Howard County Retirement Plan

Experience and Assumption Study

September 20, 2018

Bolton

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September 20, 2018

Retirement Plan Committee
Howard County Retirement Plan
3430 Court House Drive
Ellicott City, MD 21043

Dear Committee Members,

We have been asked by the Retirement Plan Committee to prepare an experience study. This report presents our recommended changes in assumptions due to our study of the demographic and economic experience of the Howard County Retirement Plan for the period June 1, 2013 through June 30, 2017, and our expectations of future experience. We summarize our recommendations in the Summary section and discuss our finding and analysis in the Demographic and Economic Assumptions sections. Finally, we discuss the effect of the proposed changes on the results of our July 1, 2017 valuation in the Impact of Changes section.

Two key assumptions are the discount rate (investment return) and the mortality table. For the discount rate we have shown the result both at the current 7.5% assumption and at 7.25%. While we prefer 7.25%, both are acceptable. For the mortality assumption we are recommending a change from the current RP-2000 AA table to RP-2014 MP2017 table. The mortality table is discussed in more detail below.

In terms of the impact of the County's cost, we provide some detail in the table at the end of the report. The Actuarially Determined Contribution (ADC) increases by $576,240 (or 0.5% of covered payroll) if the discount rate remains at 7.5% and by $1,480,753 (or 1.2% of covered payroll) if the discount rate drops to 7.25%. Please keep in mind:

- These numbers are all based on the 2017 valuation as 2018 results are not yet available.
- The County might also wish to phase in some of the assumption changes.

Please call if you have any questions.

Respectfully submitted,

Thomas B. Lowman, FSA, EA, MAAA

Ann M. Sturner, FSA, EA, MAAA

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Section I. Introduction

This report reviews the experience of the Howard County Retirement Plan (the "Plan") over the period July 1, 2013 through June 30, 2017 in order to determine potential changes in actuarial valuation assumptions. It is our understanding that the Retirement Plan Committee is responsible for recommending "the mortality and other tables and interest rates to be used" for the Plan. The study has been prepared to help the Committee make such recommendations.

For many assumptions, the experience of General Employees and Corrections Employees are shown separately.

Section VI of the report shows the cost impact of proposed changes to the County's FYE 2019 annual contribution. Actual changes will first impact the 2018 valuation and FYE 2020 contributions so FY2019 contributions will not truly be impacted by these changes.

The actual long-term cost of the Plan is not based on assumptions. The actual cost is based on the benefits paid, the investment return and the other expenses paid. However, to orderly set aside money to prefund benefits, assumptions must be made about future events. To determine the current cost to prefund the pension plan requires that a number of assumptions be made about future events. As actual experience differs from these assumptions, the cost of the plan will gradually change. Ideally, the assumptions will be close to this experience. However, some assumptions (e.g., investment return) will commonly vary materially from year to year.

While the cost of the plan will "self-adjust" to reflect actual experience, it is important to review and reset the assumptions from time to time to (1) minimize experience gains and losses, (2) reduce contribution volatility and (3) achieve a better level of intergenerational taxpayer equity.

The Retirement Plan Committee is responsible for managing and administrating the plans. A part of this responsibility is having an actuary perform annual valuations to determine the recommended cash contributions to the plans.

When considering our recommendations, we also looked at the experience shown in the prior experience study prepared in 2014.

Section I. Introduction

Certain economic assumptions (i.e., inflation) are not based solely on the Plan's experience during the past four years, and therefore require a longer period of experience to be considered as well as future expectations. Three of the key assumptions are tied to the economy. They are (1) cost of living adjustments (COLA) or CPI increases, (2) salary increases, and (3) the investment return assumption. It is possible that a decrease in the COLA assumption and some decrease in the salary increase assumption would be reasonable. We suggest that you consider lowering the 7.50% investment return assumption (and discount rate) to 7.25%. We recommend that these assumptions continue to be monitored.

In preparing this study, we have relied primarily upon annual actuarial valuation data provided to us by Howard County. The Plan's investment advisor also supplied some data specifically for this study.

Professional Qualifications

We are available to answer any questions on the material in this report or to provide explanations or further details as appropriate. The undersigned credentialed actuaries meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report. We are not aware of any direct or material indirect financial interest or relationship, including investments or other services, which could create a conflict of interest and impair the objectivity of our work.

Thomas B. Lowman, FSA, EA, MAAA

Ann M. Sturner, FSA, EA, MAAA

Section II. Summary of Recommendations

The last 10 years has been an unusual period of time both nationally and for Howard County. While the economic markets have largely recovered from the implosion of the real estate, debt and equity markets in 2008 and the first quarter of 2009, the recovery has been slow, with both short and long term effects on the County's finances. We have considered this in our review of the last four years' demographic and economic pension plan experience, and in our recommendations for changes to the assumptions used to determine the pension contributions and funding levels.

