Montgomery County Public Schools Employees' Retirement and Pension Systems

2019 Experience Review for the Years
July 1, 2014 to July 1, 2018

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GRS

GRS Retirement Consulting

September 3, 2019

Ms. Nicola Diamond
Chief Financial Officer
Montgomery County Public Schools
  Employees' Retirement and Pension Systems
850 Hungerford Drive
Rockville, Maryland 20850

Subject: Experience Review for the Years July 1, 2014 to July 1, 2018

Dear Ms. Diamond:

At your request, we have performed a review of the actuarial assumptions used in the annual actuarial valuation of the Montgomery County Public Schools (MCPS) Employees' Retirement and Pension Systems and the Montgomery County Public Schools OPEB Plan.

The primary purpose of the study is to determine the continued appropriateness of the current actuarial assumptions by comparing actual experience to expected experience. Our study was based on census information for the period from July 1, 2014 to July 1, 2018, as provided by MCPS Staff and the prior actuary (for data from July 1, 2014 through July 1, 2016).

Our study includes a review of the experience associated with the following actuarial assumptions:

- Price Inflation;
- Investment Return;
- Total Payroll Growth;
- General Wage Inflation;
- Retiree Cost of Living Increases;
- Salary Increases;
- Mortality;
- Retirement;
- Turnover (Withdrawal);
- Disability; and
- OPEB participation and Coverage Elections

The results of this analysis are set forth in Section II of this report. Section III contains the cost impact on the required contributions and funded ratio of each plan as a result of the assumption modifications.

Amy Williams and Lance J. Weiss are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

The signing actuaries are independent of the plan sponsor.

This report should not be relied on for any purpose other than the purpose stated. This report may be provided to parties other than MCPS and the MCPS plans only in its entirety and only with the permission of MCPS and the MCPS plans. GRS is not responsible for unauthorized use of this report.

This report is based upon information, furnished to us by MCPS Staff, concerning retirement and ancillary benefits, active members, deferred vested members, retirees and beneficiaries, and financial data. If your understanding of this information is different, please let us know. This information was checked for internal consistency, but it was not audited.

The results of the experience study and recommended assumptions set forth in this report are based on the data and actuarial techniques and methods described above, and upon the provisions of the Montgomery County Public Schools Employees' Retirement and Pension Systems and the Montgomery County Public Schools OPEB Plan as of the most recent actuarial valuation date, July 1, 2018. To the best of our knowledge the information contained in this report is accurate and fairly presents the experience of members participating in the MCPS plans for the period July 1, 2014 through July 1, 2018. All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

Sincerely,

Amy Williams, ASA, MAAA, FCA   Lance J. Weiss, EA, MAAA, FCA
Senior Consultant   Senior Consultant and Team Leader

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SECTION I

EXPERIENCE REVIEW SUMMARY

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Experience Review Summary

Background

For any pension or OPEB plan, actuarial assumptions are selected that are intended to provide reasonable estimates of future expected events, such as plan investment returns, and patterns of retirement, turnover and mortality. These assumptions, along with an actuarial cost method, the employee census data and the plan's provisions are used to determine the actuarial liabilities and overall actuarially determined funding requirements for the plan. The true cost to the plan over time will be the actual benefit payments and expenses required by the plan's provisions for the participant group under the plan. To the extent the actual experience deviates from the assumptions, experience gains and losses will occur. These gains (losses) then serve to reduce (increase) future actuarially determined contributions and increase (reduce) the funded ratio. The actuarial assumptions should be individually reasonable and consistent in the aggregate. They should also be reviewed periodically to ensure that they remain appropriate. The actuarial cost method, for plan sponsors that use actuarially based funding policies, automatically adjusts contributions over time for differences between what is assumed and the actual experience under the plan.

Actuarial Standards of Practice ("ASOPs")

The Actuarial Standards Board ("ASB") provides guidance on measuring the costs of financing a retirement program through the following Actuarial Standards of Practices ("ASOPs"):

(1) ASOP No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*;
(2) ASOP No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*;
(3) ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*; and
(4) ASOP No. 44, *Selection and Use of Asset Valuation Methods for Pension Valuations*.

The recommendations provided in this report are consistent with the preceding actuarial standards of practice.

The ASB recently adopted Actuarial Standard of Practice (ASOP) No. 51, Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions. ASOP No. 51 is effective for any actuarial work product with a measurement date on or after November 1, 2018.

Assumptions Reviewed

The actuarial assumptions are usually divided into two categories:

(1) Economic assumptions, which include:

- Assumed rate of price inflation (as measured by the change in the Consumer Price Index for all urban consumers)
  - Underlies all other economic assumptions
- Assumed long-term rate of return on investments
  - Rate at which projected benefits are reduced to present value

- General wage inflation
  - Reflects inflationary forces on increases in pay for all members
- Rate of payroll growth
  - Reflects expectation of growth in total payroll and affects level percent of pay contribution
- Merit/Seniority/Promotion pay increases
  - Increases in pay for individual plan members in addition to those due to inflationary forces
- Rate of retiree cost of living increases

The economic assumptions are generally chosen on the basis of the actuary's expectations as to the effect of future economic conditions on the operation of the plan, with input from Staff, the Board and other investment advisors.

(2) Demographic assumptions, which include the following rates:

- Mortality
- Retirement
- Disablement
- Turnover (other termination of employment)

Demographic assumptions are generally based on the plan's own experience, taking into account emerging trends. Rates of salary increase due to promotion and longevity are also related to the plan's experience.

For some of the assumptions, such as mortality, additional information is needed to give partial credibility to plan experience. We recommend using published mortality tables based on public sector experience.

(3) Other methods and assumptions including the following:
- OPEB participation assumption
- OPEB coverage assumption (1 person vs. 2 person)

Key Findings and Recommendations

Gabriel, Roeder, Smith & Company ("GRS") has performed an experience study of the Montgomery County Public Schools (MCPS) Employees' Retirement and Pension Systems and the Montgomery County Public Schools OPEB Plan for the period from July 1, 2014 to July 1, 2018. The primary purpose of the study was to compare the plan experience and future expectations for experience against the actuarial assumptions used in the actuarial valuations. Our study was based on the information used to perform the annual actuarial valuations for the period from July 1, 2014 to July 1, 2018.

Following is a summary of the key findings and recommendations:

- Price inflation: We recommend decreasing the rate of assumed price inflation from 2.75 percent to 2.25 percent.

- Investment Return: We recommend decreasing the investment return assumption from 7.00 percent to 6.75 percent. This reflects increasing the assumed real rate of return from 4.25 percent to 4.50 percent and decreasing the underlying assumed price inflation from 2.75 percent to 2.25 percent. We recommend monitoring the assumption for continued reasonableness in the future.
- Payroll Growth Assumption: We recommend decreasing the total payroll growth assumption from 3.00 percent to 2.50 percent. This reflects maintaining the assumed rate for productivity increases of 0.25 percent and an underlying assumed price inflation of 2.25 percent (decreased from 2.75 percent).
- Salary Increase: We recommend updating the overall assumed salary increase rates to reflect actual experience of the real salary increases (in excess of inflation). The recommended rates are higher for members earlier in their careers and lower for members later in their careers.
- Retirement Rates: We recommend an overall decrease to the assumed rates and a change to assume 100 percent of members retire at age 80 (compared to age 70 under the current assumptions).
- Turnover Rates: We recommend modifications to the current age and service-based rates to rates that are mainly service-based.
- Mortality Rates: We recommend:
  - Updating to the recently released Pub 2010 mortality tables based on public sector plan experience for general employees
  - Updating to the mortality projection scale MP-2018

The specific mortality table recommendations and a more detailed description of the new mortality tables can be found in Section II.

- **Disability Rates:** We recommend an update to apply disability rates to only members who are not eligible for normal retirement and to have separate rates for males and for females. We recommend applying partial credibility to the disability experience and adopting rates that are closer to the actual disability rates.
- **OPEB Participation Rates:** We recommend decreasing the participation rate from 90 percent to 80 percent.
- **OPEB Coverage:** We recommend increasing the percentage of retirees assumed to elect two person coverage and to have the assumption vary by gender and if the member retires before or after age 65.

The assets of the OPEB Plan are invested in the Montgomery County Consolidated Retiree Health Benefits Trust (CRHBT). Therefore, to maintain consistency in the assumptions used across the entities participating in the CRHBT, we have not recommended changes to the actuarial cost method (currently Projected Unit Credit), the investment return assumption (currently 7.50 percent) or the wage inflation assumption (currently 3.00 percent) used in the Montgomery County Public Schools OPEB Plan actuarial valuation.

Section III contains the cost impact on the required contributions and funded ratio of the plans as a result of the assumption modifications. The recommended assumptions decrease the actuarial liability and contribution requirements and increase the funded ratio. At your request, Section III also contains the cost impact of an alternate set of assumptions based on a price inflation assumption of 2.50 percent

(compared to 2.25 percent). The change in the price inflation assumption also affects the retiree post-retirement cost of living increase assumptions, the assumed salary increase rates, the payroll growth assumption and the investment return assumption.

In order to maintain the fiscal health of Montgomery County Public Schools Employees' Retirement and Pension Systems, and to comply with the Actuarial Standards of Practice (applicable to all actuaries who practice in the United States), it is important to (1) select actuarial assumptions that reflect realistic estimates of future investment returns and (2) not be unnecessarily swayed by alternative actuarial assumptions that result in the more favorable contribution levels and/or accounting disclosures. We do not recommend a decrease in the current contribution requirement for plans that are less than 100 percent funded. Therefore, for each cost impact, we have also included an alternate amortization payment (based on a shorter amortization period) that results in a contribution requirement that is similar to the amount calculated in the actuarial valuation as of July 1, 2018.

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SECTION II

EXPERIENCE ANALYSIS

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Economic Assumptions

Economic assumptions reflect the effects of economic forces on the projections of retirement benefits payable from the plan and in the discounting of those benefits to present value.

These assumptions are based, at their core, on the assumed level of price inflation. Each economic assumption is then developed from expected spreads over price inflation. Since price inflation is relatively volatile and is subject to a number of influences not based on recent history, economic assumptions are less reliably based on recent past experience than are the demographic assumptions.

The key economic assumptions are:

1. Assumed Rate of Inflation – The rate of price inflation (as measured by the Consumer Price Index for all Urban consumers) which underlies the remainder of the economic assumptions.
2. Assumed Rate of Investment Return – The rate at which projected future benefits under the system are reduced to present value.
3. General Wage Inflation – This reflects inflationary forces on increases in pay for all members.

Actuarial Standard of Practice No. 27

ASOP No. 27 provides guidance related to selecting and recommending economic assumptions, including the investment return, discount rate, inflation, postemployment benefit increases, compensation increases and any other related economic assumptions.

In developing specific actuarial assumptions, ASOP No. 27 requires the actuary to follow a general process of:

(1) Identifying the components of the assumption;
(2) Evaluating relevant data;
(3) Considering specific and general factors related to the measurement; and
(4) Selecting a reasonable assumption.

In evaluating relevant data, the actuary should include appropriate recent and long-term historic data, but not give undue weight to recent experience.

Further, under ASOP No. 27, an assumption is considered reasonable if:

- It is appropriate for the purpose of the measurement;
- It reflects the actuary's professional judgment;
- It takes into account historical and current economic data that is relevant as of the measurement date;
- It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and
- It has no significant bias (i.e., it is not significantly optimistic or pessimistic).

Also according to the ASOP No. 27, the actuary should recognize the uncertain nature of the items for which assumptions are selected and, as a result, may consider several different assumptions reasonable for a given measurement. The actuary should also recognize that different actuaries will apply different

professional judgment and may choose different reasonable assumptions. As a result, a narrow range of reasonable assumptions may develop both for an individual actuary and across actuarial practice.

Inflation

By "inflation," we mean price inflation, as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies all of the other economic assumptions we employ. It not only impacts investment return, but also salary increase rates and the payroll growth assumption. The current annual inflation assumption is 2.75 percent.

Over the five-year period from June 2014 through June 2019, the CPI-U has increased at an average rate of 1.45 percent. However, please remember that the assumed inflation rate is only weakly tied to past results.

The following table shows the average inflation over various periods, ending June 2019.

| Fiscal Year	Annual Increase in CPI-U
2014-15	0.12%
2015-16	1.00%
2016-17	1.63%
2017-18	2.87%
2018-19	1.65%
3-Year Average	2.05%
5-Year Average	1.45%
10-Year Average	1.73%
20-Year Average	2.19%
25-Year Average	2.22%
30-Year Average	2.44%
40-Year Average	3.21%
50-Year Average	3.97%

The graph on the next page shows the average annual inflation, as measured by the increase in CPI-U, in each of the 10 consecutive five-year periods over the last 50 years.

Average Annual Inflation
CPI-U Five Fiscal Year Averages
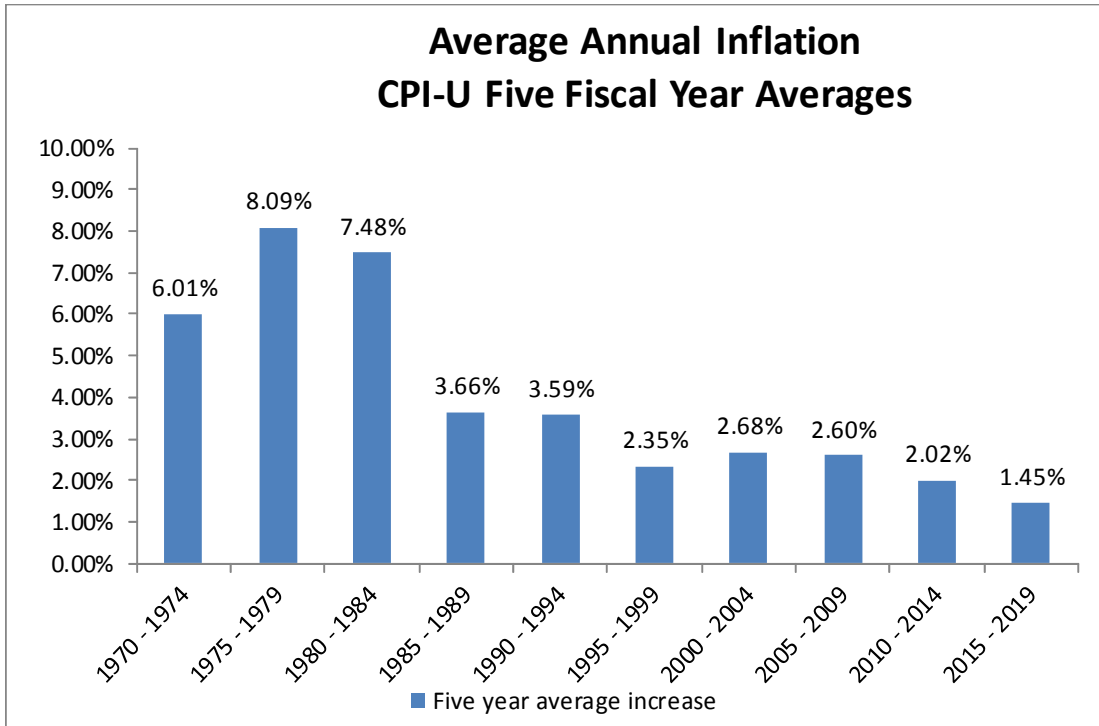
As the above chart illustrates, the high inflation of the 1970s and early 1980s is well in the past. The geometric average annual increase in price inflation was 2.44 percent per year over the last 30 years from June 1989 to June 2019, 2.19 percent over the last 20 years and 1.73 percent over the last 10 years.

The following graph illustrates the rate of inflation on a year by year basis over the last 30 years.

Annual Inflation Rate
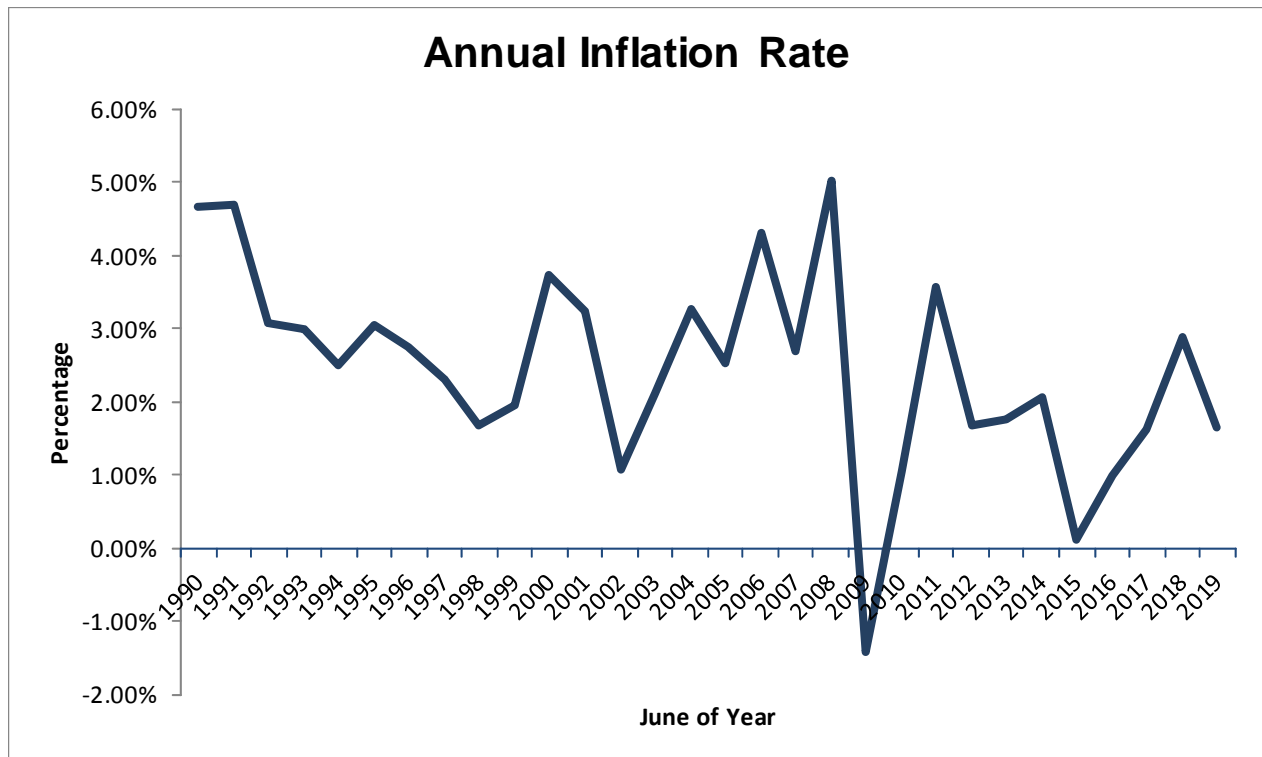
Economic Assumptions

Since price inflation is relatively volatile and is subject to a number of influences not based on recent history, economic assumptions are less reliably based on recent past experience than are the demographic assumptions. Therefore, it is important not to give undue weight to recent experience. We must also consider future expectations as well.

We surveyed the inflation assumption used by nationally recognized firms (investment consultants, asset managers and insurance companies) across the country. In our sample of these firms, the inflation assumption ranged from 1.70 percent to 2.50 percent, with an average of 2.18 percent.

Another point of reference is the Social Security Administration's (SSA) 2019 Trustees Report, in which the Office of the Chief Actuary is projecting a long-term average ultimate annual inflation rate of 2.00 percent in the high cost projection scenario, 2.60 percent under the intermediate cost projection scenario and 3.20 percent in the low cost projection scenario. The Social Security Trustees report uses the ultimate rates for their 75-year projections, much longer than the longest horizon we can discern from Treasuries and TIPS.

The following table presents a summary of inflation rate forecasts from various professional experts.

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Economic Assumptions

Forward-Looking Price Inflation Forecasts[a]	
Congressional Budget Office[b]	
5-Year Annual Average	2.46%
10-Year Annual Average	2.38%
Federal Reserve Bank of Philadelphia[c]	
5-Year Annual Average	2.10%
10-Year Annual Average	2.20%
Federal Reserve Bank of Cleveland[d]	
10-Year Expectation	1.68%
20-Year Expectation	1.89%
30-Year Expectation	2.05%
Federal Reserve Bank of St. Louis[e]	
10-Year Breakeven Inflation	1.74%
20-Year Breakeven Inflation	1.77%
30-Year Breakeven Inflation	1.78%
U.S. Department of the Treasury[f]	
10-Year Breakeven Inflation	1.70%
20-Year Breakeven Inflation	1.74%
30-Year Breakeven Inflation	1.90%
50-Year Breakeven Inflation	1.94%
100-Year Breakeven Inflation	1.97%
Social Security Trustees[g]	
Ultimate Intermediate Assumption	2.60%

[a]Version 2019-06-30 by Gabriel, Roeder, Smith & Company.

[b]*The Budget and Economic Outlook: 2019 to 2029*, Release Date: January 2019, Consumer Price Index (CPI-U), Percentage Change from Fourth Quarter to Fourth Quarter, 5-Year Annual Average (2019 - 2023), 10-Year Annual Average (2019 - 2028).

[c]*Second Quarter 2019 Survey of Professional Forecasters*, Release Date: May 10, 2019, Headline CPI, 5-Year Annual Average (2019 - 2023), 10-Year Annual Average (2019 - 2028).

[d]Inflation Expectations, Model output date: June 1, 2019.

[e]The breakeven inflation rate represents a measure of expected inflation derived from X-Year Treasury Constant Maturity Securities and X-Year Treasury Inflation-Indexed Constant Maturity Securities. Observation date: June 2019.

[f]*The Treasury Breakeven Inflation (TBI) Curve*, Monthly Average Rates, June 2019.

[g]*The 2019 Annual Report of The Board of Trustees of The Federal Old-Age And Survivors Insurance and Federal Disability Insurance Trust Funds*, April 25, 2019, Long-range (75-year) assumptions, Intermediate, Consumer Price Index (CPI-W), for 2021 and later.

Economic Assumptions

Based on this information, we believe it would be reasonable to lower the current inflation assumption of 2.75 percent to 2.25 percent. We believe a reasonable range falls between 2.10 percent and 2.60 percent (with only the Social Security Trustees Intermediate assumption providing support for 2.60 percent). This reduction recognizes lower inflation expectations in both the near term and longer term. The change will bring it closer to recent inflation levels and closer to levels expected in the financial markets. As you will see, this change also affects all of the other economic assumptions.

Post-Retirement Cost of Living Increases (COLA)

Retirement allowances may be adjusted each year based on the change in the Consumer Price Index (CPI) from September to September of the previous year. The index that is used is the Urban Wage Earners and Clerical Workers – United States City Average by the Bureau of Labor Statistics. The Cost-of-living adjustment is capped at the lesser of 3 percent or the increase in CPI for benefits attributable to service before July 1, 2011, and capped at the lesser of 2 percent or the increase in CPI for benefits attributable to service on or after July 1, 2011. The Cost-of-living adjustment is not capped for Retirement System members.

A simple COLA (increase based on the original benefit at retirement) is granted for members with no service on or after July 1, 1998, and is compound (increase based on the previous year's benefit including all prior COLAs) for members with service on or after July 1, 1998.

In years in which COLAs would be less than zero due to a decline in the CPI, retirement allowances will not be adjusted. COLAs in succeeding years are adjusted until the difference between the negative COLA that would have applied and the zero COLA is fully recovered.

In order to review this assumption, we performed a simulation of inflation assuming that inflation is normally distributed with a mean return equal to the alternate mean returns of 2.50 percent and 2.25 percent and a standard deviation of 1.49 percent. The standard deviation is approximately equal to the standard deviation of inflation for the 20-year period ending in June 2019. We then determined a simulated COLA increase based on simulated inflation and with no COLA cap, a COLA cap of 3.00 percent and a COLA cap of 2.00 percent.

The following table contains the simulated results for each COLA provision and alternate inflation rate. We are recommending that the assumptions be based on the average simulated results between the 15th and 85th percentiles to provide additional conservatism and exclude future outcomes from the average that have a low likelihood of occurrence.

Cola Provision	Uncapped		Capped at 3.00%		Capped at 2.00%	
	Mean of Simulated Results*	Assumption	Mean of Simulated Results	Assumption	Mean of Simulated Results	Assumption
2.75% Inflation		3.00%		2.75%		1.95%
2.50% Inflation	2.49%	2.50%	2.34%	2.35%	1.85%	1.85%
2.25% Inflation	2.24%	2.25%	2.16%	2.15%	1.76%	1.75%

*Average simulated results between the 15th and 85th percentiles.

Based on an inflation assumption of 2.25 percent, the recommended assumption is 2.25 percent for members with an uncapped COLA, 2.15 percent for a 3.00 percent capped COLA and 1.75 percent for a 2.00 capped COLA.

Economic Assumptions

Investment Return

As previously stated, actuaries are required to comply with Actuarial Standard of Practice No. 27 (ASOP No. 27) in setting economic assumptions for retirement plans, including the assumed investment return rate.

In a public retirement system like the Montgomery County Public Schools Employees' Retirement and Pension Systems, it is ultimately the Board of Education's responsibility to approve the actuarial assumptions used in the actuarial valuations. It is the actuary's duty to provide the Board with information needed to make those decisions and to make recommendations to the Board. Although the Board of Education is the ultimate decision-making body, we are still bound by ASOP No. 27 in providing advice or recommendations to the Board.

For purposes of budgeting contributions as a level percentage of payroll, the assumed rate of investment return is used as the discount rate to determine the present value of the system's pension obligations. It is important to note that an actuarial investment return assumption based on expected future experience is a single estimate for all years and therefore implicitly assumes that returns above and below expectations will "average out" over time. In other words, the expected risk premium is reflected in the assumed rate of investment return in advance of being earned, while the investment risk is not reflected until actual experience emerges with each actuarial valuation.

The review of the investment return assumption in this report considers forward-looking measures of likely investment return outcomes for the asset classes in the current Montgomery County Public Schools Employees' Retirement and Pension Systems' investment policy. For purposes of this analysis, we have used the capital market assumptions from 14 nationally recognized firms (investment consultants, asset managers and insurance companies) in our analysis of the System's investment return assumption.

