The tables below show the preliminary changes in the total normal cost, actuarial accrued liability, funded ratios, and employer contribution rates for the Pension and HIB Plans (and both plans combined) due to the recommended assumption changes, as if they were applied in the June 30, 2021 actuarial valuations.

Pension Plan

Preliminary Change in Plan Liabilities and Funded Ratios as of June 30, 2021

	Current Assumptions	Recommended Assumptions	
	Liability / Funded Ratio	Liability / Funded Ratio	Increase / (Decrease)
Total Employer and Employee Normal Cost	$53,488,000	$55,104,000	$1,616,000
Actuarial Accrued Liability	$2,605,614,000	$2,674,096,000	$68,482,000
Funded Ratio on Valuation Value of Assets Basis	78.5%	76.5%	(2.0)%
Funded Ratio on Market Value of Assets Basis	87.1%	84.9%	(2.2)%

Preliminary Employer Contribution Rate Impact (% of Payroll)

Contributions	Recommended Assumptions
Normal Cost	0.75%
UAAL	2.18%[35]
Total	**2.93%[36]**

Discussion on 1955/1980 Plan Member Contribution Rate and Development of Possible Changes in Employee and Employer Normal Cost Rates for the 2013 Tier

There would be no change in the total (Pension Plan plus HIB Plan) member contribution rate for 1955/1980 Plan members if the recommended assumption changes were implemented since the rate for these members has been set based on bargaining unit contract negotiations in 2013.

On the other hand, pursuant to Section 7522.30(a) of the California Government Code, 2013 Tier members are required to contribute at least 50% of the normal cost rates. Furthermore, Section 7522.30(d) states that the 2013 Tier member contribution rates, "once established…shall not be adjusted on account of a change to the normal cost rate unless the normal cost rate increases or decreases by more than 1 percent of payroll above or below the normal cost rate in effect at the time the employee contribution rate is first established or, if

[35] Reflects the change in the amortization period for assumption or method changes from 25 years to 20 years, which was adopted by the Board at their September 22, 2022 meeting.

[36] This rate has not been adjusted to take into account the continuance of the higher contribution rates from the 2021/2022 fiscal year to the 2022/2023 fiscal year, as approved by the Board. That additional rate is 2.20% of payroll.

later, the normal cost rate in effect at the time of the last adjustment to the employee contribution rate under this section."

Effective with the June 30, 2020 valuation, the total Normal Cost rate was determined to be 18.81%, which was a change of more than 1% of payroll compared to the rate of 17.56% that was determined in the first CalPEPRA valuation. This was the first time since the first CalPEPRA valuation that the change in the total Normal Cost rate exceeded the 1% of payroll threshold. Consequently, the member contribution rate for 2013 Tier members was increased to 9.41%, which was 50% of the total Normal Cost rate. For the June 30, 2021 valuation, the 2013 Tier member contribution rate remained at 9.41% for the Pension Plan, because the total Normal Cost rate for this tier remained within 1% of payroll of the new 18.81% threshold noted above.

We have remeasured the total Normal Cost rate as of June 30, 2021 under the economic actuarial assumptions recommended in this report and have determined that the resulting preliminary total Normal Cost rate of 19.70% is less than 1% above the new 18.81% threshold. However, we caution that if the economic assumptions recommended herein are adopted by the Board, they will first be applied in the June 30, 2022 valuation in combination with the membership data supplied by EBMUDERS to perform that valuation, the CalPEPRA compensation limits for 2022, and other factors; and the final total Normal Cost rate will again be compared to the 18.81% threshold to determine if an increase in the employee contribution rate for 2013 Tier members will be necessary.[37]

HIB Plan

Preliminary Change in Plan Liabilities and Funded Ratios as of June 30, 2021

	Current Assumptions	Recommended Assumptions	
	Liability / Funded Ratio	Liability / Funded Ratio	Increase / (Decrease)
Total Employer and Employee Normal Cost	$2,209,000	$2,303,000	$94,000
Actuarial Accrued Liability	$123,027,000	$126,162,000	$3,135,000
Funded Ratio on Valuation Value of Assets Basis	42.4%	41.4%	(1.0)%
Funded Ratio on Market Value of Assets Basis	47.1%	45.9%	(1.2)%

Preliminary Employer Contribution Rate Impact (% of Payroll)

Contributions	Recommended Assumptions
Normal Cost	0.04%
UAAL	0.10%[38]
Total	**0.14%[39]**

[37] Note that in the June 30, 2021 valuation, the 2013 Tier total normal cost rate increased by 0.32% of payroll for the Pension Plan.