We make the following recommendations:

- Update mortality tables to more recent standard tables. Plan experience too small in scale to rely on.
- Lower retirement rates to reflect members working longer
- Change employee turnover slightly, mostly lowering rates for those with longer service
- Lower disablement rates 10% for General Employees
- Lower salary increases by 0.25%

In addition, we suggest you consider the following changes even if done gradually:

- Revise the inflation and retiree COLA assumption from 2.75% to 2.50%.
- Revise the investment return assumption from 7.50% to 7.25%.

We discuss the actual experience and the reasons for these recommended assumption changes in Sections III (demographic assumptions) and IV (economic assumptions) and reflect the effect of these changes on the pension funding level and required contributions in Section VI.

Section III. Demographic Assumptions

This section addresses our review and recommendations regarding all demographic assumptions. The order we address these assumptions is the order of significance of the assumption in determining plan liabilities.

Mortality

The current assumed mortality rates for healthy and disabled participants are as follows:

- *Pre-Retirement Healthy:* The base mortality rates are 70% of the RP-2000 Combined Mortality Table (sex distinct). The base mortality rates are then projected using Scale AA.
- *Post-Retirement Healthy:* The base mortality rates are the RP-2000 Combined Mortality Table (sex distinct). The base mortality rates are then projected using Scale AA.
- *Disabled:* 2014 ERISA 4044 mortality – eligible for Social Security for General, not eligible for Social Security for Corrections.

The active mortality was very close to expected mortality while the retiree mortality was greater than the expected rates. The plan is not large enough to base their assumption just on their own experience. Therefore, our general approach is just to update the assumption to a more current table.

The current mortality tables have become outdated and we recommend changing to a more current mortality table. In 2014, the Society of Actuaries (SOA) released the RP2014 mortality tables and annually releases new mortality improvement scales (most recent is MP2017).

In August 2018, the SOA released an Exposure Draft of new mortality tables for public retirement plans (Pub-2010 mortality tables). We do not recommend adopting the new the Pub-2010 tables until they are final. These tables show that nationally experience is that the "White Collar" table is a closer fit than the RP2014 table and general employees have a slightly higher mortality rate than public safety employees. While our experience is limited, the County's public safety experience is actually better than general employees and the White Collar table would predict only about 25 deaths for the general plan when there actually were 41.

For all active and in-pay participants, we recommend initially adopting the RP2014 Combined Mortality Table for males and females with generational projection using scale MP2017 for males and females. Once the Pub-2010 tables are final, we can review the new tables and make recommendations for changes.

Section III. Demographic Assumptions

Mortality

The following table summarizes the pre-retirement mortality experience for active participants over the plan years ending June 30, 2014 through June 30, 2017 and illustrates the expected experience using the new mortality tables.

Pre-retirement Deaths 2014-2017						
Group	Exposed	Expected (Current Rates)	Actual	Expected (Proposed Rates)	Ratio of Actual to Expected	
					Current Assumptions	Proposed Assumptions
General Employees	6,191	11.91	10	13.02	84%	77%
Corrections Employees	526	0.66	1	0.82	151%	122%

The following table summarizes the post-retirement mortality experience for healthy retirees, disabled retirees, and surviving spouses over the same 2014-2017 period and illustrates the expected experiencing using the new mortality tables.

Post-retirement Deaths 2014-2017						
Group	Exposed	Expected (Current Rates)	Actual	Expected (Proposed Rates)	Ratio of Actual to Expected	
					Current Assumptions	Proposed Assumptions
General and Corrections Employees Combined	3,174	32.95	41	32.35	124%	127%

Section III. Demographic Assumptions

Retirement

Retirement experience is dependent on the plan provisions. The following are the key provisions:

General Employees: Normal retirement with unreduced benefits can occur at the earlier of (1) the attainment of age 62 with a few years of eligibility service[1], or (2) the completion of 30 years of eligibility service.

Corrections Employees: Normal retirement with unreduced benefits can occur at the earlier of (1) the attainment of age 62 with a few years of eligibility service[2], or (2) the completion of 20 years of eligibility service.

Both Groups: Early Retirement with reduced benefit can occur at the earlier of (1) the attainment of age 55 with 15 years of eligibility service, or (2) the completion of 25 years of eligibility service.

The current assumptions (probability of retiring) are tied to when a member is eligible for both early and normal retirement.

We reviewed the expected and actual experience; however, we only recommend making minimal changes to the retirement assumptions. We recommend monitoring the retirement experience over the next few years and possibly making some additional adjustments to the retirement rates prior to the next experience study if necessary.

[1] More specifically, the requirement is age 62 with at least 2 years of eligibility service and the sum of age and service must be at least 67.
[2] Same requirement as General Employees.