Our analysis is performed using the GRS Capital Market Assumption Modeler (CMAM) tool. Because GRS is an actuarial and benefits consulting firm, we do not develop or maintain our own capital market expectations. Instead, we annually request forward-looking expectations developed by nationally recognized firms who develop capital market assumptions (investment consultants, asset managers and insurance companies) and update our CMAM tool each year. The capital market assumptions in the 2019 CMAM are from the following firms (in alphabetical order): Aon Hewitt, BlackRock, BNY Mellon, Callan, Cambridge, JPMorgan, Marquette Associates, Meketa, Mercer, NEPC, RVK, Verus, Voya and Wilshire. The benefit of using capital market expectations from multiple firms is that we can identify the uncertain nature of the items affecting the selection of the investment return assumption. While there may be differences in asset classes, investment horizons, inflation assumptions, treatment of investment expenses, excess manager performance (i.e., alpha), etc., we align the various capital market assumption sets from the 14 different firms to best fit the System's investment policy (i.e., target asset allocation) as consistently as possible.

To the best of our ability, we have adapted the System's investment policy to fit with the various investment firms' assumptions adjusting for these known differences in asset classes and methodology. In the following charts, to the extent possible all returns are net of passive investment expenses and have no assumption for excess manager performance (alpha) in excess of active management fees.

Economic Assumptions

Importantly, the information in this report is not intended to be construed as investment advice.

Real Return

The allocation of assets within the universe of investment options will significantly impact the overall performance. Therefore, it is meaningful to identify the range of expected returns based on each fund's targeted allocation of investments and an overall set of capital market assumptions.

Below is a table with the Montgomery County Public Schools Employees' Retirement and Pension Systems' current target asset allocation:

Long-Term Target Asset Allocation	
Asset Class	**Target Percentage**
US Large Cap Equity	20.0%
US Small Cap Equity	4.0%
International Large Cap Equity	15.0%
International Small Cap Equity	4.0%
Emerging Market Equity	7.0%
Core Fixed Income	18.0%
Bank Loans	2.5%
Emerging Market Debt	2.5%
Private Equity	10.0%
Real Estate	8.0%
Hedge Funds	7.0%
Cash	2.0%
Total	**100.0%**
Total Equity	**50.0%**
Total Fixed Income	**23.0%**
Total Alternatives	**25.0%**
Total Other	**2.0%**

The arithmetic expected return developed from this asset allocation is shown in the following tables. The CMAM begins with the nominal expected return from each consultant (column 2), takes out each consultant's price inflation assumption (column 3) to arrive at the real return (column 4). We then incorporate the recommended price inflation assumption of 2.25 percent (column 5) to get the adjusted nominal return (column 6). Additional investment expenses paid out of trust assets which are not already reflected in the expected returns (column 7) are netted out of the return. The final arithmetic expected return is shown in column 8. Note that the arithmetic return is in general higher than the median return due to compounding effect of random returns. In general, the difference between the arithmetic and median return will be larger for larger standard deviation of returns. We have shown the standard deviation of returns as the investment risk in column 9.

Economic Assumptions

ASOP No. 27 acknowledges that for any given economic assumption, there is a reasonable range of opinions on that assumption. This is evident from the summaries we show from our CMAM.

Firm	Firm Expected Nominal Return	Firm Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Investment Expenses	Expected Nominal Return Net of Expenses (6)-(7)	Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	5.16%	2.20%	2.96%	2.25%	5.21%	0.00%	5.21%	11.58%
2	6.78%	2.50%	4.28%	2.25%	6.53%	0.00%	6.53%	12.61%
3	6.87%	2.50%	4.37%	2.25%	6.62%	0.00%	6.62%	12.54%
4	6.37%	2.20%	4.17%	2.25%	6.42%	0.00%	6.42%	9.75%
5	6.65%	2.00%	4.65%	2.25%	6.90%	0.00%	6.90%	10.78%
6	7.25%	2.25%	5.00%	2.25%	7.25%	0.00%	7.25%	12.55%
7	7.49%	2.26%	5.23%	2.25%	7.48%	0.00%	7.48%	13.72%
8	7.32%	2.31%	5.01%	2.25%	7.26%	0.00%	7.26%	11.78%
9	7.04%	2.00%	5.04%	2.25%	7.29%	0.00%	7.29%	11.72%
10	7.34%	2.21%	5.13%	2.25%	7.38%	0.00%	7.38%	12.28%
11	7.90%	2.15%	5.75%	2.25%	8.00%	0.00%	8.00%	12.32%
12	8.09%	2.30%	5.79%	2.25%	8.04%	0.00%	8.04%	11.50%
13	7.83%	2.00%	5.83%	2.25%	8.08%	0.00%	8.08%	11.12%
14	7.84%	1.70%	6.14%	2.25%	8.39%	0.00%	8.39%	12.60%
Average	**7.14%**	**2.18%**	**4.95%**	**2.25%**	**7.20%**	**0.00%**	**7.20%**	**11.92%**

The average expected nominal return from column 8 is 7.20 percent. This is the average arithmetic rate of return.

Economic Assumptions

Note that the arithmetic rates of return represent the average future expected return which is higher than the median future expected return. Setting the actuarial valuation assumption at the arithmetic expected return ignores the downward effect of volatility on the accumulation of assets. Consequently, the probability of actually achieving the actuarial assumption compounded over time is less than 50 percent if it is set at the arithmetic expectation.

The next step in our analysis is to compare the probabilities of achieving returns over a 20-year horizon. We compute the 40th, 50th, and 60th percentiles of returns as well as the probability of achieving the current assumption of 7.00 percent and alternate assumptions of 6.75 percent, 6.50 percent and 6.25 percent based on a price inflation assumption of 2.25 percent over a 20-year horizon. Note that the investment horizon for the capital market assumption sets used in this analysis is between 5 and 10 years. For purposes of this analysis, no adjustment has been made to return expectations for 20 years. This implies that the second 10 years are expected to have the same distribution of returns as the first 10 years. A different assumption would result in a different distribution of returns[1].

Firm	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding 7.00%	Probability of exceeding 6.75%	Probability of exceeding 6.50%	Probability of exceeding 6.25%
	40th	50th	60th				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	3.93%	4.58%	5.23%	17.57%	20.15%	22.94%	25.95%
2	5.09%	5.79%	6.50%	33.36%	36.64%	40.04%	43.51%
3	5.19%	5.89%	6.60%	34.59%	37.93%	41.38%	44.90%
4	5.43%	5.98%	6.53%	31.95%	36.14%	40.51%	45.02%
5	5.75%	6.36%	6.96%	39.44%	43.49%	47.62%	51.79%
6	5.82%	6.52%	7.23%	43.17%	46.72%	50.30%	53.89%
7	5.85%	6.62%	7.39%	45.00%	48.27%	51.56%	54.84%
8	5.96%	6.62%	7.28%	44.24%	48.03%	51.85%	55.66%
9	6.00%	6.66%	7.32%	44.81%	48.63%	52.47%	56.29%
10	6.00%	6.68%	7.37%	45.36%	49.01%	52.68%	56.33%
11	6.61%	7.30%	8.00%	54.41%	58.04%	61.60%	65.08%
12	6.79%	7.43%	8.08%	56.76%	60.59%	64.34%	67.96%
13	6.89%	7.51%	8.14%	58.20%	62.13%	65.94%	69.61%
14	6.96%	7.67%	8.37%	59.46%	62.92%	66.28%	69.53%
Average	5.88%	6.54%	7.22%	43.45%	47.05%	50.68%	54.31%

The 50th percentile return is also related to the geometric average return. The geometric average of a sequence of returns over a number of years is the compound average of those returns over the number of years compounded. As the number of years in the geometric average increase and if the distributions of

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[1] *We requested capital market assumptions over a longer horizon from each of the fourteen firms. Six of the firms provided capital market assumptions over a period of 20, 25 or 30 years, the other eight did not provide assumptions over a period longer than 10 years. Each of the six that provided assumptions over a longer horizon had different expectations after the first 10 years. However, two of those six indicated that return expectations after the 10th year were set based on historical return experience, as opposed to a market-based or forward-looking methodology that is predominately used in the development of the 10-year expectations. The other firms did not provide a description of methodology for the longer horizon. Therefore, our analysis is based on capital market assumptions over an investment horizon of five to 10 years for all 14 firms for consistency.*

returns each year are independent and identically distributed, then the geometric average will converge to the median return. The median return is also a reasonable rate of return for purposes of the valuation. The average of 50th percentile returns (based on the recommended price inflation assumption of 2.25 percent) is 6.54 percent.

Column 5 of the tables on the previous page show the estimated probability of achieving the current assumed rate of return of 7.00 percent over a 20-year period (based on the recommended price inflation assumption of 2.25 percent and the capital market assumptions from the investment consultants, most of which are based on investment horizons of between 5 and 10 years). The average probability of achieving 7.00 percent over 20 years based on these assumptions is about 43 percent.

Recommendation

Based on (1) the GRS analysis of the expected investment returns for the Montgomery County Public Schools Employees' Retirement and Pension Systems, (2) our recommended assumption for inflation of 2.25 percent and (3) the current Montgomery County Public Schools Employees' Retirement and Pension Systems' target asset allocation, we recommend reducing the investment return assumption of 7.00 percent to 6.75 percent. We recommend that the assumed investment return assumption be monitored for continued appropriateness between full experience reviews. Also, any significant changes in the target asset allocation of the Plans may warrant an additional review of the rate of return assumption.

We believe that the recommended assumption can be supported by Actuarial Standard of Practice No. 27. Under the Standard, all economic assumptions must be selected to be consistent with the purpose of the measurement. The purpose of the measurement is to determine the contribution rate which will lead to the accumulation of assets to pay benefits when due.

The assets of the OPEB Plan are invested in the Montgomery County Consolidated Retiree Health Benefits Trust (CRHBT) and therefore the investment return assumption used for the Montgomery County Public Schools OPEB Plan is the same as the assumption used for the Montgomery County OPEB Plan. Therefore, we have not reviewed this assumption. The current investment return assumption is 7.50 percent.

General Wage Inflation and Payroll Growth

A General Wage Inflation (GWI) assumption represents the real wage growth over time in the general economy, (i.e., how much the pay scales themselves will change year to year). It does not necessarily reflect actual pay increases received by individuals or even how payroll in total may change, which can be impacted by population changes, etc. Wage inflation consists of two components, (1) a portion due to pure price inflation (i.e., increases due to changes in the CPI), and (2) increases in average salary levels in excess of pure price inflation (i.e., increases due to changes in productivity levels, supply and demand in the labor market and other macroeconomic factors).

The Average Wage Index (AWI), formerly named the National Average Earnings (NAE), series published in connection with the operation of the Social Security program, is a useful proxy for measuring general changes in wage levels in the economy. Increases in AWI typically exceed increases in the Consumer Price Index (CPI), although there are periods where the patterns are reversed. The economic argument for wages exceeding prices in the long run is that CPI is based on the prices of a fixed basket of goods whereas wages reflect innovations, real productivity growth, labor supply and demand and other factors in addition to pure price inflation.
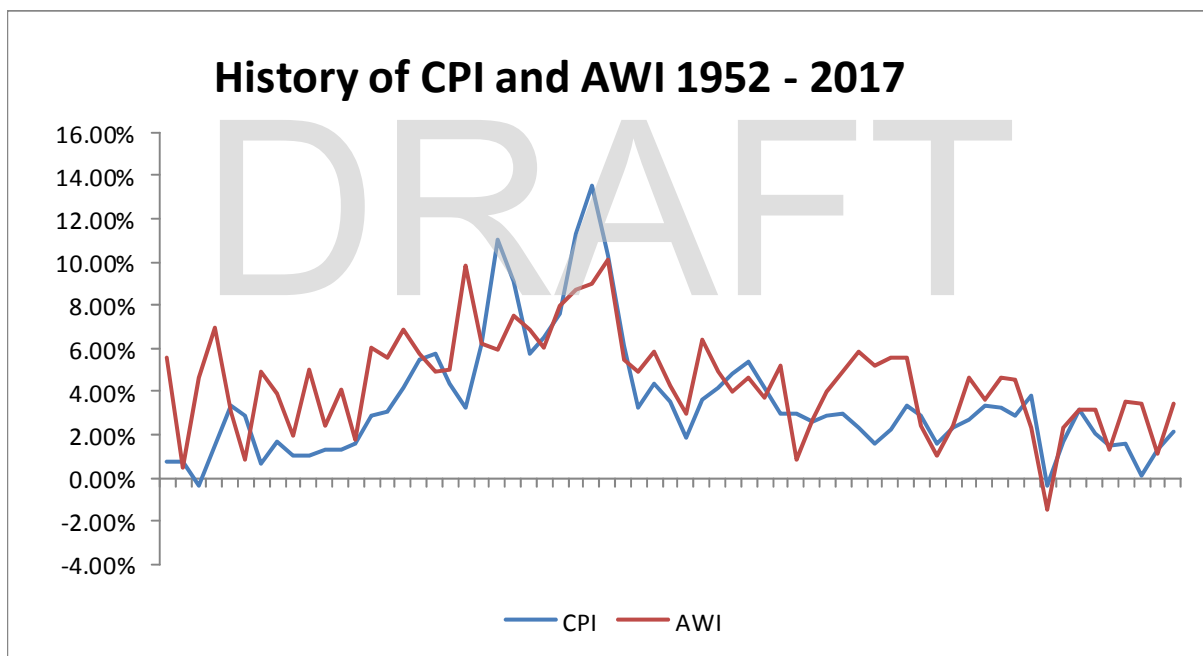
Over the last 65 years, AWI has exceeded CPI 43 times and the averages over that period are 4.4 percent for AWI and 3.5 percent for CPI. The last 25 years has had fewer cases of high inflation, but the distinction between prices and wages still appears. Over the last 25 years, the average increase in AWI is 3.2 percent and the average increase in CPI is 2.3 percent.

As with the investment return assumption, past experience does not necessarily dictate future expectations. Current expectations are mixed on whether price and wage inflation will remain low in the short term, particularly due to the after effects of recent federal government spending. For a long-term view, the 2019 Annual Report from the Trustees of the Social Security Administration (SSA) assumes an intermediate average ultimate CPI of 2.6 percent over the next 75 years and an ultimate intermediate

growth assumption for average wages in covered employment of 3.8 percent. The SSA report provides alternate "High-cost" assumptions of 2.0 percent CPI/2.6 percent wages and "Low-cost" assumptions of 3.2 percent CPI/5.0 percent wages.

With ongoing pressure on the ability of states, counties and municipalities to sustain across the board increases in wages consistent with historical norms, we do not believe there is justification to increase the total payroll growth and wage inflation assumptions. We recommend maintaining the assumption for productivity increases of 0.25 percent. Combining the recommendation of 0.25 percent for productivity increases with a 2.25 percent inflation assumption implies a general wage inflation assumption of 2.50 percent.

These assumptions are summarized below:

	Current Assumption	Recommended Assumption
Price Inflation	2.75%	2.25%
Productivity Increases	0.25%	0.25%
General Wage Inflation	3.00%	2.50%

We also recommend a total payroll growth assumption (used to amortize the unfunded liability) of 2.50 percent. The total payroll growth assumption does not assume an increase in the number of active members.

Salary Scale Assumption

Salary Increase

The components that determine the total salary increase are wage inflation, merit and longevity increases and promotion increases. We recommend a change to the merit and longevity and promotion increase portion of the salary increase assumption to better reflect actual experience.

The experience in the following tables shows that actual salary increases (real) were higher on average than the current assumptions during the experience study period for Teachers with less than 20 years of service and Staff with less than 15 years of service. However, average inflation over the experience study period was about 1.40 percent, which is lower than the current assumption of 2.75 percent. Therefore, actual rates of salary increases (in excess of inflation) were higher than the current assumptions for all years of service. The recommended real rates of salary increase are higher than the current assumed rates of salary increase and apply partial credibility to the actual salary increase experience. The recommended rates reflect that all members will receive salary increases at least equal to price inflation.

Following is a summary of the average salary increases for each employee group:

	Expected Real Salary Increase*			Expected Total Salary Increase		
	Actual Real Salary Increase*	Current Assumption	Proposed Assumption	Actual Total Salary Increase	Current Assumption	Proposed Assumption
Teachers						
0 Years	12.14%	4.80%	6.31%	13.54%	7.55%	8.56%
1-4 Years	6.36%	3.00%	4.88%	7.76%	5.75%	7.13%
5-9 Years	4.61%	2.18%	3.47%	6.01%	4.93%	5.72%
10-14 Years	3.49%	1.36%	2.60%	4.89%	4.11%	4.85%
15-19 Years	2.22%	0.45%	1.26%	3.62%	3.20%	3.51%
20-24 Years	0.61%	-0.29%	0.05%	2.01%	2.46%	2.30%
25+ Years	0.18%	-0.52%	0.02%	1.58%	2.23%	2.27%
Total Average	3.14%	1.15%	2.22%	4.54%	3.90%	4.47%
Staff						
0 Years	26.05%	1.92%	6.99%	27.45%	4.67%	9.24%
1-4 Years	9.94%	2.19%	5.90%	11.34%	4.94%	8.15%
5-9 Years	4.21%	1.89%	3.01%	5.61%	4.64%	5.26%
10-14 Years	2.71%	0.84%	1.85%	4.11%	3.59%	4.10%
15-19 Years	1.42%	0.33%	0.70%	2.82%	3.08%	2.95%
20-24 Years	1.04%	-0.24%	0.33%	2.44%	2.51%	2.58%
25+ Years	0.85%	-0.22%	0.27%	2.25%	2.53%	2.52%
Total Average	3.30%	0.83%	1.99%	4.70%	3.58%	4.24%
Excludes price inflation of	1.40%	2.75%	2.25%			

GRS Retirement Consulting

Salary Scale Assumption

Teachers Salary Experience (Less Than 15 Years)

Total Increase

Age	0 Years Beg. of Year	0 Years End of Year	Actual Total Increase	Current Total Increase	Proposed Total Increase	1-4 Years Beg. of Year	1-4 Years End of Year	Actual Total Increase	Current Total Increase	Proposed Total Increase	5-9 Years Beg. of Year	5-9 Years End of Year	Actual Total Increase	Current Total Increase	Proposed Total Increase	10-14 Years Beg. of Year	10-14 Years End of Year	Actual Total Increase	Current Total Increase	Proposed Total Increase
Under 25	$46,445	$52,434	12.895%	8.350%	7.500%	$47,280,595	$50,169,997	6.111%	4.500%	5.500%	$105,761	$103,465	-2.171%	6.000%	5.000%	$ -	$ -		5.150%	6.250%
25-29	162,215	204,478	26.054%	9.400%	9.250%	228,298,259	246,045,848	7.774%	6.300%	7.250%	85,398,690	91,358,576	6.979%	6.000%	6.750%	364,419	388,839	6.701%	5.150%	6.250%
30-34	257,374	339,001	31.715%	8.750%	9.250%	122,559,226	130,986,971	6.876%	5.500%	7.250%	246,643,955	260,874,128	5.770%	5.350%	5.750%	121,731,057	128,381,882	5.464%	5.150%	5.500%
35-39	221,175	251,541	13.729%	7.350%	9.250%	79,186,442	85,105,262	7.475%	5.450%	7.250%	129,528,581	137,125,897	5.865%	4.900%	5.750%	285,045,787	300,970,780	5.587%	4.650%	5.500%
40-44	700,653	771,978	10.180%	8.300%	9.250%	62,652,284	67,708,889	8.071%	5.800%	7.250%	92,219,987	98,036,091	6.307%	4.600%	5.750%	189,804,966	199,391,046	5.050%	4.000%	5.000%
45-49	271,859	352,436	29.639%	7.050%	9.250%	57,675,317	62,979,482	9.197%	5.850%	7.250%	79,916,197	85,236,002	6.657%	4.550%	5.750%	155,564,349	162,833,010	4.672%	3.700%	4.500%
50-54	375,777	423,794	12.778%	5.750%	9.250%	40,097,208	43,989,293	9.707%	5.700%	7.250%	78,097,668	82,879,584	6.123%	4.500%	5.750%	118,969,778	124,343,849	4.517%	3.750%	4.500%
55-59	762,178	783,638	2.816%	7.250%	7.250%	23,840,522	25,885,030	8.576%	5.650%	7.250%	57,554,867	60,541,026	5.188%	4.000%	4.750%	108,077,092	112,622,662	4.206%	3.450%	4.250%
60-64	206,797	218,915	5.860%	7.250%	7.250%	12,888,833	14,005,767	8.666%	4.750%	7.250%	28,562,558	30,053,137	5.219%	4.000%	4.750%	67,096,805	69,432,564	3.481%	3.200%	3.500%
65-69	21,986	38,694	75.994%	7.250%	7.250%	4,282,993	4,569,300	6.685%	4.650%	7.250%	9,526,875	9,910,433	4.026%	3.750%	4.000%	17,926,968	18,414,102	2.717%	3.100%	3.000%
70-74	14,232	15,452	8.572%	7.250%	7.250%	558,800	614,956	10.049%	4.950%	7.250%	1,576,289	1,633,641	3.638%	3.250%	3.500%	4,005,841	4,122,892	2.922%	3.100%	3.000%
75+	-	-		7.250%	7.250%	39,193	32,989	-15.829%	4.950%	7.250%	440,231	476,434	8.224%	3.250%	3.500%	1,151,710	1,180,988	2.542%	3.100%	3.000%

Real Increase

Age	0 Years Actual Real Increase	0 Years Current Real Increase	0 Years Proposed Real Increase	1-4 Years Actual Real Increase	1-4 Years Current Real Increase	1-4 Years Proposed Real Increase	5-9 Years Actual Real Increase	5-9 Years Current Real Increase	5-9 Years Proposed Real Increase	10-14 Years Actual Real Increase	10-14 Years Current Real Increase	10-14 Years Proposed Real Increase
Under 25	11.495%	5.600%	5.250%	4.711%	1.750%	3.250%	-3.571%	3.250%	2.750%		2.400%	4.000%
25-29	24.654%	6.650%	7.000%	6.374%	3.550%	5.000%	5.579%	3.250%	4.500%	5.301%	2.400%	4.000%
30-34	30.315%	6.000%	7.000%	5.476%	2.750%	5.000%	4.370%	2.600%	3.500%	4.064%	2.400%	3.250%
35-39	12.329%	4.600%	7.000%	6.075%	2.700%	5.000%	4.465%	2.150%	3.500%	4.187%	1.900%	3.250%
40-44	8.780%	5.550%	7.000%	6.671%	3.050%	5.000%	4.907%	1.850%	3.500%	3.650%	1.250%	2.750%
45-49	28.239%	4.300%	7.000%	7.797%	3.100%	5.000%	5.257%	1.800%	3.500%	3.272%	0.950%	2.250%
50-54	11.378%	3.000%	7.000%	8.307%	2.950%	5.000%	4.723%	1.750%	3.500%	3.117%	1.000%	2.250%
55-59	1.416%	4.500%	5.000%	7.176%	2.900%	5.000%	3.788%	1.250%	2.500%	2.806%	0.700%	2.000%
60-64	4.460%	4.500%	5.000%	7.266%	2.000%	5.000%	3.819%	1.250%	2.500%	2.081%	0.450%	1.250%
65-69	74.594%	4.500%	5.000%	5.285%	1.900%	5.000%	2.626%	1.000%	1.750%	1.317%	0.350%	0.750%
70-74	7.172%	4.500%	5.000%	8.649%	2.200%	5.000%	2.238%	0.500%	1.250%	1.522%	0.350%	0.750%
75+		4.500%	5.000%	-17.229%	2.200%	5.000%	6.824%	0.500%	1.250%	1.142%	0.350%	0.750%

Actual real increase equal to total actual increase less actual average inflation of 1.40% during the experience study period.

Current real increase equal to total current increase less assumed inflation of 2.75%.

Proposed real increase equal to total proposed increase less proposed inflation of 2.25%.