[38] Reflects the change in the amortization period for assumption or method changes from 25 years to 20 years, which was adopted by the Board at their September 22, 2022 meeting.

[39] This rate has not been adjusted to take into account the continuance of the higher contribution rates from the 2021/2022 fiscal year to the 2022/2023 fiscal year, as approved by the Board. That additional rate is 0.02% of payroll.

Pension Plan and HIB Plan Combined

	Preliminary Change in Plan Liabilities and Funded Ratios as of June 30, 2021		
	Current Assumptions	Recommended Assumptions	
	Liability / Funded Ratio	Liability / Funded Ratio	Increase / (Decrease)
Total Employer and Employee Normal Cost	$55,697,000	$57,407,000	$1,710,000
Actuarial Accrued Liability	$2,728,641,000	$2,800,258,000	$71,617,000
Funded Ratio on Valuation Value of Assets Basis	76.9%	74.9%	(2.0)%
Funded Ratio on Market Value of Assets Basis[40]	85.3%	83.2%	(2.1)%

	Preliminary Employer Contribution Rate Impact (% of Payroll)
Contributions	Recommended Assumptions
Normal Cost	0.79%
UAAL	2.28%[41]
Total	**3.07%[42]**

[40] Note that this is not the measurement used for cost-of-living benefit increase purposes for the Pension Plan (i.e., for the 85% funding threshold), as that measurement uses liabilities determined on a Projected Benefit Obligation basis, rather than Actuarial Accrued Liability under the Entry Age Cost Method.

[41] Reflects the change in the amortization period for assumption or method changes from 25 years to 20 years, which was adopted by the Board at their September 22, 2022 meeting.

[42] This rate has not been adjusted to take into account the continuance of the higher contribution rates from the 2021/2022 fiscal year to the 2022/2023 fiscal year, as approved by the Board. That additional rate is 2.22% of payroll.

Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.00%, net of administrative and investment expenses.
Employee Contribution Crediting Rate:	7.00%, compounded semi-annually.
Consumer Price Index (CPI) and Cost of Living Adjustment (COLA):	CPI increases of 2.75% per year. Retiree COLA increases of 2.75% per year. For members with a sufficient COLA bank, withdrawals from the bank can be made to increase the retiree COLA up to 3.00% per year.
Payroll Growth:	Inflation of 2.75% per year plus "across the board" real salary increases of 0.50% per year, used to amortize the Unfunded Actuarial Accrued Liability as a level percentage of payroll
Increase in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Inflation of 2.75% per year from the valuation date.
Increase in California Government Code Section 7522.10 Compensation Limit:	Inflation of 2.75% per year from the valuation date.
Salary Increases:	The annual rate of compensation increase includes: inflation at 2.75%, plus "across the board" salary increases of 0.50% per year, plus the following merit and promotion increases:

Merit and Promotion Increases

Time from Hire (Years)	Rate (%)
Less than 1	6.25
1 – 2	6.00
2 – 3	5.00
3 – 4	3.75
4 – 5	2.50
5 – 6	1.50
6 – 7	1.25
7 – 8	1.25
8 – 9	1.00
9 – 10	1.00
10 & Over	0.75

Appendix B: Proposed Actuarial Assumptions

Economic Assumptions

Net Investment Return:	6.75%, net of administrative and investment expenses.
Employee Contribution Crediting Rate:	6.75%, compounded semi-annually.
Consumer Price Index (CPI) and Cost of Living Adjustment (COLA):	CPI increases of 2.75% per year. Retiree COLA increases of 2.75% per year. For members with a sufficient COLA bank, withdrawals from the bank can be made to increase the retiree COLA up to 3.00% per year.
Payroll Growth:	Inflation of 2.50% per year plus "across the board" real salary increases of 0.50% per year, used to amortize the Unfunded Actuarial Accrued Liability as a level percentage of payroll.
Increase in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Inflation of 2.50% per year from the valuation date.
Increase in California Government Code Section 7522.10 Compensation Limit:	Inflation of 2.50% per year from the valuation date.
Salary Increases:	The annual rate of compensation increase includes: inflation at 2.50%, plus "across the board" salary increases of 0.50% per year, plus the following merit and promotion increases:

Merit and Promotion Increases

Time from Hire (Years)	Rate (%)
Less than 1	6.25
1 – 2	6.00
2 – 3	5.00
3 – 4	3.75
4 – 5	2.50
5 – 6	1.50
6 – 7	1.25
7 – 8	1.25
8 – 9	1.00
9 – 10	1.00
10 & Over	0.75

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