Section III. Demographic Assumptions

Retirement

General Employees

The following table summarize the retirement experience for General Employees over the years ending June 30, 2014 through 2017. Overall, retirement experience was less than expected so we reduced the rates for most retirement criteria.

Retirement Rates - General Employees
2014-2017

Age/Retirement Eligibility	Exposed	Current Retirement Rates	Actual Retirements	Actual Retirement Rates	Proposed Retirement Rates
Early retirement	608	5%	14	2%	4%
First eligible for normal retirement					
Before age 60	39	20%	4	10%	15%
Age 60 and over	166	22%	20	12%	17%
After first eligible for normal, by age group					
Under age 50	2	1%	1	50%	10%
50-59	170	6%	9	5%	6%
60-74	804	22%	134	17%	20%
Age 75 and over	20	100%	5	25%	100%
Total	**1,809**		**187**		
Actual to Expected Ratio				**81%**	**91%**

Section III. Demographic Assumptions

Retirement

Corrections Employees

The following table summarize the retirement experience for Corrections Employees over the years ending June 30, 2014 through 2017. The number of retirements is very small, so it is difficult to adjust the rates. Overall, retirement experience was less than expected so we reduced rates for some retirement criteria. We did increase the rate at first eligibility for early retirement slightly because we observed a higher retirement percentage at that point in time.

Retirement Rates - Corrections Employees
2014-2017

Age/Retirement Eligibility	Exposed	Current Retirement Rates	Actual Retirements	Actual Retirement Rates	Proposed Retirement Rates
Early retirement					
First eligibility	3	30%	2	67%	40%
Early retirement after first eligibility	6	5%	0	0%	5%
Normal retirement eligible, age < 62					
First eligible for normal	7	55%	2	29%	40%
After first eligible for normal (age < 50 and service < 25	2	1%	0	0%	1%
All other age/service groups	19	16%	1	5%	10%
Normal retirement eligible, age 62+	14	70%	1	7%	50%
Age 70 and over	0	100%	0	N/A	100%
Total	**51**		**6**		
Actual to Expected Ratio				**38%**	**51%**

Section III. Demographic Assumptions

Termination of Employment

Current termination assumptions vary based on length of service. We assume that the longer an employee has worked for the County, the lower the probability of termination. This is consistent with recent experience. Separate rates are used for General Employees and Corrections Employees.

General Employees

The following table summarizes the termination experience for General Employees over the years ending June 30, 2014 through 2017. Termination experience was greater than expected for employees with less than 4 years of experience but less than expected for those with 4 or more years of experience. We recommend increasing the rates for 0-4 years of service and decreasing the rates for the remaining service groups. We have not changed the rates fully to raise the Actual to Expected ratio to 100% because the economy may still be causing members to be less likely to quit their jobs. We will continue to monitor experience in the upcoming actuarial valuations.

Termination Rates - General Employees
2014-2017

Service Group	Exposed	Current Termination Rate	Expected (Current Rates)	Actual	Proposed Termination Rate	Expected (Proposed Rates)	Ratio of Actual to Expected	
							Current Assumptions	Proposed Assumptions
0	507	11.80%	59.84	64	13.00%	65.91	107%	97%
1	590	11.70%	69.03	61	12.00%	70.80	88%	86%
2	378	7.00%	25.83	32	8.00%	29.52	124%	108%
3	263	7.00%	17.85	28	8.00%	20.40	157%	137%
4	224	4.30%	9.25	8	4.00%	8.60	86%	93%
5-9	1,525	4.30%	57.92	43	4.00%	53.88	74%	80%
10-14	995	3.50%	29.72	19	3.00%	25.47	64%	75%
15-19	307	3.50%	10.75	4	2.50%	7.68	37%	52%
20 and over	145	0.00%	1.45	3	0.00%	0.00	207%	0%
Total	**4,934**		**281.64**	**262**		**274.95**	**93%**	**95%**

Exposures are limited to employees that are not retirement eligible.

Section III. Demographic Assumptions

Termination of Employment

Corrections Employees

The following table summarizes the termination experience for Corrections Employees over the years ending June 30, 2014 through 2017. Termination experience was greater than expected for employees with less than 4 years of experience but less than expected for those with 4 or more years of experience. We recommend increasing the rates for 0-4 years of service and decreasing the rates for the remaining service groups. We will continue to monitor experience in the upcoming actuarial valuations.