Salary Scale Assumption

Teachers Salary Experience (15 Years+ and Total Average)

Total Increase

Age	15-19 Years Beg. of Year	15-19 End of Year	15-19 Actual Total Increase	15-19 Current Total Increase	15-19 Proposed Total Increase	20-24 Years Beg. of Year	20-24 End of Year	20-24 Actual Total Increase	20-24 Current Total Increase	20-24 Proposed Total Increase	25+ Years Beg. of Year	25+ End of Year	25+ Actual Total Increase	25+ Current Total Increase	25+ Proposed Total Increase	Total Avg Beg. of Year	Total Avg End of Year	Total Avg Actual Total Increase	Total Avg Current Total Increase	Total Avg Proposed Total Increase
Under 25	$ -	$ -		4.500%	4.750%	$ -	$ -		2.750%	2.750%	$ -	$ -		2.350%	2.500%	$47,432,801	$50,325,896	6.099%	4.507%	5.501%
25-29	-	-		4.500%	4.750%	-	-		2.750%	2.750%	-	-		2.350%	2.500%	314,223,583	337,997,741	7.566%	6.218%	7.114%
30-34	181,694	201,151	10.709%	4.500%	4.750%	-	-		2.750%	2.750%	-	-		2.350%	2.500%	491,373,306	520,783,133	5.985%	5.340%	6.064%
35-39	103,220,262	108,196,849	4.821%	4.500%	4.750%	189,148	194,749	2.961%	2.750%	2.750%	-	-		2.350%	2.500%	597,391,395	631,845,078	5.767%	4.785%	5.657%
40-44	273,733,897	286,217,435	4.560%	3.550%	4.250%	51,657,069	53,023,134	2.644%	2.750%	2.750%	193,193	199,270	3.146%	2.350%	2.500%	670,962,049	705,347,843	5.125%	3.975%	4.838%
45-49	205,905,241	212,720,865	3.310%	2.950%	3.250%	173,406,641	176,805,212	1.960%	2.550%	2.250%	40,373,939	41,291,477	2.273%	2.350%	2.500%	713,113,543	742,218,484	4.081%	3.398%	3.843%
50-54	140,485,507	144,698,353	2.999%	2.850%	3.000%	96,590,504	98,537,289	2.016%	2.450%	2.250%	139,332,891	141,751,561	1.736%	2.350%	2.250%	613,949,333	636,623,723	3.693%	3.246%	3.634%
55-59	134,130,448	138,310,385	3.116%	2.900%	3.000%	82,890,389	84,443,198	1.873%	2.400%	2.250%	163,390,560	165,846,755	1.503%	2.150%	2.250%	570,646,056	588,432,694	3.117%	2.948%	3.273%
60-64	94,063,438	96,307,768	2.386%	2.650%	2.500%	77,275,156	78,921,738	2.131%	2.150%	2.250%	119,179,923	120,764,399	1.329%	2.150%	2.250%	399,273,510	409,704,288	2.612%	2.663%	2.862%
65-69	25,636,281	26,157,564	2.033%	1.950%	2.250%	22,822,632	23,129,848	1.346%	2.450%	2.250%	49,821,679	50,573,984	1.510%	2.350%	2.250%	130,039,414	132,793,925	2.118%	2.571%	2.647%
70-74	5,321,668	5,438,368	2.193%	1.950%	2.250%	3,891,907	3,913,213	0.547%	2.450%	2.250%	15,335,412	15,510,880	1.144%	2.100%	2.250%	30,704,149	31,249,402	1.776%	2.362%	2.505%
75+	593,756	597,939	0.704%	1.950%	2.250%	976,186	985,709	0.976%	2.450%	2.250%	4,414,463	4,496,520	1.859%	2.100%	2.250%	7,615,539	7,770,579	2.036%	2.366%	2.461%

Real Increase

Age	15-19 Actual Real Increase	15-19 Current Real Increase	15-19 Proposed Real Increase	20-24 Actual Real Increase	20-24 Current Real Increase	20-24 Proposed Real Increase	25+ Actual Real Increase	25+ Current Real Increase	25+ Proposed Real Increase	Total Avg Actual Real Increase	Total Avg Current Real Increase	Total Avg Proposed Real Increase
Under 25		1.750%	2.500%		0.000%	0.500%		-0.400%	0.250%	4.699%	1.757%	3.251%
25-29		1.750%	2.500%		0.000%	0.500%		-0.400%	0.250%	6.166%	3.468%	4.864%
30-34	9.309%	1.750%	2.500%		0.000%	0.500%		-0.400%	0.250%	4.585%	2.590%	3.814%
35-39	3.421%	1.750%	2.500%	1.561%	0.000%	0.500%		-0.400%	0.250%	4.367%	2.035%	3.407%
40-44	3.160%	0.800%	2.000%	1.244%	0.000%	0.500%	1.746%	-0.400%	0.250%	3.725%	1.225%	2.588%
45-49	1.910%	0.200%	1.000%	0.560%	-0.200%	0.000%	0.873%	-0.400%	0.250%	2.681%	0.648%	1.593%
50-54	1.599%	0.100%	0.750%	0.616%	-0.300%	0.000%	0.336%	-0.400%	0.000%	2.293%	0.496%	1.384%
55-59	1.716%	0.150%	0.750%	0.473%	-0.350%	0.000%	0.103%	-0.600%	0.000%	1.717%	0.198%	1.023%
60-64	0.986%	-0.100%	0.250%	0.731%	-0.600%	0.000%	-0.071%	-0.600%	0.000%	1.212%	-0.087%	0.612%
65-69	0.633%	-0.800%	0.000%	-0.054%	-0.300%	0.000%	0.110%	-0.400%	0.000%	0.718%	-0.179%	0.397%
70-74	0.793%	-0.800%	0.000%	-0.853%	-0.300%	0.000%	-0.256%	-0.650%	0.000%	0.376%	-0.388%	0.255%
75+	-0.696%	-0.800%	0.000%	-0.424%	-0.300%	0.000%	0.459%	-0.650%	0.000%	0.636%	-0.384%	0.211%

Actual real increase equal to total actual increase less actual average inflation of 1.40% during the experience study period.

Current real increase equal to total current increase less assumed inflation of 2.75%.

Proposed real increase equal to total proposed increase less proposed inflation of 2.25%.

Staff Salary Experience (Less Than 15 Years)

Total Increase

Age	0 Years Beg. of Year	End of Year	Actual Total Increase	Current Total Increase	Proposed Total Increase	1-4 Years Beg. of Year	End of Year	Actual Total Increase	Current Total Increase	Proposed Total Increase	5-9 Years Beg. of Year	End of Year	Actual Total Increase	Current Total Increase	Proposed Total Increase	10-14 Years Beg. of Year	End of Year	Actual Total Increase	Current Total Increase	Proposed Total Increase
Under 25	$ 72,882	$ 131,917	81.001%	3.950%	13.250%	$ 2,719,953	$ 3,311,462	21.747%	2.750%	12.250%	$ 313,367	$ 346,475	10.565%	5.350%	8.250%	$ -	$ -		4.850%	6.250%
25-29	204,174	268,462	31.487%	4.800%	11.250%	11,103,788	12,849,700	15.724%	5.000%	10.250%	5,588,283	6,033,618	7.969%	5.350%	6.750%	921,492	986,632	7.069%	4.850%	6.250%
30-34	247,312	279,463	13.000%	5.600%	9.250%	13,900,407	15,435,977	11.047%	5.150%	8.250%	12,653,649	13,354,965	5.542%	5.500%	5.750%	10,737,961	11,293,049	5.169%	4.850%	5.250%
35-39	228,592	284,532	24.472%	3.800%	8.750%	14,363,358	15,861,939	10.433%	4.950%	7.750%	13,204,248	14,108,400	6.847%	4.800%	5.500%	17,444,875	18,361,099	5.252%	4.100%	5.000%
40-44	148,660	187,061	25.831%	5.650%	8.750%	14,803,894	16,232,756	9.652%	5.150%	7.750%	16,988,322	17,887,318	5.292%	5.000%	5.500%	21,397,246	22,326,749	4.344%	3.700%	4.500%
45-49	314,224	452,527	44.014%	4.650%	8.750%	14,481,986	16,210,300	11.934%	5.050%	7.750%	25,153,015	26,702,724	6.161%	4.600%	5.500%	34,138,929	35,685,981	4.532%	3.850%	4.500%
50-54	421,657	473,039	12.186%	4.400%	8.750%	17,451,263	19,350,534	10.883%	4.950%	7.750%	24,626,059	25,954,364	5.394%	4.450%	5.000%	39,648,957	41,270,632	4.090%	3.750%	4.000%
55-59	227,388	286,636	26.056%	4.650%	8.750%	12,509,010	13,722,365	9.700%	5.050%	7.750%	21,708,681	22,836,488	5.195%	4.300%	5.000%	34,776,285	35,964,321	3.416%	3.150%	3.500%
60-64	13,508	26,908	99.200%	3.850%	8.750%	7,842,592	8,650,598	10.303%	4.500%	7.750%	14,860,583	15,545,219	4.607%	4.300%	4.500%	24,791,234	25,699,987	3.666%	3.100%	3.500%
65-69	21,691	31,041	43.105%	3.850%	7.750%	1,717,836	1,861,909	8.387%	4.400%	6.750%	5,589,337	5,840,035	4.485%	3.800%	4.500%	9,364,665	9,661,866	3.174%	2.500%	3.500%
70-74	-	-		3.850%	7.750%	342,674	363,365	6.038%	4.650%	6.750%	909,636	940,685	3.413%	4.100%	4.000%	2,763,290	2,783,114	0.717%	2.750%	2.500%
75+	-	-		3.850%	7.750%	20,301	24,946	22.881%	4.650%	6.750%	421,914	434,053	2.877%	4.100%	4.000%	1,295,723	1,351,545	4.308%	2.750%	2.500%

Real Increase

Age	0 Years Actual Real Increase	Current Real Increase	Proposed Real Increase	1-4 Years Actual Real Increase	Current Real Increase	Proposed Real Increase	5-9 Years Actual Real Increase	Current Real Increase	Proposed Real Increase	10-14 Years Actual Real Increase	Current Real Increase	Proposed Real Increase
Under 25	79.601%	1.200%	11.000%	20.347%	0.000%	10.000%	9.165%	2.600%	6.000%		2.100%	4.000%
25-29	30.087%	2.050%	9.000%	14.324%	2.250%	8.000%	6.569%	2.600%	4.500%	5.669%	2.100%	4.000%
30-34	11.600%	2.850%	7.000%	9.647%	2.400%	6.000%	4.142%	2.750%	3.500%	3.769%	2.100%	3.000%
35-39	23.072%	1.050%	6.500%	9.033%	2.200%	5.500%	5.447%	2.050%	3.250%	3.852%	1.350%	2.750%
40-44	24.431%	2.900%	6.500%	8.252%	2.400%	5.500%	3.892%	2.250%	3.250%	2.944%	0.950%	2.250%
45-49	42.614%	1.900%	6.500%	10.534%	2.300%	5.500%	4.761%	1.850%	3.250%	3.132%	1.100%	2.250%
50-54	10.786%	1.650%	6.500%	9.483%	2.200%	5.500%	3.994%	1.700%	2.750%	2.690%	1.000%	1.750%
55-59	24.656%	1.900%	6.500%	8.300%	2.300%	5.500%	3.795%	1.550%	2.750%	2.016%	0.400%	1.250%
60-64	97.800%	1.100%	6.500%	8.903%	1.750%	5.500%	3.207%	1.550%	2.250%	2.266%	0.350%	1.250%
65-69	41.705%	1.100%	5.500%	6.987%	1.650%	4.500%	3.085%	1.050%	2.250%	1.774%	-0.250%	1.250%
70-74		1.100%	5.500%	4.638%	1.900%	4.500%	2.013%	1.350%	1.750%	-0.683%	0.000%	0.250%
75+		1.100%	5.500%	21.481%	1.900%	4.500%	1.477%	1.350%	1.750%	2.908%	0.000%	0.250%

Actual real increase equal to total actual increase less actual average inflation of 1.40% during the experience study period.

Current real increase equal to total current increase less assumed inflation of 2.75%.

Proposed real increase equal to total proposed increase less proposed inflation of 2.25%.

Salary Scale Assumption

Staff Salary Experience (15 Years+ and Total Average)

Age	15-19 Years Beg. of Year	End of Year	Actual Total Increase	Current Total Increase	Proposed Total Increase	20-24 Years Beg. of Year	End of Year	Actual Total Increase	Current Total Increase	Proposed Total Increase	25+ Years Beg. of Year	End of Year	Actual Total Increase	Current Total Increase	Proposed Total Increase	Total Average Beg. of Year	End of Year	Actual Total Increase	Current Total Increase	Proposed Total Increase
Under 25	$ -	$ -		3.100%	3.500%	$ -	$ -		2.900%	3.000%	$ -	$ -		2.750%	3.000%	$ 3,106,202	$ 3,789,854	22.009%	3.040%	11.870%
25-29	-	-		3.100%	3.500%	-	-		2.900%	3.000%	-	-		2.750%	3.000%	17,817,737	20,138,412	13.025%	5.100%	8.957%
30-34	626,945	646,067	3.050%	3.100%	3.500%	-	-		2.900%	3.000%	-	-		2.750%	3.000%	38,166,274	41,009,521	7.450%	5.151%	6.506%
35-39	8,171,722	8,486,622	3.854%	3.100%	3.500%	574,798	585,170	1.804%	2.900%	3.000%	-	-		2.750%	3.000%	53,987,593	57,687,762	6.854%	4.332%	5.621%
40-44	13,882,727	14,380,591	3.586%	3.700%	3.500%	8,006,450	8,237,116	2.881%	2.900%	3.000%	546,512	561,710	2.781%	2.750%	3.000%	75,773,811	79,813,301	5.331%	4.187%	5.015%
45-49	24,929,536	25,623,059	2.782%	3.400%	3.000%	12,204,578	12,541,146	2.758%	2.800%	2.750%	12,765,186	13,115,122	2.741%	2.750%	2.750%	123,987,454	130,330,859	5.116%	3.837%	4.439%
50-54	30,673,930	31,577,476	2.946%	2.950%	3.000%	21,945,798	22,434,070	2.225%	2.600%	2.500%	28,083,486	28,793,051	2.527%	2.750%	2.500%	162,851,150	169,853,166	4.300%	3.508%	3.916%
55-59	33,396,838	34,270,115	2.615%	3.100%	2.750%	19,797,105	20,303,744	2.559%	2.400%	2.500%	45,236,409	46,292,850	2.335%	2.500%	2.500%	167,651,716	173,676,519	3.594%	3.169%	3.481%
60-64	22,626,954	23,168,167	2.392%	3.000%	2.750%	11,706,994	12,003,237	2.530%	2.150%	2.500%	32,266,208	32,915,854	2.013%	2.350%	2.500%	114,108,073	118,009,970	3.419%	3.023%	3.389%
65-69	9,370,996	9,624,069	2.701%	2.250%	2.750%	3,899,737	3,975,442	1.941%	2.100%	2.500%	12,239,110	12,443,897	1.673%	2.350%	2.500%	42,203,372	43,438,259	2.926%	2.614%	3.218%
70-74	2,799,770	2,863,676	2.283%	2.250%	2.250%	2,069,550	2,084,891	0.741%	2.100%	2.250%	4,027,606	4,096,977	1.722%	2.550%	2.250%	12,912,526	13,132,708	1.705%	2.621%	2.546%
75+	967,367	962,382	-0.515%	2.250%	2.250%	594,488	605,435	1.841%	2.100%	2.250%	1,603,643	1,632,602	1.806%	2.550%	2.250%	4,903,436	5,010,963	2.193%	2.631%	2.485%

Age	15-19 Years Actual Real Increase	Current Real Increase	Proposed Real Increase	20-24 Years Actual Real Increase	Current Real Increase	Proposed Real Increase	25+ Years Actual Real Increase	Current Real Increase	Proposed Real Increase	Total Average Actual Real Increase	Current Real Increase	Proposed Real Increase
Under 25		0.350%	1.250%		0.150%	0.750%		0.000%	0.750%	20.609%	0.290%	9.620%
25-29		0.350%	1.250%		0.150%	0.750%		0.000%	0.750%	11.625%	2.350%	6.707%
30-34	1.650%	0.350%	1.250%		0.150%	0.750%		0.000%	0.750%	6.050%	2.401%	4.256%
35-39	2.454%	0.350%	1.250%	0.404%	0.150%	0.750%		0.000%	0.750%	5.454%	1.582%	3.371%
40-44	2.186%	0.950%	1.250%	1.481%	0.150%	0.750%	1.381%	0.000%	0.750%	3.931%	1.437%	2.765%
45-49	1.382%	0.650%	0.750%	1.358%	0.050%	0.500%	1.341%	0.000%	0.500%	3.716%	1.087%	2.189%
50-54	1.546%	0.200%	0.750%	0.825%	-0.150%	0.250%	1.127%	0.000%	0.250%	2.900%	0.758%	1.666%
55-59	1.215%	0.350%	0.500%	1.159%	-0.350%	0.250%	0.935%	-0.250%	0.250%	2.194%	0.419%	1.231%
60-64	0.992%	0.250%	0.500%	1.130%	-0.600%	0.250%	0.613%	-0.400%	0.250%	2.019%	0.273%	1.139%
65-69	1.301%	-0.500%	0.500%	0.541%	-0.650%	0.250%	0.273%	-0.400%	0.250%	1.526%	-0.136%	0.968%
70-74	0.883%	-0.500%	0.000%	-0.659%	-0.650%	0.000%	0.322%	-0.200%	0.000%	0.305%	-0.129%	0.296%
75+	-1.915%	-0.500%	0.000%	0.441%	-0.650%	0.000%	0.406%	-0.200%	0.000%	0.793%	-0.119%	0.235%

Actual real increase equal to total actual increase less actual average inflation of 1.40% during the experience study period.

Current real increase equal to total current increase less assumed inflation of 2.75%.

Proposed real increase equal to total proposed increase less proposed inflation of 2.25%.

GRS Retirement Consulting

Salary Scale Assumption

Staff

| | Current Rates | | | | | | | | Proposed Rates | | | | | | |
| | Years of Credited Service | | | | | | | | Years of Credited Service | | | | | | |
Age	0	1-4	5-9	10-14	15-19	20-24	25+	Age	0	1-4	5-9	10-14	15-19	20-24	25+
Under 25	3.95%	2.75%	5.35%	4.85%	3.10%	2.90%	2.75%	Under 25	13.25%	12.25%	8.25%	6.25%	3.50%	3.00%	3.00%
25-29	4.80%	5.00%	5.35%	4.85%	3.10%	2.90%	2.75%	25-29	11.25%	10.25%	6.75%	6.25%	3.50%	3.00%	3.00%
30-34	5.60%	5.15%	5.50%	4.85%	3.10%	2.90%	2.75%	30-34	9.25%	8.25%	5.75%	5.25%	3.50%	3.00%	3.00%
35-39	3.80%	4.95%	4.80%	4.10%	3.10%	2.90%	2.75%	35-39	8.75%	7.75%	5.50%	5.00%	3.50%	3.00%	3.00%
40-44	5.65%	5.15%	5.00%	3.70%	3.70%	2.90%	2.75%	40-44	8.75%	7.75%	5.50%	4.50%	3.50%	3.00%	3.00%
45-49	4.65%	5.05%	4.60%	3.85%	3.40%	2.80%	2.75%	45-49	8.75%	7.75%	5.50%	4.50%	3.00%	2.75%	2.75%
50-54	4.40%	4.95%	4.45%	3.75%	2.95%	2.60%	2.75%	50-54	8.75%	7.75%	5.00%	4.00%	3.00%	2.50%	2.50%
55-59	4.65%	5.05%	4.30%	3.15%	3.10%	2.40%	2.50%	55-59	8.75%	7.75%	5.00%	3.50%	2.75%	2.50%	2.50%
60-64	3.85%	4.50%	4.30%	3.10%	3.00%	2.15%	2.35%	60-64	8.75%	7.75%	4.50%	3.50%	2.75%	2.50%	2.50%
65-69	3.85%	4.40%	3.80%	2.50%	2.25%	2.10%	2.35%	65-69	7.75%	6.75%	4.50%	3.50%	2.75%	2.50%	2.50%
70+	3.85%	4.65%	4.10%	2.75%	2.25%	2.10%	2.55%	70+	7.75%	6.75%	4.00%	2.50%	2.25%	2.25%	2.25%

Teachers

| | Current Rates | | | | | | | | Proposed Rates | | | | | | |
| | Years of Credited Service | | | | | | | | Years of Credited Service | | | | | | |
Age	0	1-4	5-9	10-14	15-19	20-24	25+	Age	0	1-4	5-9	10-14	15-19	20-24	25+
Under 25	8.35%	4.50%	6.00%	5.15%	4.50%	2.75%	2.35%	Under 25	7.50%	5.50%	5.00%	6.25%	4.75%	2.75%	2.50%
25-29	9.40%	6.30%	6.00%	5.15%	4.50%	2.75%	2.35%	25-29	9.25%	7.25%	6.75%	6.25%	4.75%	2.75%	2.50%
30-34	8.75%	5.50%	5.35%	5.15%	4.50%	2.75%	2.35%	30-34	9.25%	7.25%	5.75%	5.50%	4.75%	2.75%	2.50%
35-39	7.35%	5.45%	4.90%	4.65%	4.50%	2.75%	2.35%	35-39	9.25%	7.25%	5.75%	5.50%	4.75%	2.75%	2.50%
40-44	8.30%	5.80%	4.60%	4.00%	3.55%	2.75%	2.35%	40-44	9.25%	7.25%	5.75%	5.00%	4.25%	2.75%	2.50%
45-49	7.05%	5.85%	4.55%	3.70%	2.95%	2.55%	2.35%	45-49	9.25%	7.25%	5.75%	4.50%	3.25%	2.25%	2.50%
50-54	5.75%	5.70%	4.50%	3.75%	2.85%	2.45%	2.35%	50-54	9.25%	7.25%	5.75%	4.50%	3.00%	2.25%	2.25%
55-59	7.25%	5.65%	4.00%	3.45%	2.90%	2.40%	2.15%	55-59	7.25%	7.25%	4.75%	4.25%	3.00%	2.25%	2.25%
60-64	7.25%	4.75%	4.00%	3.20%	2.65%	2.15%	2.15%	60-64	7.25%	7.25%	4.75%	3.50%	2.50%	2.25%	2.25%
65-69	7.25%	4.65%	3.75%	3.10%	1.95%	2.45%	2.35%	65-69	7.25%	7.25%	4.00%	3.00%	2.25%	2.25%	2.25%
70+	7.25%	4.95%	3.25%	3.10%	1.95%	2.45%	2.10%	70+	7.25%	7.25%	3.50%	3.00%	2.25%	2.25%	2.25%

Demographic Assumptions

The following pages present the analysis of the demographic assumptions. These assumptions include assumed rates of mortality, retirement patterns, disability incidence and turnover patterns. These patterns generally take the form of tables of rates of incidence based on age and/or years of service.

Absent any significant changes in benefit provisions, these assumptions generally exhibit relative consistency over periods of time. As a result, each demographic assumption is normally reviewed by relating actual experience to that assumed over the recent past.

Actuarial Standard of Practice No. 35 – Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations

ASOP 35 applies to actuaries when they are selecting demographic and all other assumptions not covered by ASOP No. 27, Selection of Economic Assumptions for Measuring Pension Obligations, to measure obligations under any defined benefit pension plan that is not a social insurance program as described in section 1.2, Scope, of ASOP No. 32, Social Insurance.

The actuary should identify the types of demographic assumptions to use for a specific measurement. In doing so, the actuary should determine the following:

(a) The purpose and nature of the measurement;
(b) The plan provisions or benefits and factors that will affect the timing and value of any potential benefit payments;
(c) The characteristics of the obligation to be measured (such as measurement period, pattern of plan payments over time, open or closed group, and volatility);
(d) The contingencies that give rise to benefits or result in loss of benefits;
(e) The significance of each assumption; and
(f) The characteristics of the covered group.

Not every contingency requires a separate assumption. For example, for a plan that is expected to provide benefits of equal value to employees who voluntarily terminate employment or become disabled, retire, or die, the actuary may use an assumption that reflects some or all of the above contingencies in combination rather than selecting a separate assumption for each.

Analysis Approach

The analysis of demographic experience is conducted for each assumption using a measure known as the "Actual to Expected (A/E) Ratio." The A/E Ratio is simply the ratio of the actual number of occurrences of the event to which the assumption applies (e.g., deaths or retirements) to the number expected to occur in accordance with the assumption. An A/E Ratio of 1.00 indicates that the assumption precisely predicted the number of occurrences. An A/E Ratio exceeding 1.00 indicates that the assumption underestimated actual experience. Conversely, an A/E Ratio lower than 1.00 indicates that the assumption overestimated actual experience.

These are statistical analyses. As a result, there are several considerations we must keep in mind as we analyze these ratios:

(1) An actuarial assumption is designed to reflect average experience over long periods of time (30 - 50 years). As a result:

    (a) A deviation between actual experience and that expected from our assumptions for one or two years does not necessarily mean that the assumption should be changed.

    b) A change in actuarial assumption should result if the experience indicates a consistent pattern which is different from that assumed over a period of years.

(2) The larger the amount of data available, the more reliable the statistics used in the analysis. As a result:

    (a) Events that occur with great frequency (e.g., general employment turnover) are more credibly predictable than those occurring less frequently (e.g., active member death).

    (b) In all cases, data covering the entire study period produce more credible results than data for a single year.

    (c) Year by year experience is helpful only in identifying trends and determining whether the four-year data is truly reflective of the entire period.

This analysis is based on the actuarial valuation data for the four-year period from July 1, 2014 to July 1, 2018.

DRAFT

Retirement

The plan provisions establish the minimum eligibility requirements for retirement. Members of the Pension System hired before July 1, 2011 are eligible for normal retirement with 30 years of eligible service or beginning at age 62 if service conditions are met and members hired on or after July 1, 2011 are eligible for normal retirement with combined age plus eligibility service of at least 90 years or at age 65 with 10 years of eligibility service. Members of the Pension System are eligible for early retirement at age 55 with 15 years of eligibility service (age 60 for members hired on or after July 1, 2011).

Retirement cost, however, is determined not by the minimum eligibility requirements but by the ages at which members actually retire. The actuarial valuation does not assume that everyone retires at earliest eligibility. The assumption about the timing of retirement once eligibility has been established is a major component in cost calculations. Note that higher rates of retirement at earlier retirement ages or years of service upon attaining retirement eligibility generally result in higher actuarially determined contributions, and vice versa.

Experience during the last four years was considered in the analysis shown on the following pages. The "Exposure" column shows the number of employees eligible to retire at various years of service or ages throughout the experience period. An individual could potentially be counted up to four times if eligible each year in the period. By tabulating employees in this fashion we are able to answer the question "For all employees eligible at condition X, how many retired?"

Retirement-eligible members who terminated were included in the retirement experience.

Because of the limited number of active members remaining in the Employees' Retirement System, we did not analyze Employees' Retirement System retirement experience.

The current and proposed rates are age and service based. The following graphs and tables illustrate actual experience, current assumptions and proposed assumptions separately on a service and age basis. The proposed rates reflect changes to the current assumptions including changing the age at which 100 percent retirement is assumed from 70 to 80.