Termination Rates - Corrections
2014-2017

Service Group	Exposed	Current Termination Rate	Expected (Current Rates)	Actual	Proposed Termination Rate	Expected (Proposed Rates)	Ratio of Actual to Expected	
							Current Assumptions	Proposed Assumptions
0	37	17.00%	6.29	9	25.00%	9.25	143%	97%
1	43	3.00%	1.29	10	15.00%	6.45	775%	155%
2	27	3.00%	0.81	1	5.00%	1.35	123%	74%
3	29	3.00%	0.87	2	5.00%	1.45	230%	138%
4	25	5.00%	1.25	0	4.00%	1.00	0%	0%
5-9	192	5.00%	9.50	6	4.00%	7.60	63%	79%
10-14	112	5.00%	5.45	0	2.00%	2.18	0%	0%
15-19	24	0.00%	0.00	0	0.00%	0.00	0%	0%
20 and over	0	0.00%	0.00	0	0.00%	0.00	0%	0%
Total	**489**		**25.46**	**28**		**29.28**	**110%**	**96%**

Exposures are limited to employees that are not retirement eligible.

Section III. Demographic Assumptions

Disability Incidence and Type of Disability

The disability assumption is based on age. We assume that the older the employee, the higher the probability of becoming disabled. Different disability rates apply to General Employees and Corrections Employees.

The following table summarize the disability experience for General Employees and Corrections Employees over the years ending June 30, 2014 through 2017.

Disability Rates 2014-2017						
Group	Exposed	Expected (Current Rates)	Actual	Expected (Proposed Rates)	Ratio of Actual to Expected	
					Current Assumptions	Proposed Assumptions
General Employees	6,191	7.35	6	6.61	82%	91%
Corrections Employees	526	1.56	2	1.56	128%	128%

As you can see, the data is limited in size, so we have also considered the experience in the prior experience study which included the years ending June 30, 2009 through June 30, 2013 when making recommendations.

For General Employees, in the prior study there were 6 actual disabilities and 6.7 expected disabilities (using the current assumptions). Thus, the Actual to Expected ratio for the 8-year period is 85% (12 Actual divided by 14.1 Expected). We recommend decreasing all disability rates by 10% for General employees.

For Corrections Employees, in the prior study there were no disabilities and 1.4 expected disabilities (using the current assumptions). Thus, the Actual to Expected ratio for the 8-year period is 67% (2 Actual divided by 3.0 Expected). We are not suggesting any changes to the disability rates for Corrections Employees at this time, because the data is limited in size and therefore credibility for this purpose.

We currently assume that 10% of all disabilities occur in the line of duty for General Employees and 66.67% of all disabilities occur in the line of duty for Corrections Employees. Three of the General Employees disabilities and one of the Corrections Employees disabilities were in the line of duty. However, we do not recommend changing these assumptions due to the small number of disabilities. In addition, we do not recommend changing the assumptions detailed in the actuarial valuation report regarding the percentage of disabled participants assumed to collect Social Security disability benefits. We will review this assumption again in the next experience study.

Section III. Demographic Assumptions

Beneficiary Demographics

Percentage of participants with an eligible spouse: (for death benefit purposes)	70% with a spouse of the opposite gender, three years younger than a male participant, and three years older than a female participant.

The current percentage married assumption is 70%. We do not have exact data to base an assumption on. The MetLife 2018 "US Employee Benefit Trends Study" shows that 70% of employees surveyed were either married or Domestic Partners. We are recommending staying at 70%.

Based on our review of retiree data, we believe the current assumption regarding the difference in average age between participants and their spouses adequately represents actual experience.

Sick Leave

We currently assume the additional service that employees receive credit for at retirement in lieu of unused sick leave adds 1.5% to employees' creditable service for both General Employees and Corrections Employees. We have not studied this as it is a minor assumption.

Section IV. Economic Assumptions

Inflation

The inflation assumption is at the heart of the economic assumptions, as it is used as a starting point for all of the other economic assumptions, including the Cost-of-Living Adjustment (COLA), salary improvement and investment return assumptions. Thus, our experience analysis starts with the inflation assumption. The current inflation assumption is 2.75%.

Unlike demographic assumptions where past experience is often a good predictor of future experience, economic assumptions, and particularly investment return and inflation assumptions typically reflect future expectations more than past experience. So, we analyzed the inflation assumption from three perspectives:

- Past experience – based on the Consumer Price Index for all Urban Consumers (CPI) over the last 5, 10, 15, 20 and 25 years
- Current expectations of future experience – based on investment experts' analysis of future expected inflation
- Current, market-based expectations of future inflation – based on the difference between the treasury bond nominal yield curve and the Treasury Inflation Protected Securities (TIPS) yield curve. This curve is known as the Treasury Break-even Inflation yield curve (TBI).

Effective for the July 1, 2018 COLA, the retiree COLA is based on the consumer price index for "All Urban Consumers (CPI-U) Baltimore-Columbia-Towson, MD, all items, as published by the United States Department of Labor from February of the current year to February of the preceding year. Every July 1st the COLA is added to the monthly benefit of each retire and beneficiary who has been in pay status for 12 months or more.

The COLA adjusted benefit is the lesser of (1) the annuity amount increased by the full percentage change in CPI or (2) the initial benefit amount increased by 3% each year since retirement. Hence it is possible for a retiree to receive in one year a COLA of more than 3% as long as the cumulative adjustments from retirement date to the present are 3% per year or less.

Section IV. Economic Assumptions

Inflation

Past experience

We first considered prior experience in developing our recommendation for the inflation assumption. The average annual increase in the CPI-U Baltimore-Columbia-Towson, MD over multiple time periods.

	Averaging Period				
	5 years	10 years	15 years	20 years	25 years
CPI-U	1.23%	2.10%	2.52%	2.29%	2.33%

Investment experts' inflation assumptions

Next, we considered the inflation assumption built into the investment return assumptions from the Plan's investment manager, Summit Strategies Group. As of June 30, 2018, Summit's 10- and 30-year investment return analysis includes a 2.0% inflation assumption. Also of interest is the forecast of the Philadelphia branch of the Federal Reserve Bank, which in the second quarter of 2018 projected 10-year inflation to run at 2.3% (identified as Long-Term for the 2018 to 2027 period).

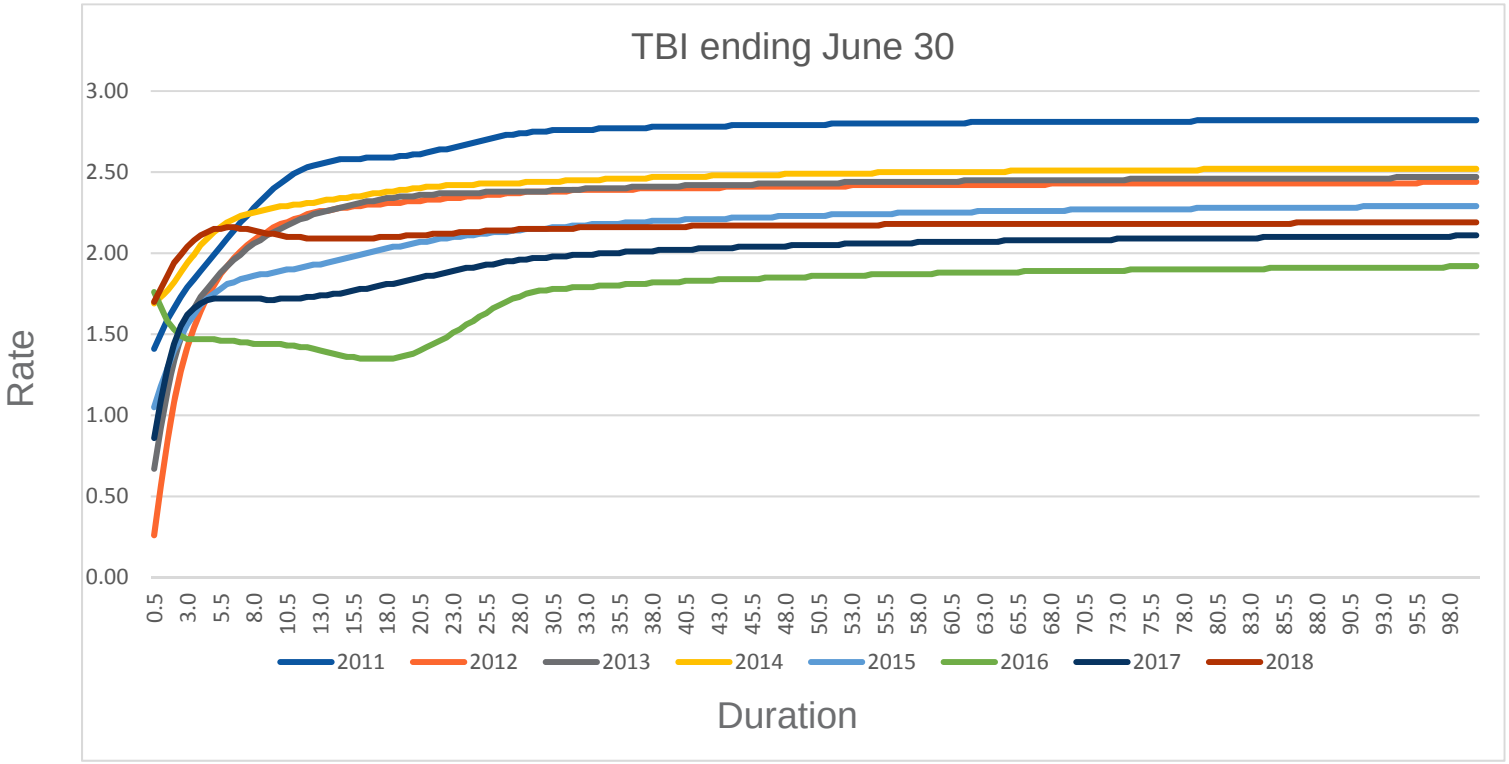
TBI return

Finally, we considered the inflation expectations built into the difference between the nominal treasury yields and the TIPS yields. The following table shows the TBI yields as of the present.