Retirement Assumption

Teachers – Service Basis

Service @ Retirement	Actual Experience			Current Assumptions			Proposed Assumptions		
	Exposures	Retirements	Actual Rate	Expected Retirements	Assumed Rate[1]	Actual / Expected	Expected Retirements	Proposed Rate[1]	Actual / Expected
Under 5	1	0	0.0%	0	2.0%	0.0	0	4.0%	0.0
5	32	4	12.5%	9	28.0%	0.4	6	20.0%	0.6
6	54	7	13.0%	16	29.2%	0.4	11	19.7%	0.7
7	90	9	10.0%	24	26.9%	0.4	16	17.3%	0.6
8	129	10	7.8%	35	26.9%	0.3	21	16.3%	0.5
9	188	31	16.5%	51	27.1%	0.6	31	16.6%	1.0
10	216	29	13.4%	52	24.3%	0.6	35	16.1%	0.8
11	254	29	11.4%	63	24.7%	0.5	39	15.4%	0.7
12	318	47	14.8%	84	26.4%	0.6	50	15.8%	0.9
13	303	47	15.5%	74	24.3%	0.6	46	15.2%	1.0
14	285	57	20.0%	72	25.4%	0.8	45	15.8%	1.3
15	278	58	20.9%	89	31.9%	0.7	55	19.7%	1.1
16	295	49	16.6%	92	31.1%	0.5	56	18.9%	0.9
17	356	53	14.9%	109	30.7%	0.5	67	18.8%	0.8
18	399	70	17.5%	118	29.7%	0.6	76	18.9%	0.9
19	393	79	20.1%	123	31.4%	0.6	76	19.3%	1.0
20	314	58	18.5%	95	30.3%	0.6	68	21.8%	0.8
21	277	65	23.5%	84	30.3%	0.8	61	22.1%	1.1
22	287	49	17.1%	84	29.2%	0.6	63	21.8%	0.8
23	297	58	19.5%	83	27.8%	0.7	64	21.5%	0.9
24	274	58	21.2%	84	30.8%	0.7	61	22.2%	1.0
25	262	54	20.6%	84	32.0%	0.6	64	24.2%	0.9
26	248	61	24.6%	80	32.1%	0.8	59	23.8%	1.0
27	219	53	24.2%	75	34.1%	0.7	52	23.6%	1.0
28	225	70	31.1%	75	33.4%	0.9	53	23.5%	1.3
29	205	45	22.0%	64	31.1%	0.7	48	23.5%	0.9
30+	3,216	642	20.0%	806	25.1%	0.8	679	21.1%	0.9
Totals:	**9,415**	**1,792**	**19.0%**	**2,624**	**27.9%**	**0.7**	**1,901**	**20.2%**	**0.9**
Under 10	**494**	**61**	**12.35%**	**135**	**27.24%**	**0.5**	**85**	**17.19%**	**0.7**
10-14	**1,376**	**209**	**15.19%**	**345**	**25.08%**	**0.6**	**215**	**15.65%**	**1.0**
15-19	**1,721**	**309**	**17.95%**	**532**	**30.89%**	**0.6**	**329**	**19.12%**	**0.9**
20-24	**1,449**	**288**	**19.88%**	**430**	**29.67%**	**0.7**	**317**	**21.87%**	**0.9**
25-29	**1,159**	**283**	**24.42%**	**377**	**32.53%**	**0.8**	**275**	**23.75%**	**1.0**
30+	**3,216**	**642**	**19.96%**	**806**	**25.06%**	**0.8**	**679**	**21.12%**	**0.9**

[1]100 percent retirement is assumed at age 70 under the current rates and age 80 under the proposed rates.
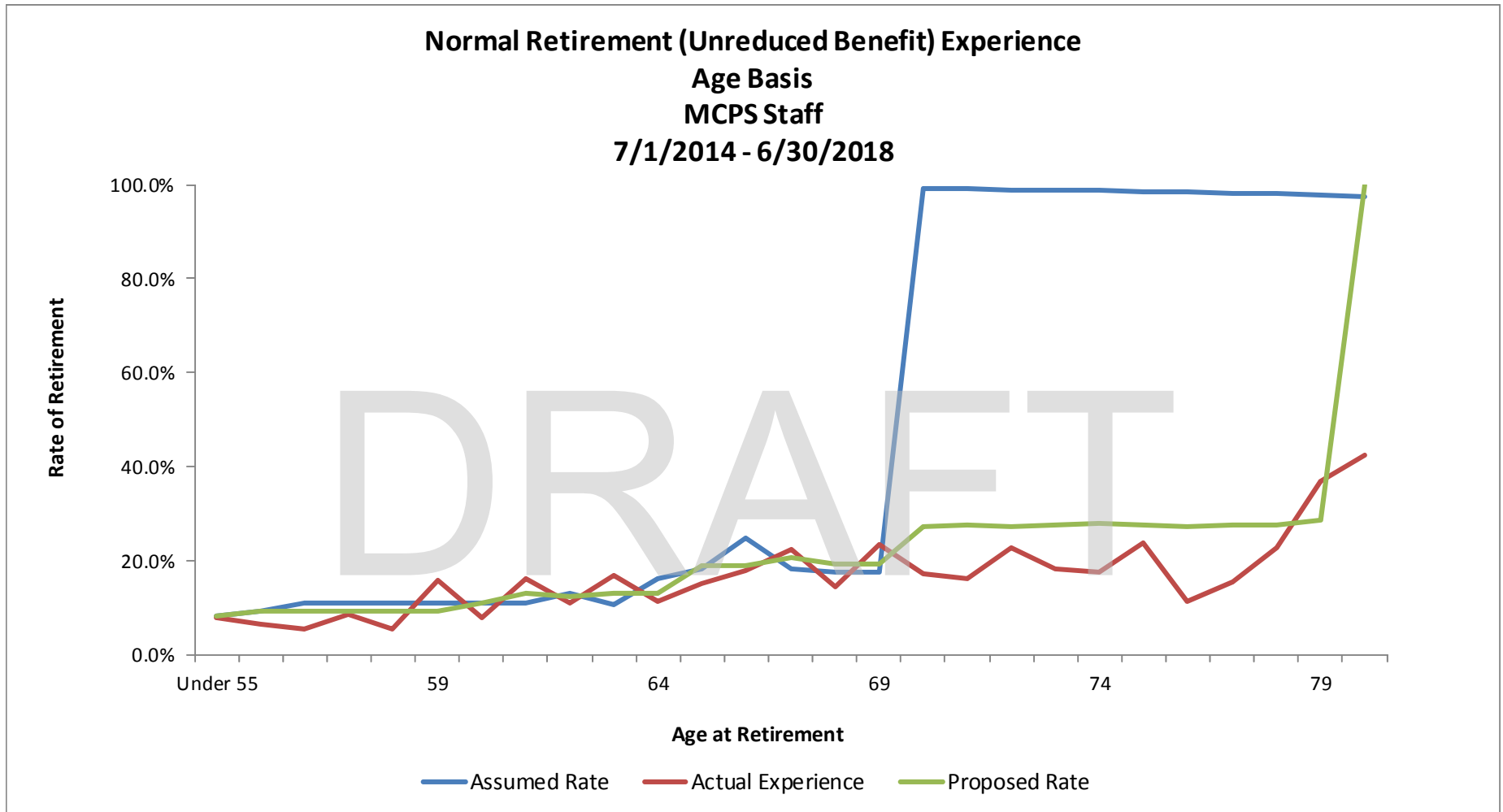
Normal Retirement (Unreduced Benefit) Experience
Service Basis
MCPS Teachers
7/1/2014 - 6/30/2018

Retirement Assumption

Teachers – Age Basis

Age @ Retirement	Actual Experience			Current Assumptions			Proposed Assumptions		
	Exposures	Retirements	Actual Rate	Expected Retirements	Assumed Rate[1]	Actual / Expected	Expected Retirements	Proposed Rate[1]	Actual / Expected
Under 55	331	40	12.1%	24	7.1%	1.7	36	11.0%	1.1
55	154	22	14.3%	6	4.0%	3.6	20	13.0%	1.1
56	165	21	12.7%	24	14.8%	0.9	21	13.0%	1.0
57	199	24	12.1%	29	14.8%	0.8	26	13.0%	0.9
58	213	29	13.6%	31	14.8%	0.9	28	13.0%	1.0
59	229	35	15.3%	34	14.8%	1.0	30	13.0%	1.2
60	223	37	16.6%	33	14.8%	1.1	33	14.9%	1.1
61	217	47	21.7%	32	14.7%	1.5	36	16.8%	1.3
62	1,371	207	15.1%	273	19.9%	0.8	232	16.9%	0.9
63	1,265	271	21.4%	183	14.4%	1.5	216	17.1%	1.3
64	1,041	148	14.2%	175	16.8%	0.8	178	17.1%	0.8
65	931	198	21.3%	268	28.8%	0.7	220	23.6%	0.9
66	735	197	26.8%	183	24.9%	1.1	175	23.9%	1.1
67	533	123	23.1%	112	21.0%	1.1	127	23.9%	1.0
68	430	84	19.5%	94	21.8%	0.9	97	22.7%	0.9
69	329	72	21.9%	84	25.6%	0.9	76	23.1%	0.9
70	256	55	21.5%	254	99.2%	0.2	76	29.5%	0.7
71	214	53	24.8%	212	99.2%	0.2	63	29.5%	0.8
72	143	36	25.2%	142	99.1%	0.3	42	29.4%	0.9
73	112	18	16.1%	111	99.0%	0.2	33	29.3%	0.5
74	90	21	23.3%	89	99.0%	0.2	27	29.6%	0.8
75	58	14	24.1%	57	98.9%	0.2	17	29.8%	0.8
76	46	13	28.3%	45	98.7%	0.3	14	29.6%	1.0
77	29	6	20.7%	29	98.6%	0.2	9	30.2%	0.7
78	20	3	15.0%	20	98.5%	0.2	6	30.5%	0.5
79	27	8	29.6%	27	98.2%	0.3	8	30.2%	1.0
80+	54	10	18.5%	53	97.5%	0.2	54	100.0%	0.2
Totals:	**9,415**	**1,792**	**19.0%**	**2,624**	**27.9%**	**0.7**	**1,901**	**20.2%**	**0.9**
Under 60	**1,291**	**171**	**13.25%**	**149**	**11.54%**	**1.1**	**161**	**12.49%**	**1.1**
60-64	**4,117**	**710**	**17.25%**	**696**	**16.91%**	**1.0**	**696**	**16.91%**	**1.0**
65-69	**2,958**	**674**	**22.79%**	**741**	**25.04%**	**0.9**	**696**	**23.51%**	**1.0**
70-74	**815**	**183**	**22.45%**	**808**	**99.14%**	**0.2**	**240**	**29.46%**	**0.8**
75-79	**180**	**44**	**24.44%**	**178**	**98.64%**	**0.2**	**54**	**29.94%**	**0.8**
80+	**54**	**10**	**18.52%**	**53**	**97.49%**	**0.2**	**54**	**100.00%**	**0.2**

[1] 100 percent retirement is assumed at age 70 under the current rates and age 80 under the proposed rates.

Normal Retirement (Unreduced Benefit) Experience
Age Basis
MCPS Teachers
7/1/2014 - 6/30/2018

Retirement Assumption

Staff – Service Basis

Service @ Retirement	Actual Experience			Current Assumptions			Proposed Assumptions		
	Exposures	Retirements	Actual Rate	Expected Retirements	Assumed Rate[1]	Actual / Expected	Expected Retirements	Proposed Rate[1]	Actual / Expected
Under 5	4	0	0.0%	0	2.0%	0.0	0	4.0%	0.0
5	32	2	6.3%	9	28.0%	0.2	4	12.5%	0.5
6	47	6	12.8%	12	26.0%	0.5	5	11.5%	1.1
7	65	8	12.3%	18	27.1%	0.5	8	11.8%	1.0
8	106	6	5.7%	25	23.2%	0.2	13	12.6%	0.4
9	140	15	10.7%	30	21.7%	0.5	16	11.8%	0.9
10	149	21	14.1%	33	22.0%	0.6	22	14.6%	1.0
11	192	17	8.9%	51	26.7%	0.3	29	15.0%	0.6
12	191	29	15.2%	54	28.3%	0.5	30	15.8%	1.0
13	161	21	13.0%	51	31.8%	0.4	26	16.4%	0.8
14	196	27	13.8%	55	27.9%	0.5	30	15.5%	0.9
15	187	29	15.5%	70	37.7%	0.4	34	17.9%	0.9
16	185	32	17.3%	66	35.6%	0.5	33	18.1%	1.0
17	195	32	16.4%	66	33.9%	0.5	34	17.6%	0.9
18	184	26	14.1%	61	33.3%	0.4	30	16.5%	0.9
19	162	28	17.3%	53	32.6%	0.5	27	16.9%	1.0
20	127	24	18.9%	52	40.8%	0.5	26	20.1%	0.9
21	86	15	17.4%	38	44.6%	0.4	19	22.4%	0.8
22	65	15	23.1%	28	43.7%	0.5	14	21.8%	1.1
23	65	11	16.9%	23	35.7%	0.5	12	18.6%	0.9
24	62	6	9.7%	20	32.7%	0.3	11	17.7%	0.5
25	63	9	14.3%	18	28.1%	0.5	14	22.4%	0.6
26	63	17	27.0%	16	25.5%	1.1	13	21.0%	1.3
27	71	13	18.3%	19	27.2%	0.7	15	21.0%	0.9
28	80	6	7.5%	22	27.0%	0.3	17	21.1%	0.4
29	81	20	24.7%	24	30.1%	0.8	18	22.3%	1.1
30+	1,405	217	15.4%	303	21.6%	0.7	241	17.2%	0.9
Totals:	**4,364**	**652**	**14.9%**	**1,218**	**27.9%**	**0.5**	**744**	**17.0%**	**0.9**
Under 10	**394**	**37**	**9.39%**	**94**	**23.81%**	**0.4**	**47**	**11.93%**	**0.8**
10-14	**889**	**115**	**12.94%**	**244**	**27.45%**	**0.5**	**138**	**15.48%**	**0.8**
15-19	**913**	**147**	**16.10%**	**316**	**34.67%**	**0.5**	**159**	**17.39%**	**0.9**
20-24	**405**	**71**	**17.53%**	**162**	**40.01%**	**0.4**	**82**	**20.27%**	**0.9**
25-29	**358**	**65**	**18.16%**	**99**	**27.69%**	**0.7**	**77**	**21.56%**	**0.8**
30+	**1,405**	**217**	**15.44%**	**303**	**21.56%**	**0.7**	**241**	**17.16%**	**0.9**

[1]*100 percent retirement is assumed at age 70 under the current rates and age 80 under the proposed rates.*

Normal Retirement (Unreduced Benefit) Experience
Service Basis
MCPS Staff
7/1/2014 - 6/30/2018

Retirement Assumption

Staff – Age Basis

Age @ Retirement	Actual Experience			Current Assumptions			Proposed Assumptions		
	Exposures	Retirements	Actual Rate	Expected Retirements	Assumed Rate[1]	Actual / Expected	Expected Retirements	Proposed Rate[1]	Actual / Expected
Under 55	202	16	7.9%	16	8.0%	1.0	16	8.0%	1.0
55	61	4	6.6%	6	9.2%	0.7	5	9.0%	0.7
56	75	4	5.3%	8	11.0%	0.5	7	9.0%	0.6
57	82	7	8.5%	9	11.0%	0.8	7	9.0%	0.9
58	109	6	5.5%	12	11.0%	0.5	10	9.0%	0.6
59	109	17	15.6%	12	11.0%	1.4	10	9.0%	1.7
60	103	8	7.8%	11	11.0%	0.7	11	11.0%	0.7
61	105	17	16.2%	12	11.0%	1.5	14	13.0%	1.2
62	568	61	10.7%	74	13.0%	0.8	69	12.1%	0.9
63	510	86	16.9%	54	10.6%	1.6	66	13.0%	1.3
64	424	47	11.1%	68	16.0%	0.7	56	13.1%	0.8
65	372	56	15.1%	68	18.2%	0.8	70	18.8%	0.8
66	331	59	17.8%	82	24.8%	0.7	63	19.0%	0.9
67	256	57	22.3%	46	18.0%	1.2	53	20.5%	1.1
68	194	28	14.4%	34	17.5%	0.8	37	19.1%	0.8
69	179	42	23.5%	32	17.6%	1.3	34	19.1%	1.2
70	141	24	17.0%	140	99.0%	0.2	38	27.0%	0.6
71	106	17	16.0%	105	99.0%	0.2	29	27.4%	0.6
72	84	19	22.6%	83	98.9%	0.2	23	27.2%	0.8
73	61	11	18.0%	60	98.8%	0.2	17	27.5%	0.7
74	63	11	17.5%	62	98.7%	0.2	17	27.7%	0.6
75	55	13	23.6%	54	98.5%	0.2	15	27.6%	0.9
76	45	5	11.1%	44	98.3%	0.1	12	27.2%	0.4
77	39	6	15.4%	38	98.2%	0.2	11	27.4%	0.6
78	31	7	22.6%	30	98.0%	0.2	9	27.4%	0.8
79	19	7	36.8%	19	97.9%	0.4	5	28.4%	1.3
80+	40	17	42.5%	39	97.4%	0.4	40	100.0%	0.4
Totals:	**4,364**	**652**	**14.9%**	**1,218**	**27.9%**	**0.5**	**744**	**17.0%**	**0.9**
Under 60	**638**	**54**	**8.46%**	**63**	**9.89%**	**0.9**	**55**	**8.68%**	**1.0**
60-64	**1,710**	**219**	**12.81%**	**219**	**12.81%**	**1.0**	**215**	**12.60%**	**1.0**
65-69	**1,332**	**242**	**18.17%**	**262**	**19.64%**	**0.9**	**257**	**19.28%**	**0.9**
70-74	**455**	**82**	**18.02%**	**450**	**98.92%**	**0.2**	**124**	**27.30%**	**0.7**
75-79	**189**	**38**	**20.11%**	**186**	**98.26%**	**0.2**	**52**	**27.54%**	**0.7**
80+	**40**	**17**	**42.50%**	**39**	**97.43%**	**0.4**	**40**	**100.00%**	**0.4**

[1]100 percent retirement is assumed at age 70 under the current rates and age 80 under the proposed rates.

GRS Retirement Consulting

Normal Retirement (Unreduced Benefit) Experience
Age Basis
MCPS Staff
7/1/2014 - 6/30/2018

Current Retirement Rates Staff:

Staff Hired Before July 1, 2011
Years of Eligibility Service

Age	2	3	4	5-14	15	16-29	30	31+
Under 55							10%	7%
55					4%	4%	10%	9%
56					4%	3%	11%	11%
57					4%	3%	11%	11%
58					4%	3%	11%	11%
59					4%	3%	11%	11%
60					4%	3%	11%	11%
61					4%	3%	11%	11%
62				10%	14%	14%	17%	17%
63			4%	6%	12%	12%	17%	17%
64		4%	2%	8%	21%	21%	21%	21%
65	4%	2%	2%	15%	20%	20%	21%	21%
66	4%	2%	2%	16%	30%	30%	30%	30%
67	4%	2%	2%	13%	18%	18%	30%	30%
68	4%	2%	2%	12%	18%	18%	30%	30%
69	4%	2%	2%	13%	18%	18%	30%	30%
70+	100%	100%	100%	100%	100%	100%	100%	100%

Staff Hired On or After July 1, 2011
Years of Eligibility Service

Age	10	11-14	15	16-29	30	31+
Under 55						10%
55						10%
56						10%
57						10%
58						10%
59						10%
60			13%	4%	13%	11%
61			4%	3%	11%	11%
62			14%	18%	17%	17%
63			12%	12%	17%	17%
64			21%	21%	21%	21%
65	34%	15%	20%	20%	21%	21%
66	36%	16%	30%	30%	30%	30%
67	29%	13%	18%	18%	30%	30%
68	27%	12%	18%	18%	30%	30%
69	29%	13%	18%	18%	30%	30%
70+	100%	100%	100%	100%	100%	100%

Retirement Eligibility Conditions under the Pension System are as follows:
Normal Retirement
 Hired before July 1, 2011 - 30 years of eligibility service or attainment of one of the following:
 Age 62 with 5 years of eligibility service.
 Age 63 with 4 years of eligibility service.
 Age 64 with 3 years of eligibility service.
 Age 65 and older with 2 years of eligibility service.
 Hired on or after July 1, 2011: Combined age and eligibility service of at least 90 years or age 65 after 10 years of eligibility service.
Early (Reduced) Retirement
Hired before July 1, 2011: Attainment of age 55 with at least 15 years of eligibility service.
Hired on or after July 1, 2011: Attainment of age 60 with at least 15 years of eligibility service.

Retirement Assumption

Proposed Retirement Rates Staff:

Staff Hired Before July 1, 2011 — Years of Eligibility Service

Age	2	3	4	5-9	10-14	15-19	20-24	25-29	30+
Under 55									8%
55						4%	4%	4%	9%
56						6%	7%	7%	9%
57						6%	7%	7%	9%
58						6%	7%	7%	9%
59						6%	7%	7%	9%
60						6%	7%	7%	11%
61						6%	7%	7%	13%
62				6%	10%	10%	10%	20%	20%
63		4%		6%	10%	10%	10%	20%	25%
64		4%	4%	6%	10%	10%	10%	20%	25%
65	4%	4%	4%	15%	15%	20%	20%	20%	25%
66	4%	4%	4%	15%	15%	20%	20%	20%	25%
67	4%	4%	4%	15%	15%	20%	20%	20%	35%
68	4%	4%	4%	12%	15%	20%	20%	20%	30%
69	4%	4%	4%	12%	15%	20%	20%	20%	30%
70-79	4%	4%	4%	20%	25%	25%	30%	30%	35%
80+	100%	100%	100%	100%	100%	100%	100%	100%	100%

Staff Hired On or After July 1, 2011 — Years of Eligibility Service

Age	10	11-14	15	16-19	20-24	25-29	30+
Under 55							8%
55							9%
56							9%
57							9%
58							9%
59							9%
60			6%	6%	7%	7%	11%
61			6%	6%	7%	7%	13%
62			10%	6%	7%	10%	20%
63			15%	6%	7%	15%	25%
64			20%	6%	7%	20%	25%
65	25%	15%	35%	20%	20%	20%	25%
66	35%	15%	20%	20%	20%	20%	25%
67	40%	15%	20%	20%	20%	20%	35%
68	45%	15%	20%	20%	20%	20%	30%
69	50%	15%	20%	20%	20%	20%	30%
70-79	50%	25%	25%	25%	30%	30%	35%
80+	100%	100%	100%	100%	100%	100%	100%

Retirement Eligibility Conditions under the Pension System are as follows:
Normal Retirement
 Hired before July 1, 2011 - 30 years of eligibility service or attainment of one of the following:
 Age 62 with 5 years of eligibility service.
 Age 63 with 4 years of eligibility service.
 Age 64 with 3 years of eligibility service.
 Age 65 and older with 2 years of eligibility service.
 Hired on or after July 1, 2011: Combined age and eligibility service of at least 90 years or age 65 after 10 years of eligibility service.
Early (Reduced) Retirement
Hired before July 1, 2011: Attainment of age 55 with at least 15 years of eligibility service.
Hired on or after July 1, 2011: Attainment of age 60 with at least 15 years of eligibility service.

GRS Retirement Consulting

Retirement Assumption

Current Retirement Rates Teachers:

<table>
<tr><th colspan="9">Teachers Hired Before July 1, 2011
Years of Eligibility Service</th><th colspan="7">Teachers Hired On or After July 1, 2011
Years of Eligibility Service</th></tr>
<tr><th>Age</th><th>2</th><th>3</th><th>4</th><th>5-14</th><th>15</th><th>16-29</th><th>30</th><th>31+</th><th>Age</th><th>10</th><th>11-14</th><th>15</th><th>16-29</th><th>30</th><th>31+</th></tr>
<tr><td>Under 55</td><td></td><td></td><td></td><td></td><td></td><td></td><td>4%</td><td>10%</td><td>Under 55</td><td></td><td></td><td></td><td></td><td></td><td>10%</td></tr>
<tr><td>55</td><td></td><td></td><td></td><td></td><td>4%</td><td>4%</td><td>4%</td><td>4%</td><td>55</td><td></td><td></td><td></td><td></td><td></td><td>10%</td></tr>
<tr><td>56</td><td></td><td></td><td></td><td></td><td>4%</td><td>7%</td><td>14%</td><td>15%</td><td>56</td><td></td><td></td><td></td><td></td><td></td><td>10%</td></tr>
<tr><td>57</td><td></td><td></td><td></td><td></td><td>4%</td><td>7%</td><td>14%</td><td>15%</td><td>57</td><td></td><td></td><td></td><td></td><td></td><td>10%</td></tr>
<tr><td>58</td><td></td><td></td><td></td><td></td><td>4%</td><td>7%</td><td>14%</td><td>15%</td><td>58</td><td></td><td></td><td></td><td></td><td></td><td>10%</td></tr>
<tr><td>59</td><td></td><td></td><td></td><td></td><td>4%</td><td>7%</td><td>14%</td><td>15%</td><td>59</td><td></td><td></td><td></td><td></td><td></td><td>10%</td></tr>
<tr><td>60</td><td></td><td></td><td></td><td></td><td>4%</td><td>7%</td><td>14%</td><td>15%</td><td>60</td><td></td><td></td><td>13%</td><td>8%</td><td>16%</td><td>15%</td></tr>
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<tr><td>62</td><td></td><td></td><td></td><td>10%</td><td>25%</td><td>25%</td><td>17%</td><td>17%</td><td>62</td><td></td><td></td><td>25%</td><td>25%</td><td>17%</td><td>17%</td></tr>
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<tr><td>70+</td><td>100%</td><td>100%</td><td>100%</td><td>100%</td><td>100%</td><td>100%</td><td>100%</td><td>100%</td><td>70+</td><td>100%</td><td>100%</td><td>100%</td><td>100%</td><td>100%</td><td>100%</td></tr>
</table>

Retirement Eligibility Conditions under the Pension System are as follows:
Normal Retirement
 Hired before July 1, 2011 - 30 years of eligibility service or attainment of one of the following:
 Age 62 with 5 years of eligibility service.
 Age 63 with 4 years of eligibility service.
 Age 64 with 3 years of eligibility service.
 Age 65 and older with 2 years of eligibility service.
 Hired on or after July 1, 2011: Combined age and eligibility service of at least 90 years or age 65 after 10 years of eligibility service.
Early (Reduced) Retirement
 Hired before July 1, 2011: Attainment of age 55 with at least 15 years of eligibility service.
 Hired on or after July 1, 2011: Attainment of age 60 with at least 15 years of eligibility service.