We note that there are some practical limitations of the TBI yields (principally the depth of the TIPS markets, and the limited duration of both the TIPS and Treasury bonds.) However, we believe that the TBI does provide a reasonable, independent and market related method of considering long-term inflation rate expectations.

Section IV. Economic Assumptions

Inflation



Comparison of Implicit Inflation Rates, in Percent, and Period in Years

We note that the TBI yield curve graphs for 2016 and 2011 are significantly different than those for the other four years, which are clustered between 2.15% and 2.5%, except for very short durations.

Section IV. Economic Assumptions

Inflation

Recommended inflation assumption

All of the above-mentioned information points to some lowering of our inflation assumption. If we lower the discount rate from 7.5% to 7.25%, we recommend decreasing the current 2.75% assumption for CPI increases to 2.50% and the COLA assumption from 2.75% to 2.50%.

Section IV. Economic Assumptions

Investment Return

The single assumption that has the largest effect on the determination of plan liabilities, funding levels and contributions is the investment return assumption. Our belief is that historic investment experience, while interesting, is of little value in accessing the validity of an investment return assumption. We also note that the only certainty about future investment returns is that any assumption is most likely wrong, both in the short-term and in the long-term. While we typically suggest an investment return assumption based on the best estimate of the future investment return, reflecting investment advisors' investment return expectations and the plan's investment mix, we also recognize the value of choosing conservative investment return assumptions, trying not to assume the market expectations but to choose a return more likely to be exceeded than to not be met.

The current investment rate of return assumption on the market value of assets is 7.50%, net of investment expenses.

Historical returns

The following table summarizes the rates of return on the market value of assets over the period from July 1, 2012 through June 30, 2017 (five fiscal years).

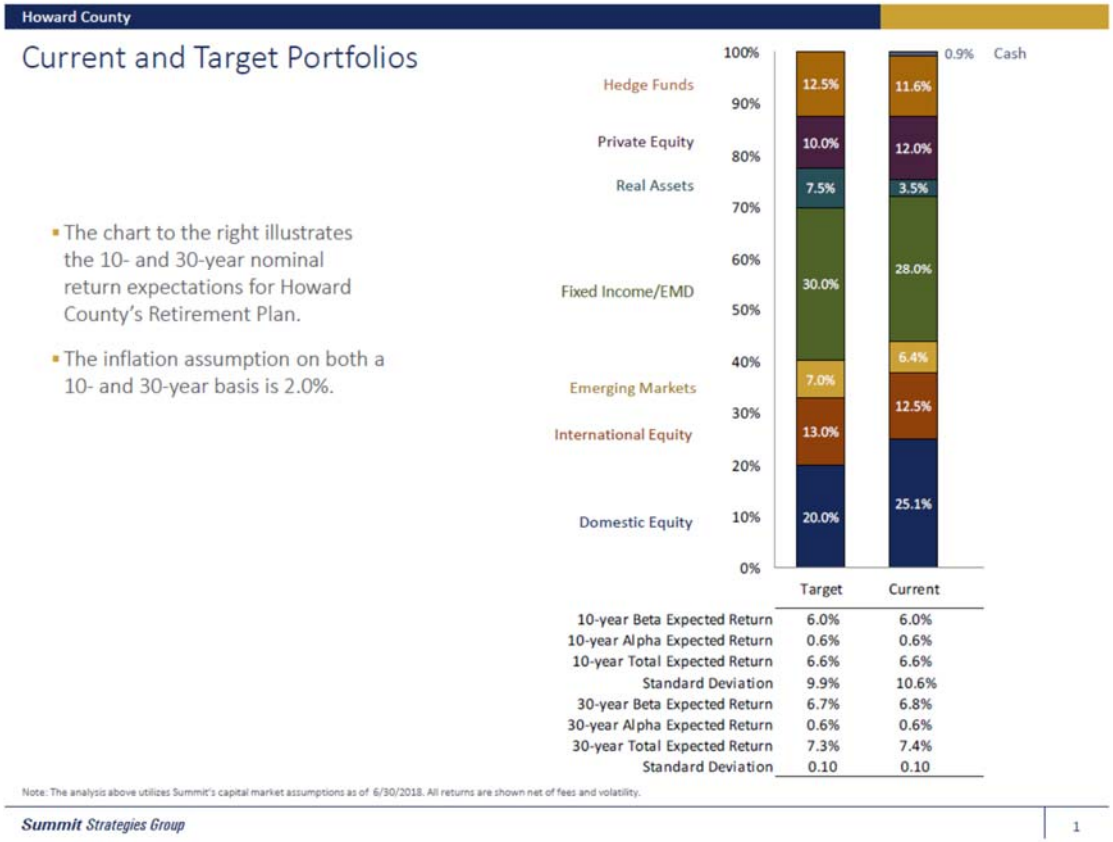
	Actual rates of return on market value of assets					
	2013	2014	2015	2016	2017	5-year average
Retirement Plan	11.8%	15.8%	2.9%	1.3%	12.5%	8.7%

Section IV. Economic Assumptions

Investment Return

Investment advisor expectations

In July 2018, the Plan's investment advisor (Summit Strategies) provided us with information on nominal rates of return (including inflation at 2.0% and "alpha" but net of investment fees).



Section IV. Economic Assumptions

Investment Return

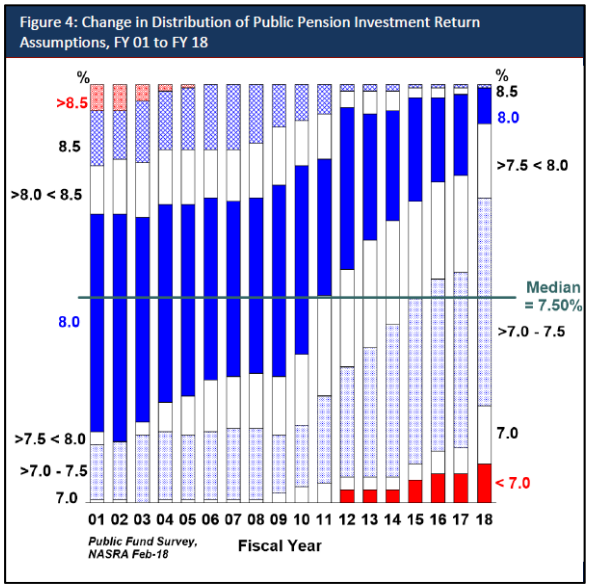
The expected target returns of 6.6% (10-year) and 7.3% (30-year) are lower than the current net rate of 7.50% but are based on a 2.00% inflation assumption and not the current 2.75% or proposed 2.5% inflation assumption.

If we follow our recommendation above and lower the 2.75% inflation assumption to 2.50% (and raise the Summit assumption from 2.00% to 2.50%), the range of returns in the Summit exhibit become 7.1% (10-year) and 7.8% (30-year). The current 7.5% assumption is within this range as is 7.25%.

NASRA

We also considered the National Association of State Retirement Systems' (NASRA) annual Public Pension Plan Investment Return Assumptions (dated February 2018) reflecting 2017 investment return assumptions used by states (and some large cities). These returns reflect a continued pattern of decreasing investment return assumptions, with an expectation that the current average of slightly more than 7.5% will continue to decline over the next two years. While we would not suggest setting investment return assumptions solely based on this survey, we believe it is useful to know what other plans are doing and review the investment assumption trends.

Figure 4: Change in Distribution of Public Pension Investment Return Assumptions, FY 01 to FY 18



Section IV. Economic Assumptions

Investment Return

Recommended investment return assumption

Currently the investment return, or discount rate, assumption is 7.50%, which is effectively a 2.75% inflation assumption and a 4.75% "real" investment return (i.e., net of inflation).

Based on the review of the investment advisor's expectations and our recommendation to decrease the inflation assumption from 2.75% to 2.50%, we suggest the Plan consider reducing the investment return assumption from 7.50% to 7.25%. The Impact of Changes shown in Section VI include the impact of all the assumption changes using both 7.50% and 7.25% investment returns.

Non-Investment Expenses

The expense load for non-investment expenses is equal to the average of the prior two years' non-investment expenses increased with assumed inflation and rounded to the nearest $1,000. As these are auto-adjusting, we see no need to change them.

Section IV. Economic Assumptions

Pay increases

The current pay increase assumption varies by service. The shorter the service of the employee, the higher the assumed pay increase.

General Employees

The following table summarize the pay increases for General Employees over the years ending June 30, 2014 through 2017. General Employees received salary adjustments of 2%, 3%, 0% and 2% in FY14 to FY17 respectively, or an average of 1.75%. The pay increases have been less than expected. We propose reducing all rates by 0.25%. We will continue to monitor pay increases over several more years, since there are often significant variations in pay increases.

Salary Percent Increases - General Employees 2014-2017

Service Group	Average Expected Increase	Average Actual Increase	Current Assumption	Proposed Assumption	Ratio of Actual to Expected	
					Current Assumptions	Proposed Assumptions
0-4	6.55%	5.92%	6.55%	6.30%	90%	94%
5-9	5.75%	5.41%	5.75%	5.50%	94%	98%
10-14	5.50%	4.82%	5.50%	5.25%	88%	92%
15-19	4.85%	4.38%	4.85%	4.60%	90%	95%
20 and over	4.00%	4.11%	4.00%	3.75%	103%	110%
Weighted Average	**5.44%**	**5.05%**		**5.19%**	**93%**	**97%**

Section IV. Economic Assumptions

Pay increases

Corrections Employees

The following table summarize the pay increases for Corrections Employees over the years ending June 30, 2014 through 2017. Corrections Employees received salary adjustments of 2%, 3%, 0% and 2% in FY14 to FY17 respectively, or an average of 1.75%. The pay increases have been less than expected. We propose reducing all rates by 0.25%. We will continue to monitor pay increases over several more years, since there are often significant variations in pay increases.