Retirement Assumption

Proposed Retirement Rates Teachers:

	Teachers Hired Before July 1, 2011 — Years of Eligibility Service										Teachers Hired On or After July 1, 2011 — Years of Eligibility Service						
Age	2	3	4	5-9	10-14	15-19	20-24	25-29	30+	Age	10	11-14	15	16-19	20-24	25-29	30+
Under 55									11%	Under 55							11%
55						4%	4%	4%	13%	55							13%
56						6%	7%	7%	13%	56							13%
57						6%	7%	7%	13%	57							13%
58						6%	7%	7%	13%	58							13%
59						6%	7%	7%	13%	59							13%
60						6%	7%	7%	15%	60			6%	6%	7%	7%	15%
61						6%	7%	7%	17%	61			6%	6%	7%	7%	17%
62				10%	10%	17%	17%	21%	25%	62			17%	6%	7%	10%	25%
63			4%	10%	10%	17%	17%	21%	25%	63			22%	6%	7%	15%	25%
64		4%	4%	10%	10%	17%	17%	21%	25%	64			27%	6%	7%	25%	25%
65	4%	4%	4%	20%	20%	20%	25%	25%	30%	65	35%	20%	35%	25%	25%	30%	30%
66	4%	4%	4%	20%	20%	20%	25%	25%	30%	66	45%	20%	20%	25%	25%	30%	30%
67	4%	4%	4%	20%	20%	20%	25%	25%	30%	67	55%	20%	20%	25%	25%	30%	30%
68	4%	4%	4%	15%	15%	20%	25%	25%	30%	68	55%	15%	20%	25%	25%	30%	30%
69	4%	4%	4%	15%	15%	20%	25%	25%	30%	69	60%	15%	20%	25%	25%	30%	30%
70-79	4%	4%	4%	25%	25%	25%	30%	30%	35%	70-79	60%	25%	25%	30%	30%	35%	35%
80+	100%	100%	100%	100%	100%	100%	100%	100%	100%	80+	100%	100%	100%	100%	100%	100%	100%

Retirement Eligibility Conditions under the Pension System are as follows:
Normal Retirement
 Hired before July 1, 2011 - 30 years of eligibility service or attainment of one of the following:
 Age 62 with 5 years of eligibility service.
 Age 63 with 4 years of eligibility service.
 Age 64 with 3 years of eligibility service.
 Age 65 and older with 2 years of eligibility service.
 Hired on or after July 1, 2011: Combined age and eligibility service of at least 90 years or age 65 after 10 years of eligibility service.
Early (Reduced) Retirement
Hired before July 1, 2011: Attainment of age 55 with at least 15 years of eligibility service.
Hired on or after July 1, 2011: Attainment of age 60 with at least 15 years of eligibility service.

GRS Retirement Consulting

Turnover

Turnover experience during the last four years was considered in the analysis shown on the following pages. The "Exposure" column shows the number of employees at various years of service throughout the experience period. "Net Turnover" shows the number of employees who terminated who were not retirement eligible. Retirement-eligible members were included in the retirement experience.

The current rates are both age and service based. The proposed rates are service based for Teachers and service and age based for Staff. The following graphs and tables illustrate the experience, current and proposed assumptions separately on a service and age basis.

DRAFT

Turnover Assumption

Teachers – Service Basis

Service	Actual Experience				Current Assumptions			Proposed Assumptions		
BOY	Exposures	Turnover	Net Turnover	Actual Rate	Expected Turnover	Assumed Rate	Actual / Expected	Expected Turnover	Proposed Rate	Actual / Expected
0	81	11	11	13.58%	6	7.30%	1.9	9	11.00%	1.2
1	4,375	447	447	10.22%	319	7.30%	1.4	394	9.00%	1.1
2	3,966	322	322	8.12%	282	7.10%	1.1	297	7.50%	1.1
3	3,860	274	274	7.10%	259	6.70%	1.1	261	6.75%	1.1
4	3,232	197	193	5.97%	200	6.20%	1.0	194	6.00%	1.0
5	2,836	179	173	6.10%	133	4.69%	1.3	156	5.50%	1.1
6	2,497	133	126	5.05%	115	4.59%	1.1	125	5.00%	1.0
7	2,429	113	104	4.28%	109	4.47%	1.0	103	4.25%	1.0
8	2,818	131	110	3.90%	123	4.37%	0.9	113	4.00%	1.0
9	3,087	113	95	3.08%	133	4.31%	0.7	108	3.50%	0.9
10	3,165	127	111	3.51%	91	2.88%	1.2	95	3.00%	1.2
11	2,974	98	74	2.49%	85	2.87%	0.9	82	2.75%	0.9
12	2,626	89	66	2.51%	74	2.83%	0.9	66	2.50%	1.0
13	2,463	70	45	1.83%	70	2.83%	0.6	55	2.25%	0.8
14	1,961	62	37	1.89%	50	2.57%	0.7	39	2.00%	0.9
15	1,933	65	38	1.97%	28	1.45%	1.4	34	1.75%	1.1
16	1,877	55	29	1.55%	27	1.44%	1.1	28	1.50%	1.0
17	1,592	49	12	0.75%	23	1.42%	0.5	20	1.25%	0.6
18	1,297	34	16	1.23%	18	1.41%	0.9	13	1.00%	1.2
19	978	24	7	0.72%	14	1.39%	0.5	7	0.75%	1.0
20+	4,234	156	28	0.66%	62	1.47%	0.5	32	0.75%	0.9
Totals:	54,281	2,749	2,318	4.27%	2,223	4.10%	1.0	2,230	4.11%	1.0
0-4	15,514	1,251	1,247	8.04%	1,068	6.88%	1.2	1,155	7.44%	1.1
5-9	13,667	669	608	4.45%	613	4.48%	1.0	605	4.43%	1.0
10-14	13,189	446	333	2.52%	371	2.81%	0.9	337	2.56%	1.0
15-19	7,677	227	102	1.33%	110	1.43%	0.9	102	1.33%	1.0
20+	4,234	156	28	0.66%	62	1.47%	0.5	32	0.75%	0.9

The assumed rates are overall blended rates based on the age and service of the individual members.

GRS Retirement Consulting

Turnover Experience - Service Basis
MCPS Teachers
7/1/2014 - 6/30/2018
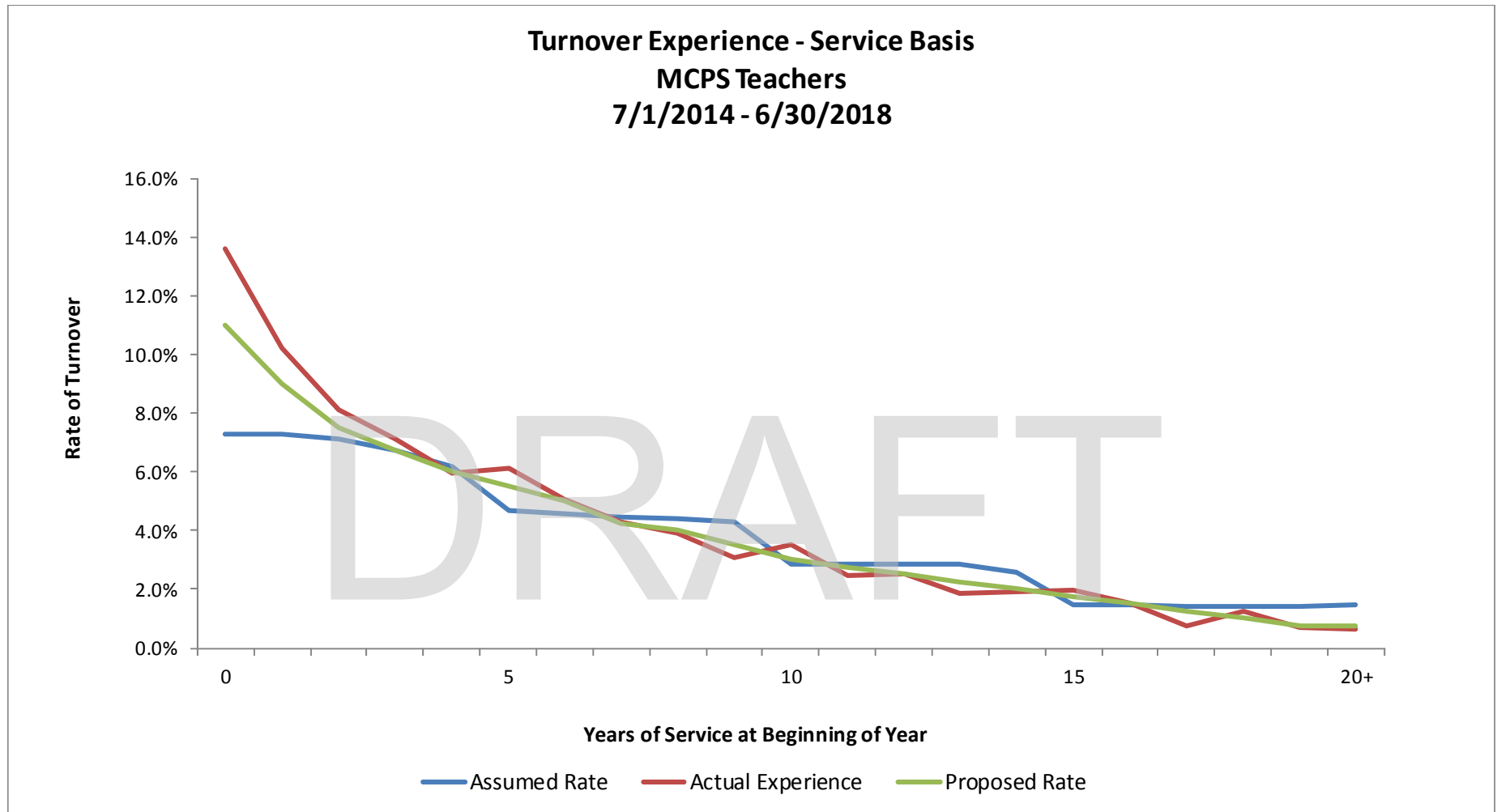
Turnover Assumption

Teachers – Age Basis

Age	Actual Experience				Current Assumptions			Proposed Assumptions		
	Exposures	Turnover	Net Turnover	Actual Rate	Expected Turnover	Assumed Rate	Actual / Expected	Expected Turnover	Proposed Rate	Actual / Expected
20-24	444	46	46	10.36%	32	7.25%	1.4	39	8.82%	1.2
25-29	6,089	489	489	8.03%	410	6.74%	1.2	435	7.15%	1.1
30-34	8,183	499	499	6.10%	456	5.57%	1.1	427	5.22%	1.2
35-39	8,666	366	366	4.22%	344	3.97%	1.1	337	3.89%	1.1
40-44	8,479	271	271	3.20%	257	3.03%	1.1	266	3.14%	1.0
45-49	9,159	212	212	2.31%	249	2.72%	0.9	264	2.88%	0.8
50-54	8,218	196	192	2.34%	246	3.00%	0.8	236	2.87%	0.8
55-59	3,454	215	143	4.14%	152	4.40%	0.9	146	4.21%	1.0
60+	1,589	455	100	6.29%	76	4.80%	1.3	79	4.98%	1.3
Totals:	**54,281**	**2,749**	**2,318**	**4.27%**	**2,223**	**4.10%**	**1.0**	**2,230**	**4.11%**	**1.0**

The assumed and proposed rates are overall blended rates based on the age and service of the individual members.

GRS Retirement Consulting

Turnover Experience - Age Basis
MCPS Teachers
7/1/2014 - 6/30/2018
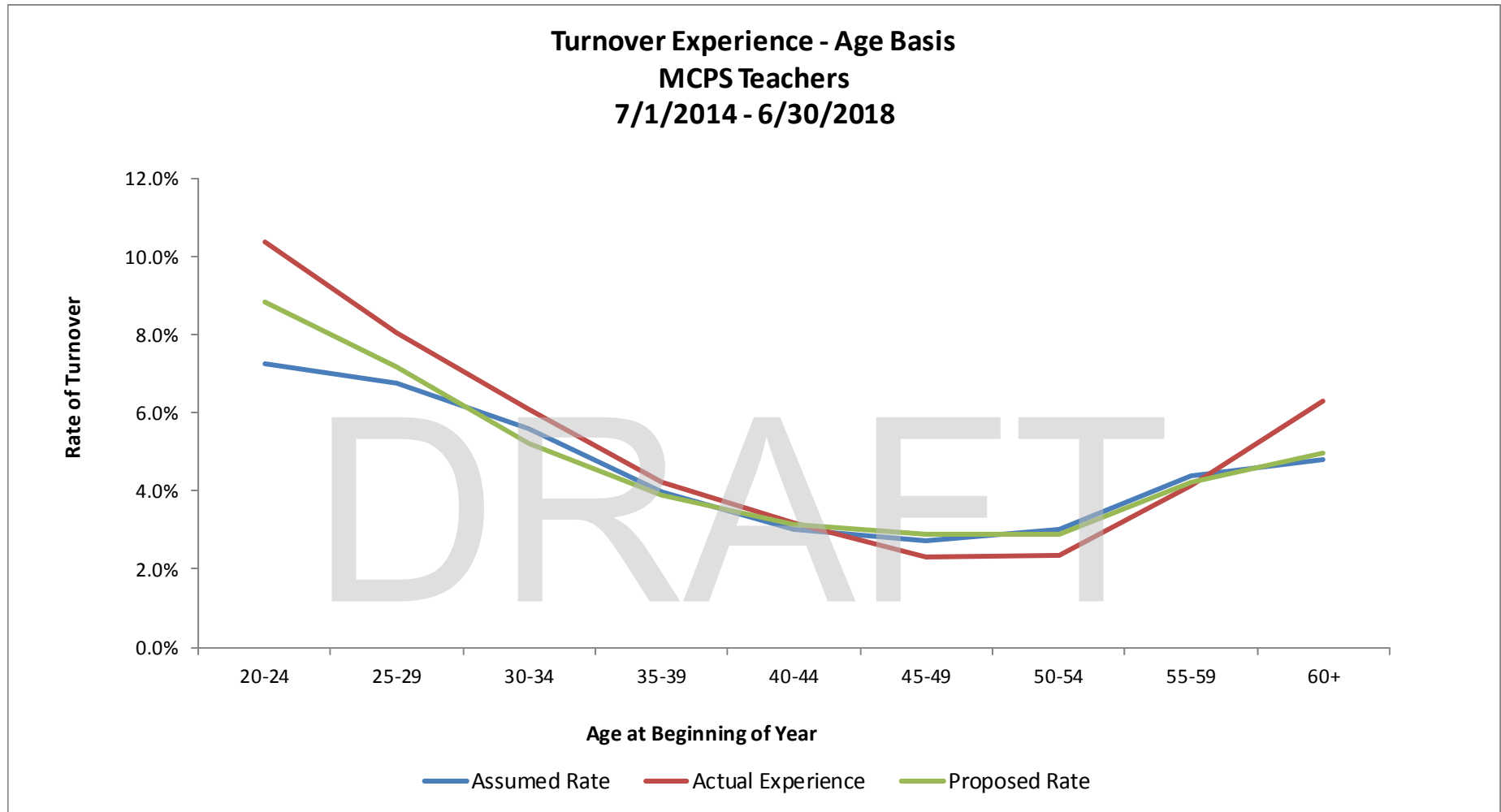
Turnover Assumption

Staff – Service Basis

Service BOY	Actual Experience				Current Assumptions			Proposed Assumptions			
	Exposures	Turnover	Net Turnover	Actual Rate	Expected Turnover	Assumed Rate	Actual / Expected	Expected Turnover	Proposed Rate[1]	Proposed Rate[2]	Actual / Expected
0	139	19	19	13.67%	14	10.40%	1.3	16	11.00%	11.53%	1.2
1	1,251	144	144	11.51%	119	9.50%	1.2	128	9.50%	10.24%	1.1
2	1,022	85	85	8.32%	90	8.80%	0.9	88	8.00%	8.61%	1.0
3	1,011	71	71	7.02%	81	8.00%	0.9	76	7.00%	7.50%	0.9
4	869	43	42	4.83%	63	7.30%	0.7	51	5.50%	5.92%	0.8
5	739	31	29	3.92%	26	3.55%	1.1	28	3.50%	3.81%	1.0
6	593	22	19	3.20%	20	3.40%	0.9	21	3.25%	3.50%	0.9
7	578	25	23	3.98%	20	3.39%	1.2	19	3.00%	3.28%	1.2
8	715	27	24	3.36%	24	3.38%	1.0	22	2.75%	3.02%	1.1
9	785	21	20	2.55%	26	3.31%	0.8	21	2.50%	2.73%	0.9
10	832	16	14	1.68%	20	2.46%	0.7	20	2.25%	2.38%	0.7
11	815	17	13	1.60%	20	2.48%	0.6	17	2.00%	2.12%	0.8
12	715	17	12	1.68%	18	2.51%	0.7	13	1.75%	1.84%	0.9
13	666	9	7	1.05%	16	2.47%	0.4	10	1.50%	1.56%	0.7
14	440	18	11	2.50%	10	2.32%	1.1	7	1.50%	1.54%	1.6
15	362	13	7	1.93%	5	1.40%	1.4	5	1.50%	1.50%	1.3
16	313	10	4	1.28%	4	1.40%	0.9	5	1.50%	1.50%	0.9
17	266	11	4	1.50%	4	1.40%	1.1	4	1.50%	1.50%	1.0
18	210	9	3	1.43%	3	1.40%	1.0	3	1.50%	1.50%	1.0
19	187	4	0	0.00%	3	1.40%	0.0	3	1.50%	1.50%	0.0
20+	975	44	9	0.92%	14	1.43%	0.6	15	1.50%	1.50%	0.6
Totals:	**13,483**	**656**	**560**	**4.15%**	**603**	**4.47%**	**0.9**	**573**		**4.25%**	**1.0**
0-4	**4,292**	**362**	**361**	**8.41%**	**369**	**8.59%**	**1.0**	**359**		**8.38%**	**1.0**
5-9	**3,410**	**126**	**115**	**3.37%**	**116**	**3.41%**	**1.0**	**111**		**3.25%**	**1.0**
10-14	**3,468**	**77**	**57**	**1.64%**	**85**	**2.46%**	**0.7**	**67**		**1.95%**	**0.8**
15-19	**1,338**	**47**	**18**	**1.35%**	**19**	**1.40%**	**1.0**	**20**		**1.50%**	**0.9**
20+	**975**	**44**	**9**	**0.92%**	**14**	**1.43%**	**0.6**	**15**		**1.50%**	**0.6**

The assumed and proposed rates are overall blended rates based on the age and service of the individual members.

[1] The service-based component of the proposed rate.

[2] The overall blended rate based on the age and service of the individual members.

GRS Retirement Consulting

Turnover Experience - Service Basis
MCPS Staff
7/1/2014 - 6/30/2018

Turnover Assumption

Staff – Age Basis

Age	Actual Experience				Current Assumptions			Proposed Assumptions		
	Exposures	Turnover	Net Turnover	Actual Rate	Expected Turnover	Assumed Rate	Actual / Expected	Expected Turnover	Proposed Rate	Actual / Expected
20-24	134	20	20	14.93%	12	8.89%	1.7	15	11.40%	1.3
25-29	595	66	66	11.09%	49	8.19%	1.4	58	9.80%	1.1
30-34	1,041	71	71	6.82%	69	6.64%	1.0	69	6.65%	1.0
35-39	1,367	65	65	4.75%	71	5.20%	0.9	61	4.44%	1.1
40-44	1,793	76	76	4.24%	75	4.16%	1.0	69	3.84%	1.1
45-49	2,840	82	82	2.89%	96	3.39%	0.9	92	3.24%	0.9
50-54	3,273	88	88	2.69%	112	3.41%	0.8	103	3.15%	0.9
55-59	1,758	78	55	3.13%	81	4.61%	0.7	69	3.94%	0.8
60+	682	110	37	5.43%	39	5.69%	1.0	36	5.22%	1.0
Totals:	**13,483**	**656**	**560**	**4.15%**	**603**	**4.47%**	**0.9**	**572**	**4.25%**	**1.0**

The assumed and proposed rates are overall blended rates based on the age and service of the individual members.

Turnover Assumption

Turnover Experience - Age Basis
MCPS Staff
7/1/2014 - 6/30/2018
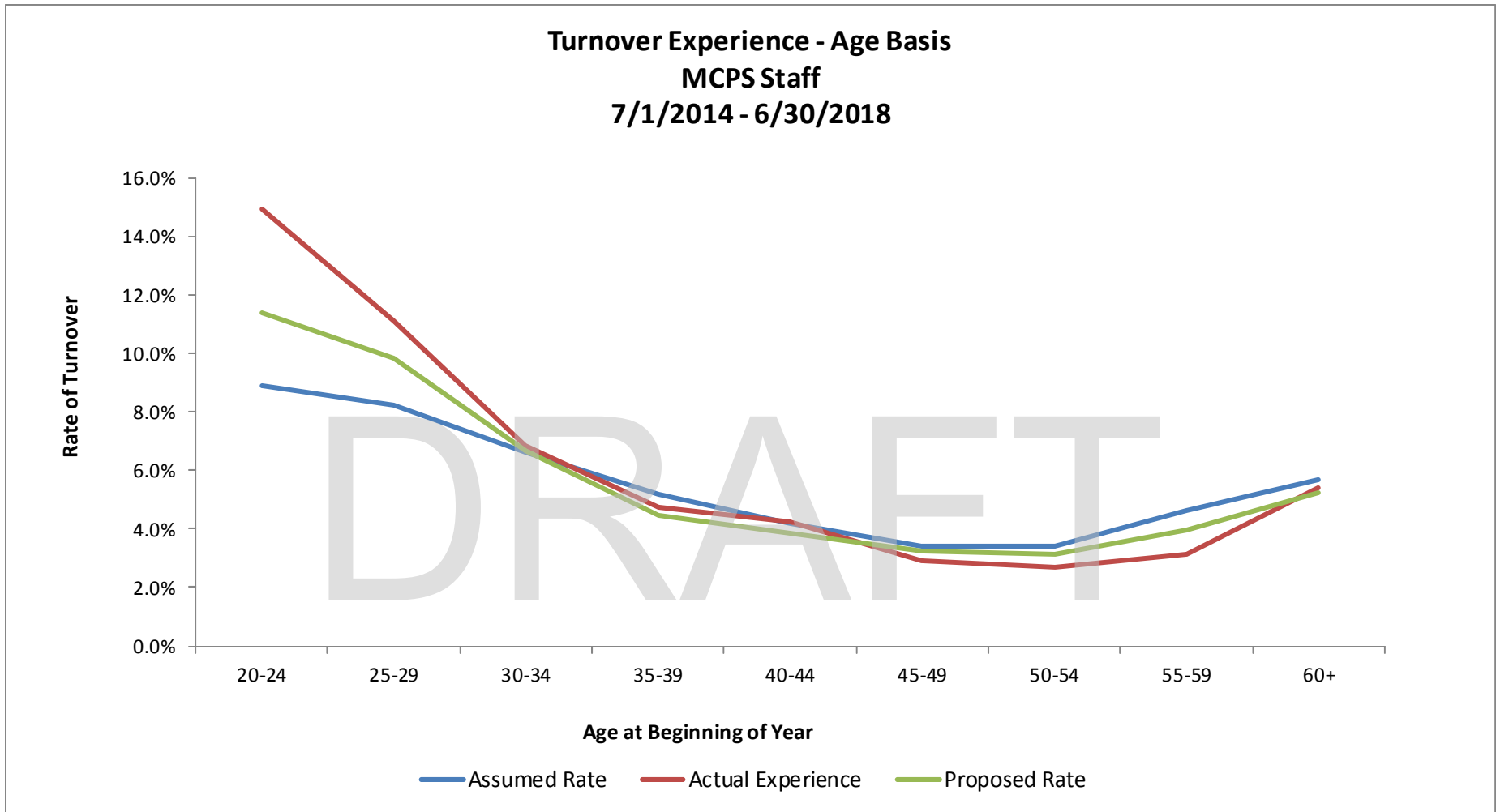
Turnover Assumption

Staff Turnover Rates

Current Rates
Years of Service

Age	0	1	2	3	4	5-9	10-14	15-19	20+
Under 30	10.40%	9.50%	8.80%	8.00%	7.30%	6.59%	0.00%	0.00%	0.00%
30-34	10.40%	9.50%	8.80%	8.00%	7.30%	6.06%	2.90%	0.00%	0.00%
35-39	10.40%	9.50%	8.80%	8.00%	7.30%	4.07%	2.46%	1.61%	0.00%
40-44	10.40%	9.50%	8.80%	8.00%	7.30%	2.79%	2.40%	1.29%	1.31%
45-49	10.40%	9.50%	8.80%	8.00%	7.30%	2.46%	2.29%	1.34%	1.17%
50-54	10.40%	9.50%	8.80%	8.00%	7.30%	2.50%	2.13%	1.46%	1.66%
55-59	10.40%	9.50%	8.80%	8.00%	7.30%	3.35%	2.33%	2.30%	1.74%
60-64	10.40%	9.50%	8.80%	8.00%	7.30%	3.65%	5.91%	7.89%	7.69%

Proposed Rates
Age

Service	Under 30	30-34	35+
0	15.50%	12.50%	11.00%
1	14.00%	11.00%	9.50%
2	12.50%	9.50%	8.00%
3	11.50%	8.50%	7.00%
4	10.00%	7.00%	5.50%
5	8.00%	5.00%	3.50%
6	7.75%	4.75%	3.25%
7	7.50%	4.50%	3.00%
8	7.25%	4.25%	2.75%
9	7.00%	4.00%	2.50%
10	6.75%	3.75%	2.25%
11	6.50%	3.50%	2.00%
12	6.25%	3.25%	1.75%
13+	6.00%	3.00%	1.50%

DRAFT

Teacher Turnover Rates

Current Rates
Years of Service

Age	0	1	2	3	4	5-9	10-14	15-19	20+
Under 30	7.30%	7.30%	7.10%	6.70%	6.20%	5.68%	0.00%	0.00%	0.00%
30-34	7.30%	7.30%	7.10%	6.70%	6.20%	5.30%	2.83%	0.00%	0.00%
35-39	7.30%	7.30%	7.10%	6.70%	6.20%	4.61%	2.63%	1.55%	0.00%
40-44	7.30%	7.30%	7.10%	6.70%	6.20%	3.56%	2.46%	1.45%	0.63%
45-49	7.30%	7.30%	7.10%	6.70%	6.20%	3.18%	2.44%	1.22%	1.29%
50-54	7.30%	7.30%	7.10%	6.70%	6.20%	3.41%	2.75%	1.61%	1.97%
55-59	7.30%	7.30%	7.10%	6.70%	6.20%	3.75%	3.98%	2.83%	3.39%
60-64	7.30%	7.30%	7.10%	6.70%	6.20%	4.57%	5.35%	5.36%	9.01%

Proposed Rates

Service	Proposed Rates
0	11.00%
1	9.00%
2	7.50%
3	6.75%
4	6.00%
5	5.50%
6	5.00%
7	4.25%
8	4.00%
9	3.50%
10	3.00%
11	2.75%
12	2.50%
13	2.25%
14	2.00%
15	1.75%
16	1.50%
17	1.25%
18	1.00%
19+	0.75%

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Disability Assumption

Disability

Disability experience during the last four years was considered in the analysis shown on the following pages. The "Exposure" column shows the number of employees in five-year age bands throughout the experience period.