Salary Percent Increases - Corrections Employees 2014-2017

Service Group	Average Expected Increase	Average Actual Increase	Current Assumption	Proposed Assumption	Ratio of Actual to Expected	
					Current Assumptions	Proposed Assumptions
0-4	6.25%	6.38%	6.25%	6.00%	102%	106%
5-9	6.75%	6.25%	6.75%	6.50%	93%	96%
10-14	6.75%	6.00%	6.75%	6.50%	89%	92%
15-19	6.75%	4.05%	6.75%	6.50%	60%	62%
20 and over	4.25%	3.95%	4.25%	4.00%	93%	99%
Weighted Average	**6.42%**	**5.86%**		**6.17%**	**91%**	**95%**

Section IV. Economic Assumptions

Payroll Growth Assumption

We currently assume that payroll will grow 2.75% annually for purposes of amortizing the unfunded actuarial liability. Recent experience is that total payroll for General Employees and Corrections Employees has increased about 5.5% annually over the last four years but headcount has also changed. Per participant payroll has increased by 3.8% annually over the last four years. We recommend retaining the current assumption that payroll will grow 2.75% annually for purposes of amortizing the unfunded actuarial liability.

Payroll changes - General and Corrections Employees Combined 2014-2017

	7/1/2013	7/1/2014	7/1/2015	7/1/2016	7/1/2017	4-year average
Total Payroll	$93,364,716	$100,210,694	$105,067,525	$110,622,450	$117,741,696	
Increase in total payroll		7.3%	4.8%	5.3%	6.4%	6.0%
Number of active participants	1,596	1,669	1,692	1,760	1,803	
Payroll per participant	$58,499	$60,042	$62,097	$62,854	$65,303	
Increase in per participant payroll		2.6%	3.4%	1.2%	3.9%	2.8%

Payroll is based on pay rates as of July 1 of each year.

Section V. Funding Methods and Other Concerns

Asset Smoothing Methods

The plan has a five-year smoothing method to defer recognition of investment returns above or below the 7.50% assumption. In addition, the actuarial value of assets can be no less than 50% of market value of assets and no more than 150% of market value of assets. We believe that the current method meets the current standard of practice and accounting rules. We recommend retaining the current asset smoothing method.

Amortization Policy

The current amortization the sum of the following:

a. Gains and losses amortized over a 15-year closed (layered) period
b. Assumption changes over a 15-year closed period
c. Post-2013 plan improvements over the average expected future working period
d. Early retirement incentives (if any) over 5 years or less
e. Surplus, when reached, over 30 years

The plan's policy falls in the Conference of Consulting Actuaries White Paper's practice category of "Model LCAM Practice". We recommend retaining the current amortization policy.

Risk Free Rates of Return (or Bond Rates) for Discount Rates

Like the other assumptions, the investment rate of return assumption is based on a "best estimate" methodology. We believe that the current method meets the current standard of practice and accounting rules. However, these rules are currently under discussion. Some believe that liabilities should be discount at a rate that is independent of how assets are invested (e.g. use bond rate to discount liabilities). The Actuarial Standard Board is working on new standards that would require disclosure of liabilities using bond rates.

Section VI. Impact of Changes

The estimated cost for the changes recommended in this report was developed based on the July 1, 2017 census and asset information. The recommended assumption changes result in the estimated County contributions shown in the table below as estimated dollar amounts and contribution rates as a % of participant payroll. Note the assumption changes will take effect with the 2018 valuation (FY2020 contribution) and not the 2017 valuation (FY2019 contribution).

The following charts show the impact of all the assumption changes on the County's contribution rate.

	Amount	Percentage of Total Payroll	7/1/2017 Funded Ratio Actuarial Value of Assets	7/1/2017 Funded Ratio Market Value of Assets
FY2019 Actuarially Determined Contribution				
No Assumption Changes	$14,296,317	11.5%	95.2%	95.2%
With Assumption Changes				
7.50% Net Investment Return	$14,872,557	12.0%	94.1%	94.0%
7.25% Net Investment Return	$15,777,070	12.7%	93.2%	93.1%

Section VII. Data, Methods and Assumptions Applied in the Experience Study

We used participant data initially prepared for the actuarial valuations for the years starting July 1, 2013 through July 1, 2017.

We determined, for each year, the actual incidence of each demographic assumption, based on the participant's age nearest birthday and years of service as of the beginning of the year and compared that to the expected incidence, determined using the same factors.