The following table presents a summary of the disability experience. Currently there are separate sets of disability rates for Teachers and for Staff. The same rates apply for both males and females. The proposed rates have separate rates for Teachers and for Staff and for males and females.

	Actual Disability	Expected Disability	
		Current Assumption	Proposed Assumption
Male Teachers	12	18	13
Female Teachers	55	92	65
Male Staff	31	29	31
Female Staff	49	28	39
Total Teachers	67	111	78
Total Staff	80	57	70
Total	147	168	148

*Current assumptions calculate expected disabilities based on applying assumed disability rates to all active members. The proposed assumptions are based on applying proposed disability rates only to active members who are not eligible for normal retirement.

Currently 20 percent of disabilities are assumed to be accidental disabilities. There was not sufficient data to analyze the percentage of disabilities assumed to be accidental. We recommend maintaining the 20 percent assumption for Staff and decreasing the assumption to 10 percent for Teachers. We monitor the percentage of total disabilities that are accidental in future actuarial valuations and recommend changes as needed.

Disability benefits are as follows:

Non-accidental
Allowance: The benefit is the service retirement allowance computed on the basis that service continues until normal retirement age without any change in rate of earnable compensation. If disability occurs after age normal retirement age, the benefit is based on creditable service at time of retirement.

Accidental
Allowance: The benefit is 66 2/3% of average final compensation for the three highest years as a member (five years if hired on or after July 1, 2011), plus the annuity provided by accumulated member contributions.

Disability Assumption

Male Teachers

Age @ Disablement	Actual Experience				Current Assumptions			Proposed Assumptions		
	Exposures		Disabilities	Actual Rate	Expected Disabilities	Assumed Rate	Actual / Expected	Expected Disabilities	Proposed Rate	Actual/ Expected
	Ordinary	Accidental								
Under 20	0	1	0		0	0.02%		0	0.01%	
20-24	0	98	0		0	0.02%		0	0.01%	
25-29	78	1,157	0	0.00%	0	0.02%	0.0	0	0.01%	0.0
30-34	938	1,723	1	0.11%	0	0.03%	2.7	0	0.03%	3.3
35-39	1,551	1,981	0	0.00%	1	0.06%	0.0	1	0.04%	0.0
40-44	1,636	1,876	1	0.06%	2	0.11%	0.5	1	0.08%	0.8
45-49	1,658	1,866	2	0.12%	3	0.17%	0.7	3	0.16%	0.8
50-54	1,130	1,299	4	0.35%	3	0.28%	1.2	3	0.28%	1.3
55-59	993	1,092	3	0.30%	4	0.36%	0.8	4	0.35%	0.9
60-64	836	958	1	0.12%	3	0.34%	0.3	1	**	0.7
65-69	436	496	0	0.00%	1	0.31%	0.0	0	**	0.0
70-74	141	161	0	0.00%	0	0.31%	0.0	0	**	0.0
75 and over	56	60	0	0.00%	0	0.32%	0.0	0	**	
Totals:	**9,453**	**12,768**	**12**	**0.12%**	**18**	**0.18%**	**0.7**	**13**	**0.13%**	**0.9**
Under 40	**2,567**	**4,960**	**1**	**0.04%**	**1**	**0.05%**	**0.7**	**1**	**0.03%**	**1.0**
40-49	**3,294**	**3,742**	**3**	**0.09%**	**5**	**0.14%**	**0.6**	**4**	**0.12%**	**0.8**
50-59	**2,123**	**2,391**	**7**	**0.33%**	**7**	**0.32%**	**1.0**	**7**	**0.31%**	**1.0**
60+	**1,469**	**1,675**	**1**	**0.07%**	**5**	**0.33%**	**0.2**	**1**	**0.10%**	**0.7**
Not Ret Elig* 60+	**1,247**	**1,247**	**1**	**0.08%**	**5**	**0.40%**	**0.2**	**1**	**0.12%**	**0.7**

*Excludes members eligible for normal retirement.

**Proposed rates are based only on members not eligible for normal retirement.

GRS Retirement Consulting

Disability Assumption

Disability Experience
Teachers - Male
7/1/2014 - 7/1/2018
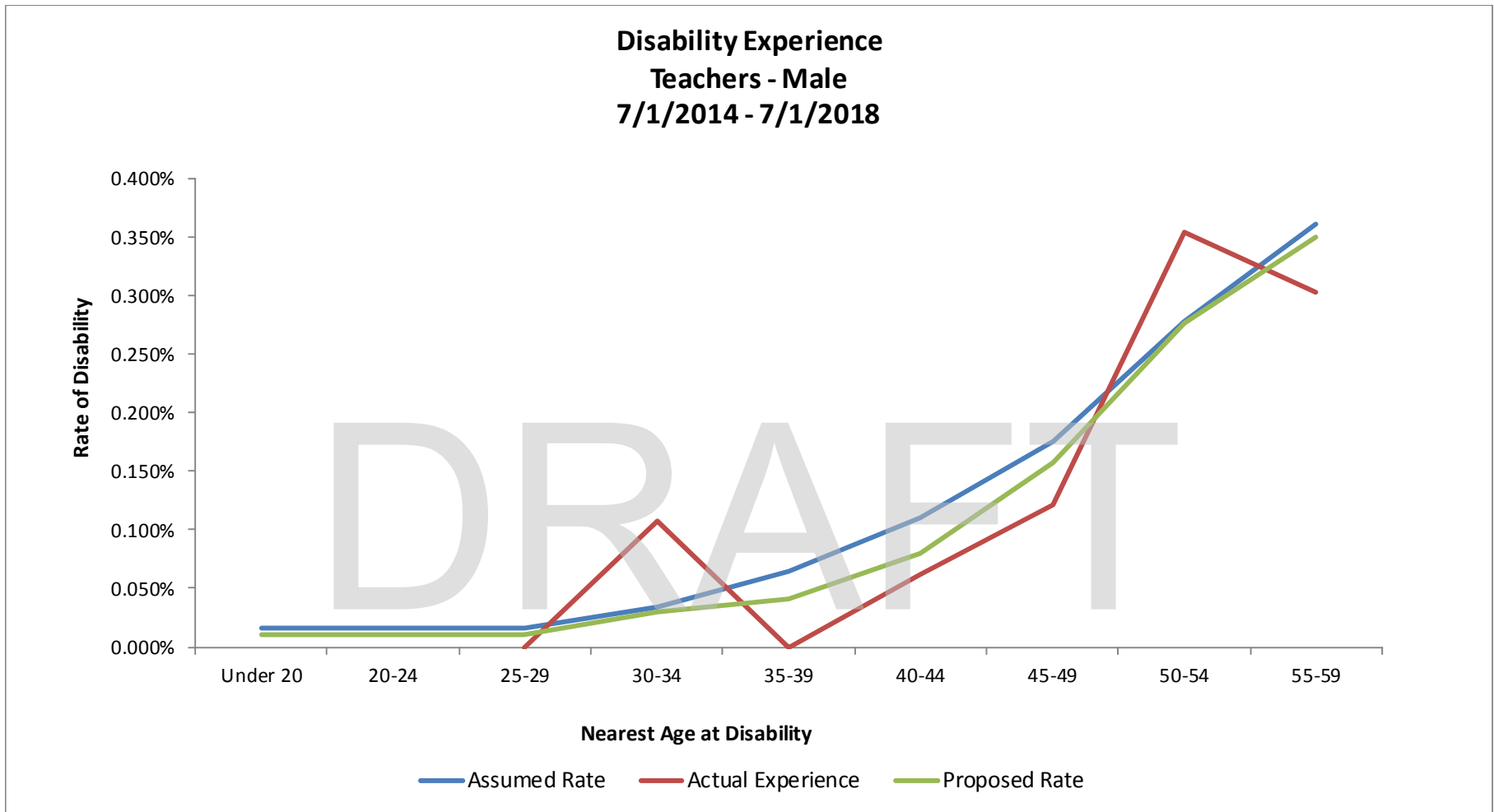
Disability Assumption

Female Teachers

Age @ Disablement	Actual Experience				Current Assumptions			Proposed Assumptions		
	Exposures		Disabilities	Actual Rate	Expected Disabilities	Assumed Rate	Actual / Expected	Expected Disabilities	Proposed Rate	Actual/ Expected
	Ordinary	Accidental								
Under 20	0	0	0		0	0.02%		0	0.01%	
20-24	0	714	0		0	0.02%	0.0	0	0.01%	0.0
25-29	762	5,348	0	0.00%	0	0.02%	0.0	0	0.01%	0.0
30-34	4,197	6,574	0	0.00%	2	0.03%	0.0	1	0.02%	0.0
35-39	5,233	6,674	1	0.02%	4	0.06%	0.3	3	0.05%	0.4
40-44	5,355	6,593	7	0.13%	6	0.11%	1.1	5	0.10%	1.3
45-49	5,913	7,316	8	0.14%	11	0.18%	0.7	9	0.15%	0.9
50-54	6,035	7,200	8	0.13%	18	0.28%	0.5	15	0.24%	0.5
55-59	6,572	7,269	25	0.38%	24	0.36%	1.0	23	0.35%	1.1
60-64	5,449	5,812	5	0.09%	19	0.34%	0.3	9	**	0.6
65-69	2,188	2,298	1	0.05%	7	0.31%	0.1	0	**	25.0
70-74	551	570	0	0.00%	2	0.31%	0.0	0	**	0.0
75 and over	141	141	0	0.00%	0	0.31%	0.0	0	**	
Totals:	**42,396**	**56,509**	**55**	**0.13%**	**92**	**0.20%**	**0.6**	**65**	**0.15%**	**0.8**
Under 40	**10,192**	**19,310**	**1**	**0.01%**	**5**	**0.05%**	**0.2**	**4**	**0.03%**	**0.3**
40-49	**11,268**	**13,909**	**15**	**0.13%**	**17**	**0.15%**	**0.9**	**15**	**0.13%**	**1.0**
50-59	**12,607**	**14,469**	**33**	**0.26%**	**42**	**0.32%**	**0.8**	**38**	**0.30%**	**0.9**
60+	**8,329**	**8,821**	**6**	**0.07%**	**28**	**0.33%**	**0.2**	**9**	**0.10%**	**0.7**
Not Ret Elig* 60+	**1,247**	**1,247**	**6**	**0.48%**	**28**	**2.23%**	**0.2**	**9**	**0.70%**	**0.7**

*Excludes members eligible for normal retirement.

**Proposed rates are based only on members not eligible for normal retirement.

GRS Retirement Consulting

Disability Assumption

**Disability Experience
Teachers - Female
7/1/2014 - 7/1/2018**

GRS Retirement Consulting
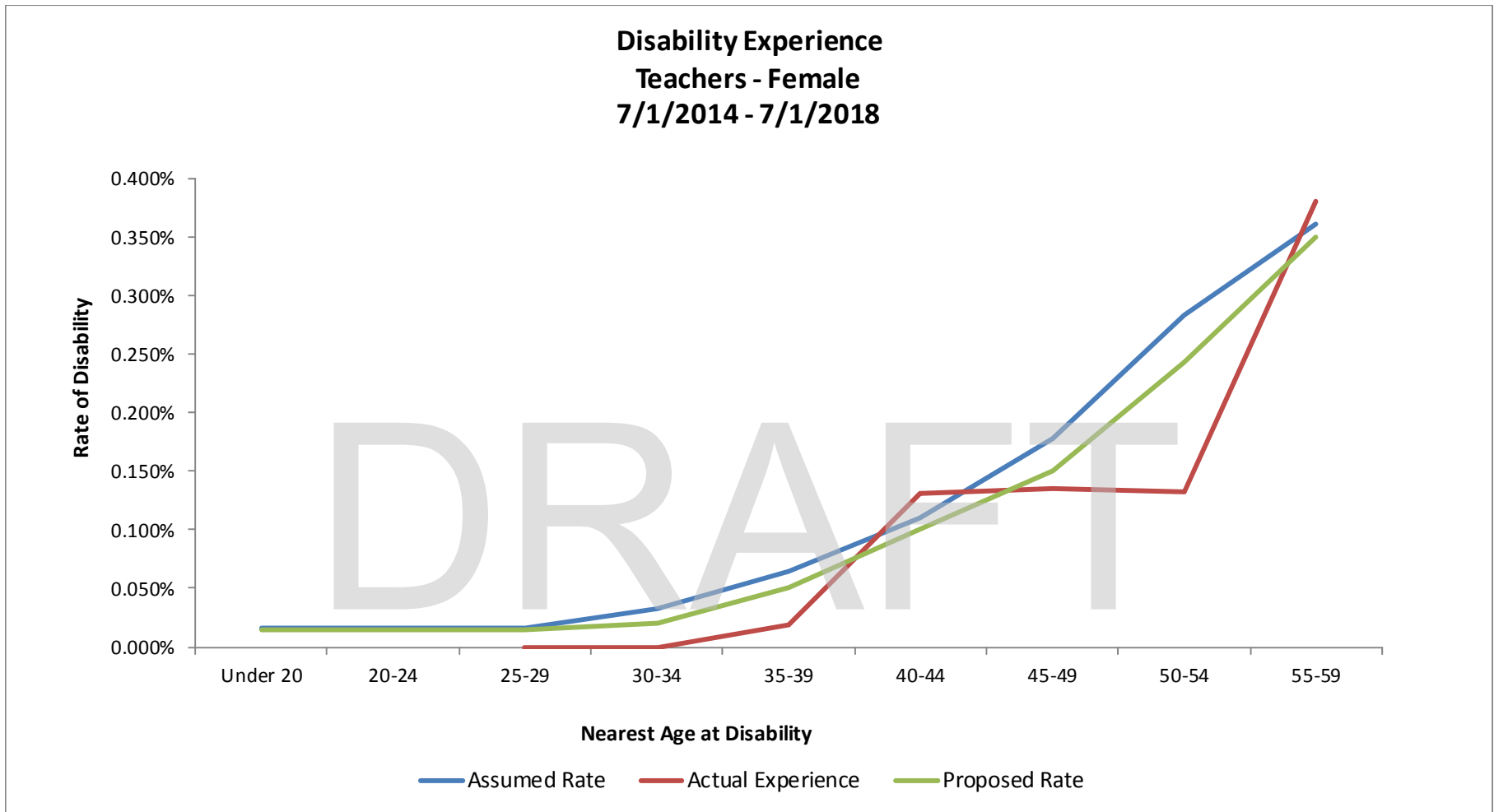
Disability Assumption

Male Staff

Age @ Disablement	Actual Experience				Current Assumptions			Proposed Assumptions		
	Exposures		Disabilities	Actual Rate	Expected Disabilities	Assumed Rate	Actual / Expected	Expected Disabilities	Proposed Rate	Actual/ Expected
	Ordinary	Accidental								
Under 20	0	2	0		0	0.02%		0	0.02%	
20-24	4	69	0		0	0.02%		0	0.02%	
25-29	100	379	0	0.00%	0	0.02%	0.0	0	0.02%	0.0
30-34	293	607	0	0.00%	0	0.03%	0.0	0	0.12%	0.0
35-39	408	724	2	0.48%	0	0.07%	6.1	1	0.17%	2.5
40-44	558	841	1	0.18%	1	0.15%	1.1	2	0.25%	0.7
45-49	1,008	1,334	4	0.39%	3	0.26%	1.4	4	0.36%	1.0
50-54	1,371	1,786	6	0.43%	6	0.41%	1.0	7	0.52%	0.8
55-59	1,668	2,006	11	0.66%	9	0.51%	1.2	11	0.66%	1.0
60-64	1,335	1,588	6	0.45%	6	0.44%	1.0	5	**	1.2
65-69	718	804	1	0.14%	3	0.36%	0.4	0	**	6.3
70-74	237	253	0	0.00%	1	0.36%	0.0	0	**	0.0
75 and over	134	137	0	0.00%	0	0.36%	0.0	0	**	
Totals:	**7,834**	**10,530**	**31**	**0.37%**	**29**	**0.35%**	**1.1**	**31**	**0.37%**	**1.0**
Under 40	**805**	**1,781**	**2**	**0.20%**	**0**	**0.05%**	**4.1**	**1**	**0.14%**	**1.5**
40-49	**1,566**	**2,175**	**5**	**0.30%**	**4**	**0.22%**	**1.3**	**5**	**0.32%**	**0.9**
50-59	**3,039**	**3,792**	**17**	**0.53%**	**15**	**0.46%**	**1.1**	**19**	**0.59%**	**0.9**
60+	**2,424**	**2,782**	**7**	**0.28%**	**10**	**0.41%**	**0.7**	**5**	**0.21%**	**1.4**
Not Ret Elig* 60+	**409**	**409**	**7**	**1.71%**	**10**	**2.48%**	**0.7**	**5**	**1.25%**	**1.4**

*Excludes members eligible for normal retirement.

**Proposed rates are based only on members not eligible for normal retirement.

GRS Retirement Consulting

Disability Experience
Staff - Male
7/1/2014 - 7/1/2018
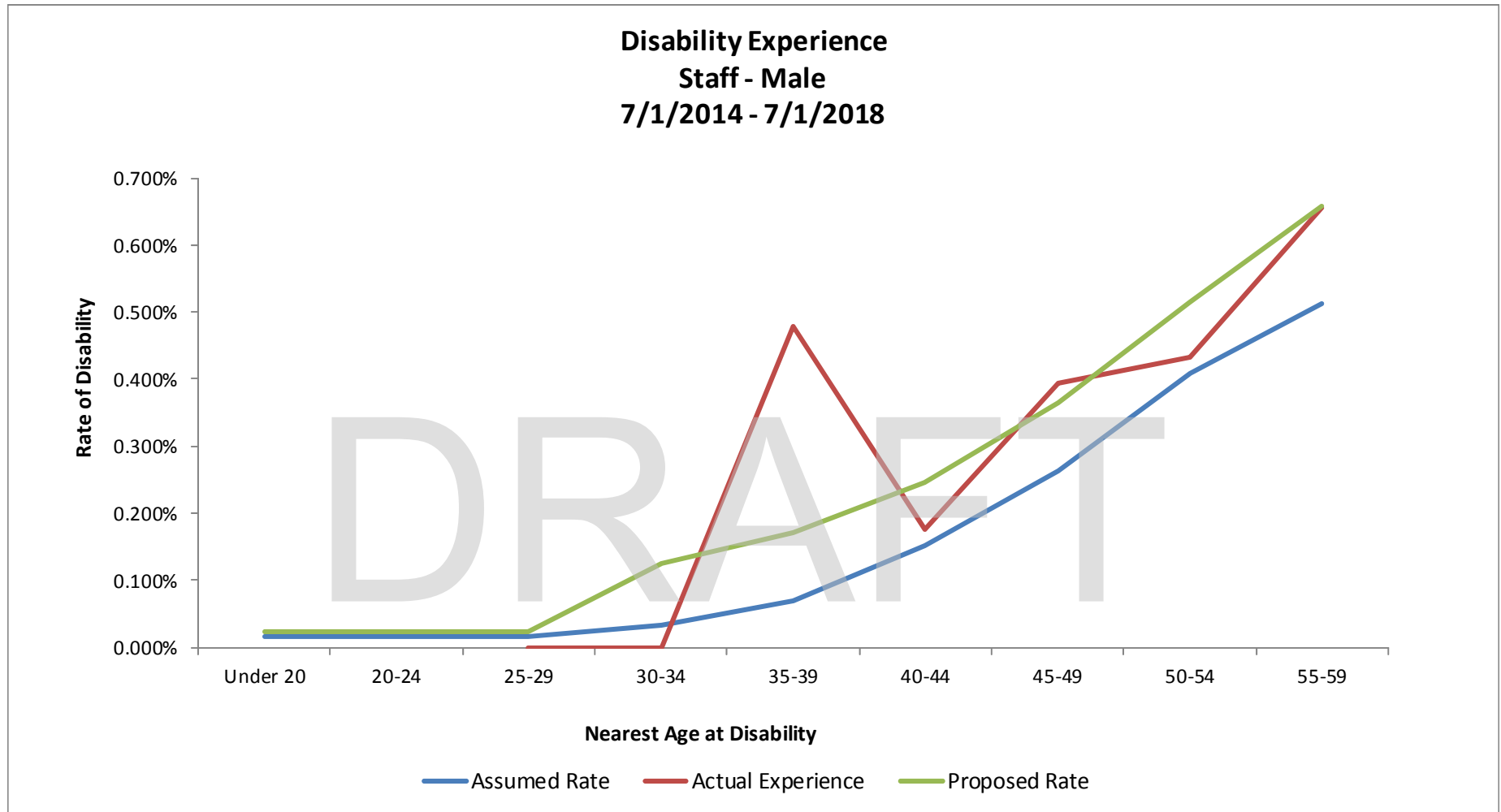
Disability Assumption

Female Staff

Age @ Disablement	Actual Experience				Current Assumptions			Proposed Assumptions		
	Exposures		Disabilities	Actual Rate	Expected Disabilities	Assumed Rate	Actual / Expected	Expected Disabilities	Proposed Rate	Actual/ Expected
	Ordinary	Accidental								
Under 20	0	0	0		0	0.02%		0	0.02%	
20-24	2	40	0		0	0.02%		0	0.02%	
25-29	26	190	0	0.00%	0	0.02%	0.0	0	0.02%	0.0
30-34	179	402	0	0.00%	0	0.04%	0.0	0	0.09%	0.0
35-39	356	619	1	0.28%	0	0.07%	3.4	1	0.16%	1.5
40-44	548	870	1	0.18%	1	0.15%	1.1	2	0.28%	0.6
45-49	1,096	1,449	5	0.46%	3	0.27%	1.6	5	0.43%	1.0
50-54	1,589	1,962	10	0.63%	7	0.40%	1.5	10	0.62%	1.0
55-59	1,550	1,793	18	1.16%	8	0.51%	2.2	14	0.90%	1.3
60-64	1,243	1,376	13	1.05%	6	0.45%	2.3	7	**	1.9
65-69	498	537	1	0.20%	2	0.36%	0.5	0	**	9.1
70-74	178	180	0	0.00%	1	0.36%	0.0	0	**	
75 and over	60	60	0	0.00%	0	0.35%	0.0	0	**	
Totals:	**7,325**	**9,478**	**49**	**0.63%**	**28**	**0.36%**	**1.8**	**39**	**0.51%**	**1.2**
Under 40	**563**	**1,251**	**1**	**0.14%**	**0**	**0.05%**	**2.6**	**1**	**0.12%**	**1.1**
40-49	**1,644**	**2,319**	**6**	**0.34%**	**4**	**0.23%**	**1.5**	**7**	**0.38%**	**0.9**
50-59	**3,139**	**3,755**	**28**	**0.86%**	**15**	**0.46%**	**1.9**	**25**	**0.76%**	**1.1**
60+	**1,979**	**2,153**	**14**	**0.70%**	**8**	**0.42%**	**1.7**	**7**	**0.35%**	**2.0**
Not Ret Elig* 60+	**409**	**409**	**14**	**3.42%**	**8**	**2.06%**	**1.7**	**7**	**1.70%**	**2.0**

*Excludes members eligible for normal retirement.

**Proposed rates are based only on members not eligible for normal retirement.

GRS Retirement Consulting

Disability Assumption

Disability Experience
Staff - Female
7/1/2014 - 7/1/2018
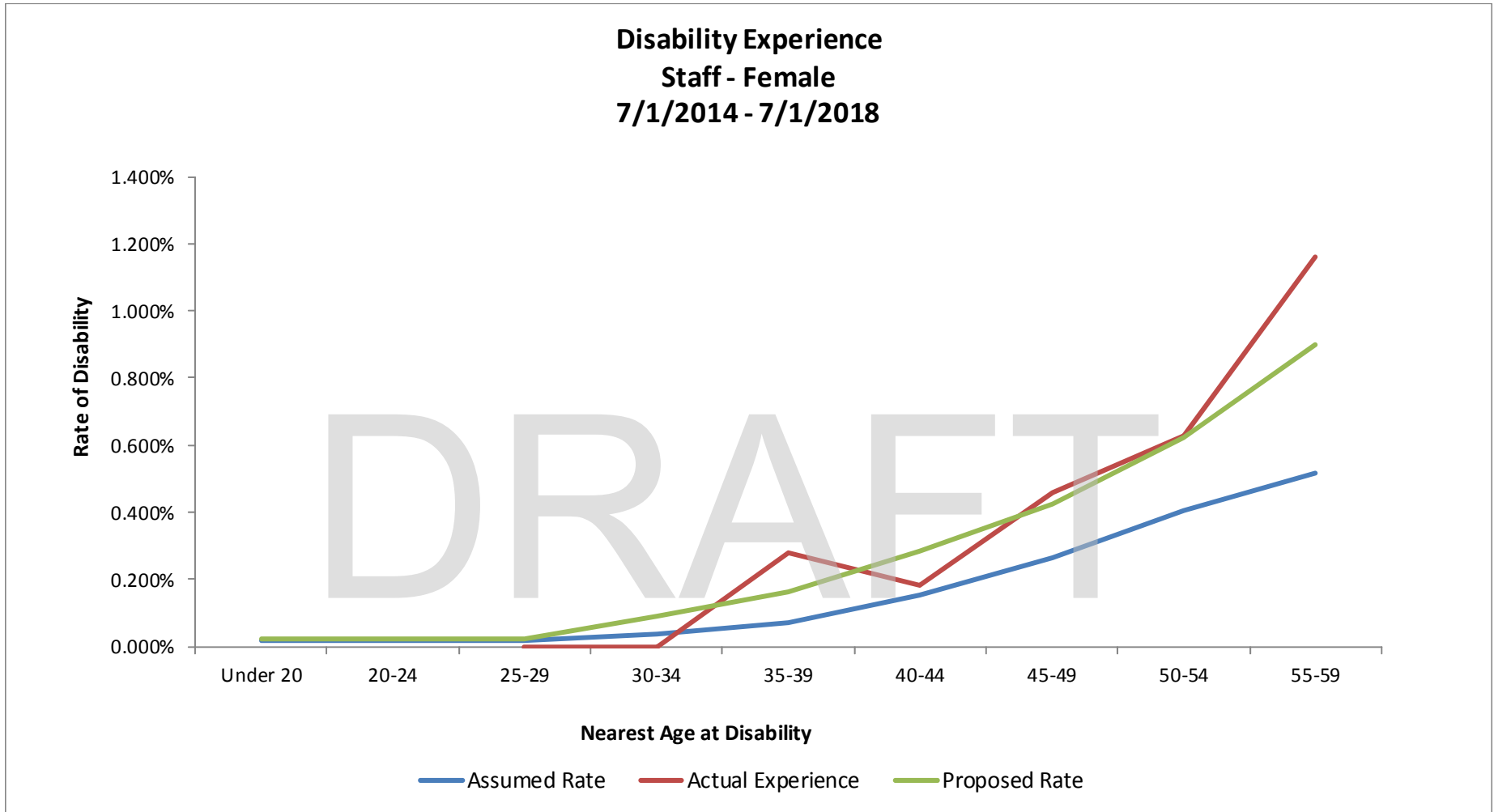
Disability Assumption

Proposed Disability Rates

| | Current Rates* | | Proposed Rates* | | | |
| | Staff | Teacher | Staff | | Teacher | |
Age	All	All	Male	Female	Male	Female
Under 25	0.02%	0.02%	0.02%	0.02%	0.01%	0.01%
25	0.02%	0.02%	0.02%	0.02%	0.01%	0.01%
26	0.02%	0.02%	0.04%	0.02%	0.01%	0.01%
27	0.02%	0.02%	0.06%	0.02%	0.01%	0.01%
28	0.02%	0.02%	0.08%	0.02%	0.01%	0.01%
29	0.02%	0.02%	0.10%	0.02%	0.01%	0.01%
30	0.02%	0.02%	0.10%	0.04%	0.03%	0.02%
31	0.02%	0.02%	0.11%	0.06%	0.03%	0.02%
32	0.04%	0.04%	0.12%	0.08%	0.03%	0.02%
33	0.04%	0.04%	0.13%	0.10%	0.03%	0.02%
34	0.04%	0.04%	0.14%	0.12%	0.03%	0.02%
35	0.04%	0.04%	0.15%	0.12%	0.04%	0.03%
36	0.04%	0.04%	0.16%	0.14%	0.04%	0.04%
37	0.09%	0.08%	0.17%	0.16%	0.04%	0.05%
38	0.09%	0.08%	0.18%	0.18%	0.04%	0.06%
39	0.09%	0.08%	0.19%	0.20%	0.04%	0.07%
40	0.09%	0.08%	0.20%	0.24%	0.06%	0.08%
41	0.09%	0.08%	0.22%	0.26%	0.07%	0.09%
42	0.18%	0.13%	0.24%	0.28%	0.08%	0.10%
43	0.18%	0.13%	0.26%	0.30%	0.09%	0.11%
44	0.18%	0.13%	0.28%	0.32%	0.10%	0.12%
45	0.18%	0.13%	0.30%	0.36%	0.12%	0.13%
46	0.18%	0.13%	0.33%	0.39%	0.14%	0.14%
47	0.31%	0.21%	0.36%	0.42%	0.16%	0.15%
48	0.31%	0.21%	0.39%	0.45%	0.18%	0.16%
49	0.31%	0.21%	0.42%	0.48%	0.20%	0.17%
50	0.31%	0.21%	0.45%	0.50%	0.22%	0.18%
51	0.31%	0.21%	0.48%	0.56%	0.25%	0.21%
52	0.46%	0.33%	0.51%	0.62%	0.28%	0.24%
53	0.46%	0.33%	0.54%	0.68%	0.31%	0.27%
54	0.46%	0.33%	0.57%	0.74%	0.34%	0.31%
55	0.46%	0.33%	0.60%	0.80%	0.35%	0.35%
56	0.46%	0.33%	0.63%	0.85%	0.35%	0.35%
57	0.55%	0.38%	0.66%	0.90%	0.35%	0.35%
58	0.55%	0.38%	0.69%	0.95%	0.35%	0.35%
59	0.55%	0.38%	0.72%	1.00%	0.35%	0.35%
60	0.55%	0.38%	0.75%	1.05%	0.35%	0.35%
61	0.55%	0.38%	0.80%	1.10%	0.35%	0.35%
62+	0.36%	0.31%	0.85%	1.15%	0.35%	0.35%

*Current rates apply to all active members. Proposed rates
apply only to active members not eligible for normal retirement.*

Mortality

Post-retirement mortality is an important component in cost calculations and should be updated from time to time to reflect current and expected future longevity improvements. Pre-retirement mortality is a relatively minor component in cost calculations. The frequency of pre-retirement deaths is so low that mortality assumptions based on actual experience can only be produced for very large retirement systems.

Actuarial Standards of Practice

Actuarial Standards of Practice (ASOP) No. 35 Disclosure Section 4.1.1 states, "The disclosure of the mortality assumption should contain sufficient detail to permit another qualified actuary to understand the provision made for future mortality improvement. If the actuary assumes zero mortality improvement after the measurement date, the actuary should state that no provision was made for future mortality improvement." The current mortality rates used in the valuation include a provision for future mortality improvement.

Recommended Changes
The current mortality assumptions are as follows:

Pre-retirement	RP-2014 White Collar Employee mortality table, sex distinct, with generational morality improvements using scale MP-2014
Post-retirement Healthy lives	RP-2014 White Collar Healthy Annuitant mortality table, sex distinct, with generational morality improvements using scale MP-2014
Disabled lives	RP-2000 disabled mortality table, sex distinct, projected to 2022 using projection scale AA (static table)

The proposed non-disabled assumption is based on the Public Sector 2010 Mortality tables (for General Employees), sex distinct, with rates projected from 2010 using projection scale MP-2018 (generational mortality). The proposed disabled mortality rates are based on the Public Sector 2010 disabled mortality tables. Because the mortality experience is not fully credible, we recommend using the public sector base mortality tables.

The proposed mortality assumptions are as follows:

Pre-retirement	Pub-2010 Employee mortality table (for General Employees), sex distinct, with generational morality improvements from 2010 using scale MP-2018
Post-retirement Healthy lives	Pub-2010 Healthy Retiree mortality table (for General Employees), sex distinct, with generational morality improvements from 2010 using scale MP-2018
Disabled lives	Pub-2010 Disabled Retiree mortality table (for General Employees), sex distinct, with generational morality improvements from 2010 using scale MP-2018

Post-retirement healthy life mortality life expectancies under the proposed assumptions are shorter compared to the current assumptions. Disabled life mortality life expectancies under the proposed assumptions are longer compared to the current assumptions. Pre-retirement healthy life mortality life expectancies under the proposed assumptions are shorter for females and longer for males between 40 and 75 compared to the current assumptions.

Mortality Assumptions

Life Expectancy Tables

	Current Assumption						Proposed Assumption					
	Healthy Mortality				Disabled Mortality		Healthy Mortality				Disabled Mortality	
	Pre-Retirement Future Life Expectancy (years) in 2019		Post-Retirement Future Life Expectancy (years) in 2019		Future Life Expectancy (years) in 2019		Pre-Retirement Future Life Expectancy (years) in 2019		Post-Retirement Future Life Expectancy (years) in 2019		Future Life Expectancy (years) in 2019	
Age	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
20	71.10	74.40	69.42	71.52	35.53	50.23	70.83	73.34	67.49	70.68	53.11	56.51
25	65.78	69.08	64.04	66.12	33.28	46.50	65.55	68.02	62.11	65.27	48.22	51.29
30	60.45	63.77	58.69	60.75	31.51	42.77	60.26	62.70	56.73	59.87	43.29	46.11
35	55.12	58.46	53.38	55.45	29.63	39.02	55.03	57.42	51.38	54.49	38.66	41.28
40	49.79	53.17	48.13	50.22	27.50	35.06	49.83	52.16	46.08	49.14	34.27	36.80
45	44.48	47.89	42.96	45.05	24.89	30.94	44.65	46.92	40.80	43.81	30.05	32.60
50	39.22	42.67	37.89	39.95	22.00	26.82	39.51	41.71	35.64	38.59	26.09	28.73
55	34.05	37.52	32.95	34.92	19.12	23.07	34.45	36.55	30.72	33.61	22.58	25.31
60	29.01	32.44	28.15	29.98	16.46	19.84	29.50	31.48	26.00	28.75	19.49	22.17
65	24.14	27.44	23.48	25.20	13.97	16.83	24.70	26.50	21.51	24.01	16.64	18.97
70	19.53	22.55	19.02	20.65	11.60	14.02	20.02	21.61	17.25	19.44	13.87	15.62
75	15.22	17.86	14.87	16.37	9.25	11.42	15.43	16.85	13.31	15.17	11.13	12.35
80	11.29	13.40	11.12	12.48	7.21	9.07	10.97	12.24	9.83	11.34	8.58	9.45
85	7.90	9.38	7.92	9.09	5.60	6.98	7.07	8.19	6.98	8.12	6.40	7.10
90	5.39	6.36	5.40	6.32	4.12	5.32	4.88	5.65	4.88	5.65	4.65	5.35
95	3.67	4.30	3.67	4.30	2.97	4.11	3.44	3.96	3.44	3.96	3.40	3.92
100	2.58	2.97	2.58	2.97	2.31	3.35	2.47	2.78	2.47	2.78	2.47	2.78
105	1.93	2.15	1.93	2.15	2.05	2.66	1.87	2.03	1.87	2.03	1.87	2.03

Mortality Assumptions

Teachers and Staff

	Actual Experience						Current Assumptions			Proposed Assumptions		
	Population Weighted		Liability Weighted		Actual Rates Weighted by		Expected	Assumed	Actual /	Expected	Proposed	Actual /
Age	Exposures	Deaths	Exposures	Deaths	Population	Liability	Deaths	Rate	Expected	Deaths	Rate	Expected
Male Service Retiree Mortality Experience												
Under 50	13	0	44	0	0.000%	0.000%	0	0.382%	0.00	0	0.257%	0.00
50-54	37	0	185	0	0.000%	0.000%	1	0.341%	0.00	1	0.366%	0.00
55-59	306	3	1,019	7	0.713%	0.713%	5	0.442%	1.61	5	0.523%	1.36
60-64	1,444	12	3,645	26	0.723%	0.723%	22	0.614%	1.18	28	0.765%	0.95
65-69	3,358	35	5,318	77	1.457%	1.457%	49	0.914%	1.60	59	1.107%	1.32
70-74	3,370	63	4,118	94	2.271%	2.271%	61	1.483%	1.53	73	1.775%	1.28
75-79	2,343	93	2,391	103	4.298%	4.298%	60	2.488%	1.73	72	3.031%	1.42
80-84	1,463	69	942	61	6.506%	6.506%	42	4.446%	1.46	52	5.513%	1.18
85-89	968	88	414	36	8.736%	8.736%	33	8.073%	1.08	40	9.728%	0.90
90-94	336	58	86	16	18.724%	18.724%	12	14.203%	1.32	14	15.882%	1.18
95-99	29	11	6	3	41.528%	41.528%	1	22.120%	1.88	1	23.387%	1.78
100+	8	4	1	1	61.191%	61.191%	0	31.818%	1.92	0	0.000%	0.00
Totals:	**13,675**	**436**	**18,171**	**424**	**1.109%**	**2.336%**	**286**	**1.575%**	**1.48**	**346**	**1.906%**	**1.23**
Female Service Retiree Mortality Experience												
Under 50	7	0	3	0	0.000%	0.000%	0	0.310%	0.00	0	0.132%	0.00
50-54	87	0	134	0	0.000%	0.000%	0	0.240%	0.00	0	0.265%	0.00
55-59	691	6	993	6	0.000%	0.576%	3	0.322%	1.79	3	0.349%	1.65
60-64	3,589	18	3,209	13	0.576%	0.415%	16	0.504%	0.82	15	0.481%	0.86
65-69	8,639	49	5,885	36	0.415%	0.605%	46	0.778%	0.78	43	0.726%	0.83
70-74	8,050	90	4,503	66	0.605%	1.461%	55	1.232%	1.19	55	1.222%	1.19
75-79	5,033	103	2,401	52	1.461%	2.153%	50	2.062%	1.04	52	2.180%	0.99
80-84	3,563	135	1,162	42	2.153%	3.617%	43	3.683%	0.98	47	4.075%	0.89
85-89	2,542	200	613	55	3.617%	8.993%	40	6.505%	1.38	46	7.431%	1.21
90-94	1,278	171	187	25	8.993%	13.414%	22	11.846%	1.13	25	13.221%	1.01
95-99	425	86	44	8	13.414%	19.428%	8	18.843%	1.03	9	20.013%	0.97
100+	48	13	3	1	19.428%	21.680%	1	28.095%	0.77	1	29.063%	0.75
Totals:	**33,952**	**871**	**19,137**	**304**	**0.829%**	**1.586%**	**284**	**1.487%**	**1.07**	**297**	**1.551%**	**1.02**
Grand Totals:	**47,627**	**1,307**	**37,308**	**728**	**1.083%**	**1.951%**	**571**	**1.529%**	**1.28**	**643**	**1.723%**	**1.13**

Expected deaths under the current and proposed assumptions are on a liability weighted basis.

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Service Retiree Mortality Experience
7/1/2014 - 6/30/2018
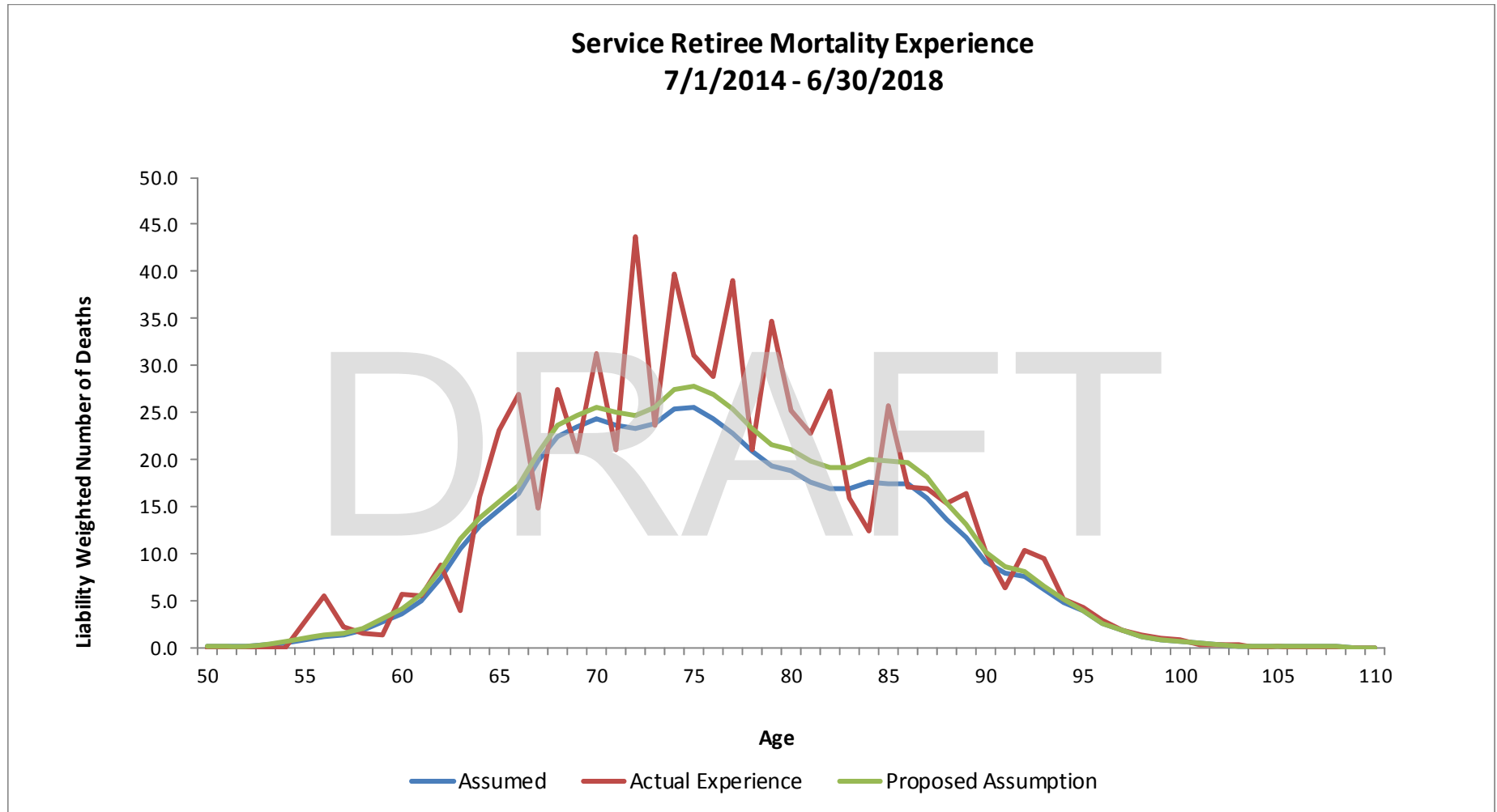
Mortality Assumptions

Teachers and Staff

	Male Disabled Retiree Mortality Experience											
	Actual Experience						Current Assumptions			Proposed Assumptions		
	Population Weighted		Liability Weighted		Actual Rates Weighted by		Expected	Assumed	Actual /	Expected	Proposed	Actual /
Age	Exposures	Deaths	Exposures	Deaths	Population	Liability	Deaths	Rate	Expected	Deaths	Rate	Expected
40-44	12	2	21	5	16.667%	23.196%	0	2.257%	10.28	0	0.829%	27.98
45-49	47	1	81	7	2.128%	9.008%	2	2.586%	3.48	1	1.207%	7.46
50-54	75	2	173	5	2.667%	3.096%	6	3.191%	0.97	3	1.758%	1.76
55-59	136	2	346	2	1.471%	0.533%	13	3.831%	0.14	8	2.325%	0.23
60-64	175	8	357	21	4.571%	6.007%	16	4.450%	1.35	10	2.744%	2.19
65-69	94	5	146	4	5.319%	2.705%	8	5.343%	0.51	5	3.234%	0.84
70-74	0	0	0	0			0			0		
75-79	0	0	0	0			0			0		
80-84	0	0	0	0			0			0		
Totals:	**539**	**20**	**1,126**	**45**	**8.331%**	**3.989%**	**45**	**4.006%**	**1.00**	**27**	**2.380%**	**1.68**
	Female Disabled Retiree Mortality Experience											
40-44	48	2	47	1	4.167%	3.102%	0	0.745%	4.16	0	0.806%	3.85
45-49	87	2	150	2	2.299%	1.217%	1	0.934%	1.30	2	1.162%	1.05
50-54	186	4	307	11	2.151%	3.627%	4	1.390%	2.61	5	1.632%	2.22
55-59	374	5	508	10	1.337%	1.950%	9	1.863%	1.05	10	1.936%	1.01
60-64	483	10	437	4	2.070%	0.989%	10	2.402%	0.41	9	2.075%	0.48
65-69	310	1	145	0	0.323%	0.194%	4	3.005%	0.06	3	2.249%	0.09
70-74	9	0	6	0	0.000%	0.000%	0	4.308%	0.00	0	3.032%	0.00
75-79	4	0	7	0	0.000%	0.000%	0	5.552%	0.00	0	4.041%	0.00
80-84	0	0	0	0			0			0		
Totals:	**1,501**	**24**	**1,606**	**29**	**3.165%**	**1.800%**	**31**	**1.928%**	**0.93**	**30**	**1.852%**	**0.97**
Grand Totals:	**2,576**	**35**	**2,732**	**74**	**2.290%**	**2.702%**	**76**	**2.784%**	**0.97**	**57**	**2.069%**	**1.31**

Expected deaths under the current and proposed assumptions are on a liability weighted basis.

GRS Retirement Consulting

Disabled Retiree Mortality Experience
7/1/2014 - 6/30/2018
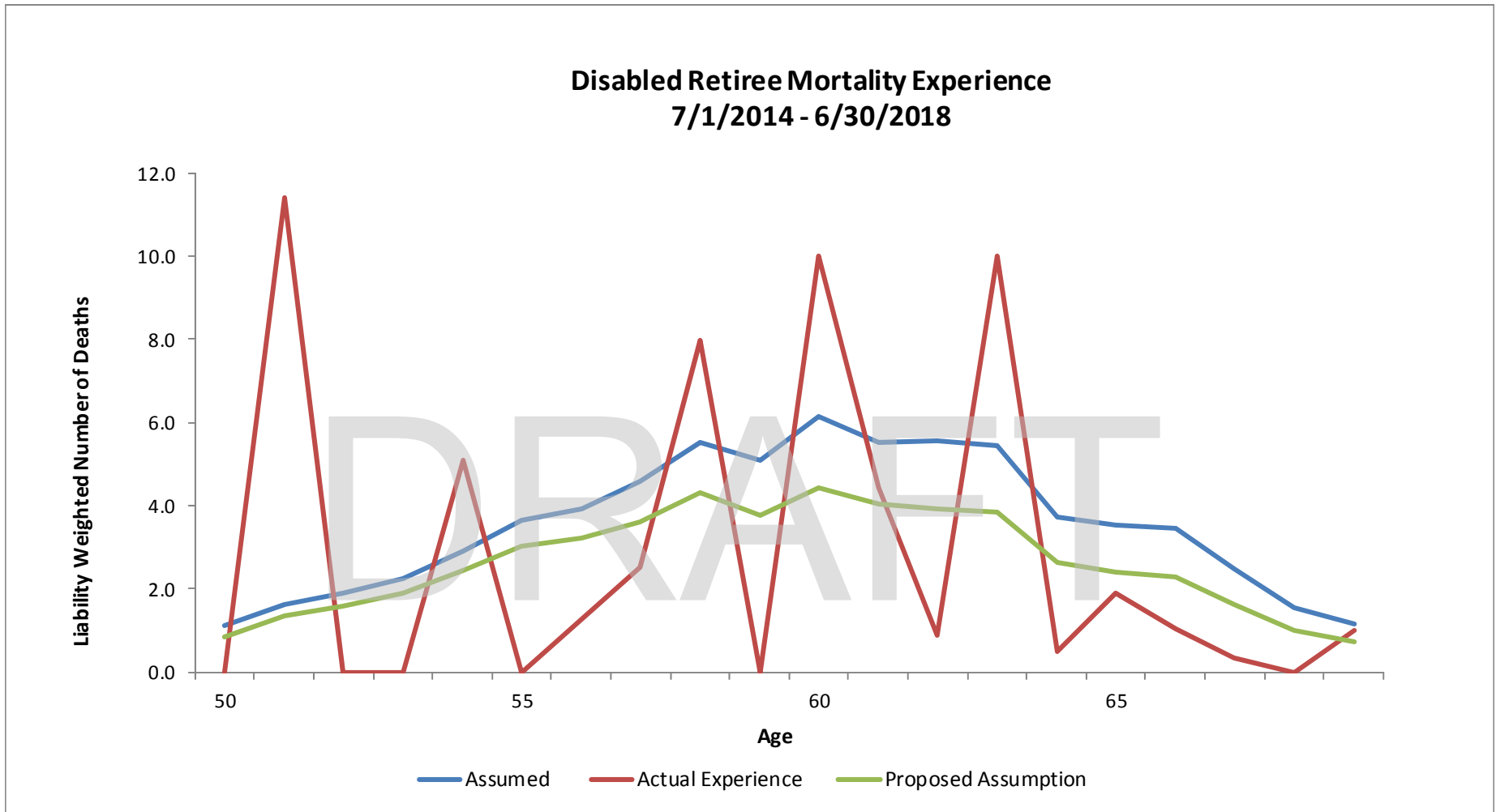
Other Postemployment Benefit (OPEB) Healthcare Assumptions

We have reviewed the healthcare related actuarial assumptions used to value the liabilities associated with the retiree healthcare benefits provided by the Montgomery County Public Schools OPEB Plan. In valuing OPEB liabilities, the actuarial assumptions selected are intended to provide reasonable estimates of future expected experience, such as morbidity factors, participation assumptions, coverage and continuance assumptions, among others. To the extent that actual experience deviates from these assumptions, experience gains and losses will occur. These gains (losses) then serve to reduce (increase) future contribution rates and increase (reduce) the funded ratio. The actuarial assumptions should be individually reasonable and consistent in aggregate, and should be reviewed periodically to ensure that they remain appropriate.

The Actuarial Standards Board (ASB) provides guidance on measuring the costs of financing a retiree healthcare benefit program through the following Actuarial Standard of Practice (ASOP):
- ASOP No. 6, Measuring Retiree Group Benefit Obligations and Determining Retiree Group Benefits Program Periodic Costs or Actuarially Determined Contributions.

The OPEB-specific actuarial assumptions recommended on the following pages are consistent with ASOP No. 6.

The following OPEB-specific actuarial assumptions were reviewed:
- Participation rates; and
- Coverage type and continuation of coverage.

The actuarial assumptions are generally based on the plan's own experience, taking into account emerging trends.

The accuracy and extent of the data is an important consideration in assessing demographic experience. The accuracy of the data for this study was sufficient. Below are the current and proposed assumptions based on the experience shown on the following page. The experience is based on elections at the time of retirement from active status.

OPEB Assumptions

Current Assumptions				
	Election %	1 Person	2 Person	% Spouses Continue
Under 65 at Retirement				
Males	90%	57%	43%	100%
Females	90%	57%	43%	100%
65+ at Retirement				
Males	90%	57%	43%	100%
Females	90%	57%	43%	100%
Proposed Assumptions				
	Election %	1 Person	2 Person	% Spouses Continue
Under 65 at Retirement				
Males	80%	30%	70%	100%
Females	80%	40%	60%	100%
65+ at Retirement				
Males	80%	30%	70%	100%
Females	80%	50%	50%	100%

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OPEB Assumptions

Male — Year Ending June 30

Under 65	2015	2016	2017	2018	Total
Retiree Only	23	22	16	20	81
Retiree plus one	27	32	30	39	128
Family	4	6	9	10	29
Total	54	60	55	69	238
No Coverage	18	16	21	12	67
Total New Retirees	72	76	76	81	305
% Electing Coverage	75%	79%	72%	85%	78%
% Electing 2+ Person Coverage	57%	63%	71%	71%	66%

Female — Year Ending June 30

Under 65	2015	2016	2017	2018	Total
Retiree Only	81	49	86	82	298
Retiree plus one	101	74	103	89	367
Family	7	5	10	19	41
Total	189	128	199	190	706
No Coverage	60	48	67	55	230
Total New Retirees	249	176	266	245	936
% Electing Coverage	76%	73%	75%	78%	75%
% Electing 2+ Person Coverage	57%	62%	57%	57%	58%

Year Ending June 30

65+	2015	2016	2017	2018	Total
Retiree Only	11	12	10	20	53
Retiree plus one	30	38	30	29	127
Family	0	1	4	2	7
Total	41	51	44	51	187
No Coverage	20	12	16	21	69
Total New Retirees	61	63	60	72	256
% Electing Coverage	67%	81%	73%	71%	73%
% Electing 2+ Person Coverage	73%	76%	77%	61%	72%

Year Ending June 30

Under 65	2015	2016	2017	2018	Total
Retiree Only	46	60	72	70	248
Retiree plus one	54	48	90	71	263
Family	0	0	0	2	2
Total	100	108	162	143	513
No Coverage	31	17	27	34	109
Total New Retirees	131	125	189	177	622
% Electing Coverage	76%	86%	86%	81%	82%
% Electing 2+ Person Coverage	54%	44%	56%	51%	52%

Year Ending June 30

Total	2015	2016	2017	2018	Total
Retiree Only	34	34	26	40	134
Retiree plus one	57	70	60	68	255
Family	4	7	13	12	36
Total	95	111	99	120	425
No Coverage	38	28	37	33	136
Total New Retirees	133	139	136	153	561
% Electing Coverage	71%	80%	73%	78%	76%
% Electing 2+ Person Coverage	64%	69%	74%	67%	68%

Year Ending June 30

Under 65	2015	2016	2017	2018	Total
Retiree Only	127	109	158	152	546
Retiree plus one	155	122	193	160	630
Family	7	5	10	21	43
Total	289	236	361	333	1219
No Coverage	91	65	94	89	339
Total New Retirees	380	301	455	422	1558
% Electing Coverage	76%	78%	79%	79%	78%
% Electing 2+ Person Coverage	56%	54%	56%	54%	55%

SECTION III

COST IMPACT OF RECOMMENDED CHANGES

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Cost Impact of Recommended Changes

Montgomery County Public Schools Employees' Retirement and Pension Systems

	Baseline	Impact July 1, 2018 Results	
	July 1, 2018 Results	6.75% Inv Return 2.25% Inflation	7.00% Inv Return 2.50% Inflation
Membership Data			
Active Members	23,286	23,286	23,286
Inactive Members (not in Pay Status)	3,409	3,409	3,409
Inactive Members (Contribution Balance Only)	2,894	2,894	2,894
Retirees and Beneficiaries	13,768	13,768	13,768
TOTAL	43,357	43,357	43,357
Plan Liabilities			
Actuarial Accrued Liability:			
Active Members	$ 1,017,525,363	$ 966,622,193	$ 955,628,603
Inactive Members	48,517,242	46,164,191	45,242,214
Retirees and Beneficiaries	1,185,163,932	1,103,484,026	1,099,940,494
TOTAL	$ 2,251,206,537	$ 2,116,270,410	$ 2,100,811,311
Actuarial Value of Assets at Valuation Date	$ 1,727,086,221	$ 1,727,086,221	$ 1,727,086,221
Unfunded (Overfunded) Actuarial Accrued Liability	$ 524,120,316	$ 389,184,189	$ 373,725,090
Funded Position of Plan's Actuarial Accrued Liability [1]	76.7 %	81.6 %	82.2 %

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Recommended Annual Contribution Requirements [2]	Fiscal Year 2020	Fiscal Year 2020	Fiscal Year 2020
Annual Normal Cost with Interest	$ 51,411,385	$ 54,316,211	$ 53,555,659
Normal Cost Expense Load	1,530,500	1,530,500	1,530,500
Amortization Payment	44,790,429	33,533,574	32,161,163
Total Annual Required Contribution	97,732,314	89,380,285	87,247,322
Expected Employee Contributions	24,715,507	24,886,502	24,946,143
Board Contribution Requirement	$ 73,016,807	$ 64,493,783	$ 62,301,179
Contribution Basis Payroll:			
For Normal Cost	$ 1,611,491,497	$ 1,621,245,254	$ 1,625,126,489
For Amortization of Unfunded Liability	$ 1,553,523,648	$ 1,553,523,648	$ 1,553,523,648
Board Contribution % of Payroll			
Employer Normal Cost	1.75%	1.91%	1.85%
Amortization of Unfunded Liability	2.88%	2.16%	2.07%
Total	4.63%	4.07%	3.92%
Average Employee Contribution Rate	1.53%	1.54%	1.54%

[1] *Equals the ratio of the actuarial value of assets to the total actuarial accrued liability.*
[2] *Board contributions are made during the first week of September. In the actuarial valuation, Board contributions are assumed to be made on October 1. The actual Board contribution for fiscal year 2020 was $83,781,225.*

Cost Impact of Recommended Changes

Montgomery County Public Schools Employees' Retirement and Pension Systems
Amortization Payment

Baseline

Base Year	Description	Initial Unfunded Liability Base	Initial Financing Period	Remaining Unfunded Liability Base	Remaining Financing Period		Amortization Factor	Amortization Payment	Amortization Payment with Interest Adjustment
2006	Plan Change	$ 118,820,991	30	$ 125,614,632	18	yrs.	13.276332	$ 9,461,546	$ 9,622,946
2010	Plan Change	(16,681,502)	30	(17,795,992)	22		15.180899	(1,172,262)	(1,192,259)
2018	Remaining Unfunded Liability	416,301,676	15	416,301,676	15		11.644834	35,749,901	36,359,742
Unfunded Liability				$ 524,120,316	15.1	yrs.	11.701614	$ 44,039,185	$ 44,790,429

Impact – 6.75% Investment Return, 2.50% Payroll Growth, 2.25% Inflation

Base Year	Description	Initial Unfunded Liability Base	Initial Financing Period	Remaining Unfunded Liability Base	Remaining Financing Period		Amortization Factor	Amortization Payment	Amortization Payment with Interest Adjustment
2006	Plan Change	$ 118,820,991	30	$ 125,614,632	18	yrs.	13.028752	$ 9,641,341	$ 9,800,075
2010	Plan Change	(16,681,502)	30	(17,795,992)	22		14.841968	(1,199,032)	(1,218,773)
2018	Assumption Change	(134,936,127)	15	(134,936,127)	15		11.461799	(11,772,683)	(11,966,508)
2018	Remaining Unfunded Liability	416,301,676	15	416,301,676	15		11.461799	36,320,797	36,918,780
Unfunded Liability				$ 389,184,189	15.6	yrs.	11.796884	$ 32,990,423	$ 33,533,574

Impact – Alternate Amortization – 6.75% Investment Return, 2.50% Payroll Growth, 2.25% Inflation

Base Year	Description	Initial Unfunded Liability Base	Initial Financing Period	Remaining Unfunded Liability Base	Remaining Financing Period		Amortization Factor	Amortization Payment	Amortization Payment with Interest Adjustment
2006	Plan Change	$ 118,820,991	30	$ 125,614,632	12	yrs.	9.691739	$ 12,961,000	$ 13,174,389
2010	Plan Change	(16,681,502)	30	(17,795,992)	12		9.691739	(1,836,202)	(1,866,433)
2018	Assumption Change	(134,936,127)	12	(134,936,127)	12		9.691739	(13,922,798)	(14,152,022)
2018	Remaining Unfunded Liability	416,301,676	15	416,301,676	12		9.691739	42,954,280	43,661,476
Unfunded Liability				$ 389,184,189	12.0	yrs.	9.691739	$ 40,156,280	$ 40,817,410

Cost Impact of Recommended Changes

Montgomery County Public Schools Employees' Retirement and Pension Systems
Amortization Payment

Baseline

Base Year	Description	Initial Unfunded Liability Base	Initial Financing Period	Remaining Unfunded Liability Base	Remaining Financing Period	Amortization Factor	Amortization Payment	Amortization Payment with Interest Adjustment
2006	Plan Change	$ 118,820,991	30	$ 125,614,632	18 yrs.	13.276332	$ 9,461,546	$ 9,622,946
2010	Plan Change	(16,681,502)	30	(17,795,992)	22	15.180899	(1,172,262)	(1,192,259)
2018	Remaining Unfunded Liability	416,301,676	15	416,301,676	15	11.644834	35,749,901	36,359,742
Unfunded Liability				$ 524,120,316	15.1 yrs.	11.701614	$ 44,039,185	$ 44,790,429

Impact – 7.00% Investment Return, 2.75% Payroll Growth, 2.50% Inflation

Base Year	Description	Initial Unfunded Liability Base	Initial Financing Period	Remaining Unfunded Liability Base	Remaining Financing Period	Amortization Factor	Amortization Payment	Amortization Payment with Interest Adjustment
2006	Plan Change	$ 118,820,991	30	$ 125,614,632	18 yrs.	13.038117	$ 9,634,415	$ 9,798,764
2010	Plan Change	(16,681,502)	30	(17,795,992)	22	14.854752	(1,198,000)	(1,218,436)
2018	Assumption Change	(150,395,226)	15	(150,395,226)	15	11.468737	(13,113,495)	(13,337,192)
2018	Remaining Unfunded Liability	416,301,676	15	416,301,676	15	11.468737	36,298,823	36,918,027
Unfunded Liability				$ 373,725,090	15.6 yrs.	11.818611	$ 31,621,743	$ 32,161,163

Impact – Alternate Amortization – 7.00% Investment Return, 2.75% Payroll Growth, 2.50% Inflation

Base Year	Description	Initial Unfunded Liability Base	Initial Financing Period	Remaining Unfunded Liability Base	Remaining Financing Period	Amortization Factor	Amortization Payment	Amortization Payment with Interest Adjustment
2006	Plan Change	$ 118,820,991	30	$ 125,614,632	11 yrs.	9.056159	$ 13,870,630	$ 14,107,242
2010	Plan Change	(16,681,502)	30	(17,795,992)	11	9.056159	(1,965,071)	(1,998,592)
2018	Assumption Change	(150,395,226)	12	(150,395,226)	11	9.056159	(16,606,955)	(16,890,245)
2018	Remaining Unfunded Liability	416,301,676	15	416,301,676	11	9.056159	45,968,900	46,753,062
Unfunded Liability				$ 373,725,090	11.0 yrs.	9.056159	$ 41,267,504	$ 41,971,467

Cost Impact of Recommended Changes

Contribution Breakout

Plan	Baseline			Impact - 6.75% Inv Return, 2.25% Inflation			Impact - 7.00% Inv Return, 2.50% Inflation		
	Core	Supplemental	Total	Core	Supplemental	Total	Core	Supplemental	Total
Board Normal Cost	0.86%	0.89%	1.75%	0.93%	0.98%	1.91%	0.90%	0.95%	1.85%
Amortization of Unfunded Liability	1.42%	1.46%	2.88%	1.05%	1.11%	2.16%	1.01%	1.06%	2.07%
Total	2.28%	2.35%	4.63%	1.98%	2.09%	4.07%	1.91%	2.01%	3.92%

Contribution Rate Based on Alternate Amortization Policy

(12-Year Amortization with 2.25% Inflation, 11-Year Amortization with 2.50% Inflation)

	Baseline Fiscal Year 2020	Alternate Impact Fiscal Year 2020	
Recommended Annual Contribution Requirements [1]		6.75% Inv Return 2.25% Inflation	7.00% Inv Return 2.50% Inflation
Annual Normal Cost with Interest	$ 51,411,385	$ 54,316,211	$ 53,555,659
Normal Cost Expense Load	1,530,500	1,530,500	1,530,500
Amortization Payment	44,790,429	40,817,410	41,971,467
Total Annual Required Contribution	97,732,314	96,664,121	97,057,626
Expected Employee Contributions	24,715,507	24,886,502	24,946,143
Board Contribution Requirement	$ 73,016,807	$ 71,777,619	$ 72,111,483
Contribution Basis Payroll:			
For Normal Cost	$ 1,611,491,497	$ 1,621,245,254	$ 1,625,126,489
For Amortization of Unfunded Liability	$ 1,553,523,648	$ 1,553,523,648	$ 1,553,523,648
Board Contribution % of Payroll			
Employer Normal Cost	1.75%	1.91%	1.85%
Amortization of Unfunded Liability	2.88%	2.63%	2.70%
Total	4.63%	4.54%	4.56%
Average Employee Contribution Rate	1.53%	1.54%	1.54%

[1] *Board contributions are made during the first week of September. In the actuarial valuation, Board contributions are assumed to be made on October 1.*

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Cost Impact of Recommended Changes

Montgomery County Public Schools OPEB Plan

	Baseline July 1, 2018 Results	Impact July 1, 2018 Results	
		7.50% Inv Return 2.25% Inflation	7.50% Inv Return 2.50% Inflation
Membership Data			
Active Members	23,286	23,286	23,286
Retirees and Beneficiaries	9,744	9,744	9,744
TOTAL	33,030	33,030	33,030
Plan Liabilities			
Actuarial Accrued Liability:			
Active Members	$ 851,243,978	$ 843,821,924	$ 844,258,799
Retirees and Beneficiaries	913,102,391	875,265,780	875,265,780
TOTAL	$ 1,764,346,369	$ 1,719,087,704	$ 1,719,524,579
Market Value of Assets at Valuation Date	$ 455,655,062	$ 455,655,062	$ 455,655,062
Unfunded (Overfunded) Actuarial Accrued Liability	$ 1,308,691,307	$ 1,263,432,642	$ 1,263,869,517
Funded Position of Plan's Actuarial Accrued Liability [1]	25.8 %	26.5 %	26.5 %
Recommended Annual Contribution Requirements	**Fiscal Year 2020**	**Fiscal Year 2020**	**Fiscal Year 2020**
Annual Normal Cost	$ 67,521,586	$ 66,309,037	$ 66,142,717
Normal Cost Expense Load	275,300	275,300	275,300
Amortization Payment	75,796,614	73,175,329	73,200,632
Interest to Beginning of Fiscal Year	10,769,513	10,481,975	10,471,399
Total Annual Required Contribution	154,363,013	150,241,641	150,090,047
Expected Benefit Payments (Pay-go)	75,180,154	73,451,309	73,451,309
Additional Contribution	$ 79,182,859	$ 76,790,332	$ 76,638,738
Contribution Basis Payroll:			
For Normal Cost	$ 1,611,493,745	$ 1,621,247,822	$ 1,625,128,203
For Amortization of Unfunded Liability	$ 1,553,523,648	$ 1,553,523,648	$ 1,553,523,648
Contribution % of Payroll			
Employer Normal Cost	4.21%	4.11%	4.09%
Amortization of Unfunded Liability	4.88%	4.71%	4.71%
Total	9.09%	8.82%	8.80%

[1] *Equals the ratio of the market value of assets to the total actuarial accrued liability.*

Actuarial liabilities, normal cost and expected benefits are net of Part D subsidies and prescription benefit rebates and are based on an investment return assumption of 7.50 percent and the Projected Unit Credit actuarial cost method. The total annual required contribution is based on 30-year level percentage of payroll amortization and a payroll growth assumption of 3.00 percent. Salary increase rates are 25 basis points higher under the 2.50 percent inflation scenario.

SECTION IV

RECOMMENDED ACTUARIAL ASSUMPTIONS

DRAFT

Actuarial Valuation Assumptions

Rate of Investment Return. 6.75% per annum. This assumption is net of investment expenses.

OPEB Plan Rate of Investment Return. 7.50% per annum. This assumption is net of investment expenses.

Price Inflation (Increase in Consumer Price Index "CPI"). The assumed rate is 2.25% per annum.

Payroll Growth. The assumed rate of total payroll growth is 2.50%.

Social Security Taxable Wage Base Increase. The assumed rate is 3.25% per annum.

Cost of Living Adjustment "COLA."
Employees' Retirement System
- o   2.25% compound COLA
Employees' Pension System
- o   Members in original pension plan (retired before July 1, 1998)
  - o   2.25% simple COLA
- o   Members in the enhanced pension plan (retired after July 1, 1998)
  - o   2.15% compound COLA for the benefit attributable to service prior to July 1, 2011
  - o   1.75% compound COLA for the benefit attributable to service on/after to July 1, 2011

Mortality. The mortality assumptions are as follows:

Pre-retirement	Pub-2010 Employee mortality table (for General Employees), sex distinct, with generational morality improvements from 2010 using scale MP-2018
Post-retirement Healthy lives	Pub-2010 Healthy Retiree mortality table (for General Employees), sex distinct, with generational morality improvements from 2010 using scale MP-2018
Disabled lives	Pub-2010 Disabled Retiree mortality table (for General Employees), sex distinct, with generational morality improvements from 2010 using scale MP-2018

Actuarial Valuation Assumptions

Annual Compensation Increases. The total assumed increase follows:

Staff

Years of Credited Service

Age	0	1-4	5-9	10-14	15-19	20-24	25+
Under 25	13.25%	12.25%	8.25%	6.25%	3.50%	3.00%	3.00%
25-29	11.25%	10.25%	6.75%	6.25%	3.50%	3.00%	3.00%
30-34	9.25%	8.25%	5.75%	5.25%	3.50%	3.00%	3.00%
35-39	8.75%	7.75%	5.50%	5.00%	3.50%	3.00%	3.00%
40-44	8.75%	7.75%	5.50%	4.50%	3.50%	3.00%	3.00%
45-49	8.75%	7.75%	5.50%	4.50%	3.00%	2.75%	2.75%
50-54	8.75%	7.75%	5.00%	4.00%	3.00%	2.50%	2.50%
55-59	8.75%	7.75%	5.00%	3.50%	2.75%	2.50%	2.50%
60-64	8.75%	7.75%	4.50%	3.50%	2.75%	2.50%	2.50%
65-69	7.75%	6.75%	4.50%	3.50%	2.75%	2.50%	2.50%
70+	7.75%	6.75%	4.00%	2.50%	2.25%	2.25%	2.25%

Teachers

Years of Credited Service

Age	0	1-4	5-9	10-14	15-19	20-24	25+
Under 25	7.50%	5.50%	5.00%	6.25%	4.75%	2.75%	2.50%
25-29	9.25%	7.25%	6.75%	6.25%	4.75%	2.75%	2.50%
30-34	9.25%	7.25%	5.75%	5.50%	4.75%	2.75%	2.50%
35-39	9.25%	7.25%	5.75%	5.50%	4.75%	2.75%	2.50%
40-44	9.25%	7.25%	5.75%	5.00%	4.25%	2.75%	2.50%
45-49	9.25%	7.25%	5.75%	4.50%	3.25%	2.25%	2.50%
50-54	9.25%	7.25%	5.75%	4.50%	3.00%	2.25%	2.25%
55-59	7.25%	7.25%	4.75%	4.25%	3.00%	2.25%	2.25%
60-64	7.25%	7.25%	4.75%	3.50%	2.50%	2.25%	2.25%
65-69	7.25%	7.25%	4.00%	3.00%	2.25%	2.25%	2.25%
70+	7.25%	7.25%	3.50%	3.00%	2.25%	2.25%	2.25%

Actuarial Valuation Assumptions

Disability. A table of disability incidence with rates follows:

	Staff		Teacher	
Age	Male	Female	Male	Female
Under 25	0.02%	0.02%	0.01%	0.01%
25	0.02%	0.02%	0.01%	0.01%
26	0.04%	0.02%	0.01%	0.01%
27	0.06%	0.02%	0.01%	0.01%
28	0.08%	0.02%	0.01%	0.01%
29	0.10%	0.02%	0.01%	0.01%
30	0.10%	0.04%	0.03%	0.02%
31	0.11%	0.06%	0.03%	0.02%
32	0.12%	0.08%	0.03%	0.02%
33	0.13%	0.10%	0.03%	0.02%
34	0.14%	0.12%	0.03%	0.02%
35	0.15%	0.12%	0.04%	0.03%
36	0.16%	0.14%	0.04%	0.04%
37	0.17%	0.16%	0.04%	0.05%
38	0.18%	0.18%	0.04%	0.06%
39	0.19%	0.20%	0.04%	0.07%
40	0.20%	0.24%	0.06%	0.08%
41	0.22%	0.26%	0.07%	0.09%
42	0.24%	0.28%	0.08%	0.10%
43	0.26%	0.30%	0.09%	0.11%
44	0.28%	0.32%	0.10%	0.12%
45	0.30%	0.36%	0.12%	0.13%
46	0.33%	0.39%	0.14%	0.14%
47	0.36%	0.42%	0.16%	0.15%
48	0.39%	0.45%	0.18%	0.16%
49	0.42%	0.48%	0.20%	0.17%
50	0.45%	0.50%	0.22%	0.18%
51	0.48%	0.56%	0.25%	0.21%
52	0.51%	0.62%	0.28%	0.24%
53	0.54%	0.68%	0.31%	0.27%
54	0.57%	0.74%	0.34%	0.31%
55	0.60%	0.80%	0.35%	0.35%
56	0.63%	0.85%	0.35%	0.35%
57	0.66%	0.90%	0.35%	0.35%
58	0.69%	0.95%	0.35%	0.35%
59	0.72%	1.00%	0.35%	0.35%
60	0.75%	1.05%	0.35%	0.35%
61	0.80%	1.10%	0.35%	0.35%
62+	0.85%	1.15%	0.35%	0.35%

20% of disabilities for Staff and 10% of disabilities for Teachers are assumed to be accidental disabilities. Disability rates do not apply while eligible for retirement.

Actuarial Valuation Assumptions

Retirement. Upon eligibility, active members are assumed to retire as follows:

Staff

Staff Hired Before July 1, 2011
Years of Eligibility Service

Age	2	3	4	5-9	10-14	15-19	20-24	25-29	30+
Under 55									8%
55						4%	4%	4%	9%
56						6%	7%	7%	9%
57						6%	7%	7%	9%
58						6%	7%	7%	9%
59						6%	7%	7%	9%
60						6%	7%	7%	11%
61						6%	7%	7%	13%
62				6%	10%	10%	10%	20%	20%
63			4%	6%	10%	10%	10%	20%	25%
64		4%	4%	6%	10%	10%	10%	20%	25%
65	4%	4%	4%	15%	15%	20%	20%	20%	25%
66	4%	4%	4%	15%	15%	20%	20%	20%	25%
67	4%	4%	4%	15%	15%	20%	20%	20%	35%
68	4%	4%	4%	12%	15%	20%	20%	20%	30%
69	4%	4%	4%	12%	15%	20%	20%	20%	30%
70-79	4%	4%	4%	20%	25%	25%	30%	30%	35%
80+	100%	100%	100%	100%	100%	100%	100%	100%	100%

Staff Hired On or After July 1, 2011
Years of Eligibility Service

Age	10	11-14	15	16-19	20-24	25-29	30+
Under 55							8%
55							9%
56							9%
57							9%
58							9%
59							9%
60			6%	6%	7%	7%	11%
61			6%	6%	7%	7%	13%
62			10%	6%	7%	10%	20%
63			15%	6%	7%	15%	25%
64			20%	6%	7%	20%	25%
65	25%	15%	35%	20%	20%	20%	25%
66	35%	15%	20%	20%	20%	20%	25%
67	40%	15%	20%	20%	20%	20%	35%
68	45%	15%	20%	20%	20%	20%	30%
69	50%	15%	20%	20%	20%	20%	30%
70-79	50%	25%	25%	25%	30%	30%	35%
80+	100%	100%	100%	100%	100%	100%	100%

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Actuarial Valuation Assumptions

Teachers

Teachers Hired Before July 1, 2011
Years of Eligibility Service

Age	2	3	4	5-9	10-14	15-19	20-24	25-29	30+
Under 55									11%
55						4%	4%	4%	13%
56						6%	7%	7%	13%
57						6%	7%	7%	13%
58						6%	7%	7%	13%
59						6%	7%	7%	13%
60						6%	7%	7%	15%
61						6%	7%	7%	17%
62				10%	10%	17%	17%	21%	25%
63			4%	10%	10%	17%	17%	21%	25%
64		4%	4%	10%	10%	17%	17%	21%	25%
65	4%	4%	4%	20%	20%	20%	25%	25%	30%
66	4%	4%	4%	20%	20%	20%	25%	25%	30%
67	4%	4%	4%	20%	20%	20%	25%	25%	30%
68	4%	4%	4%	15%	15%	20%	25%	25%	30%
69	4%	4%	4%	15%	15%	20%	25%	25%	30%
70-79	4%	4%	4%	25%	25%	25%	30%	30%	35%
80+	100%	100%	100%	100%	100%	100%	100%	100%	100%

Teachers Hired On or After July 1, 2011
Years of Eligibility Service

Age	10	11-14	15	16-19	20-24	25-29	30+
Under 55							11%
55							13%
56							13%
57							13%
58							13%
59							13%
60				6%	6%	7%	7%	15%
61				6%	6%	7%	7%	17%
62			17%	6%	7%	10%	25%
63			22%	6%	7%	15%	25%
64			27%	6%	7%	25%	25%
65	35%	20%	35%	25%	25%	30%	30%
66	45%	20%	20%	25%	25%	30%	30%
67	55%	20%	20%	25%	25%	30%	30%
68	55%	15%	20%	25%	25%	30%	30%
69	60%	15%	20%	25%	25%	30%	30%
70-79	60%	25%	25%	30%	30%	35%	35%
80+	100%	100%	100%	100%	100%	100%	100%

Actuarial Valuation Assumptions

General Turnover. A sample of these rates follows:

		Staff				Teachers
		Age				
Service	**Under 30**	**30-34**	**35+**		**Service**	
0	15.50%	12.50%	11.00%		**0**	11.00%
1	14.00%	11.00%	9.50%		**1**	9.00%
2	12.50%	9.50%	8.00%		**2**	7.50%
3	11.50%	8.50%	7.00%		**3**	6.75%
4	10.00%	7.00%	5.50%		**4**	6.00%
5	8.00%	5.00%	3.50%		**5**	5.50%
6	7.75%	4.75%	3.25%		**6**	5.00%
7	7.50%	4.50%	3.00%		**7**	4.25%
8	7.25%	4.25%	2.75%		**8**	4.00%
9	7.00%	4.00%	2.50%		**9**	3.50%
10	6.75%	3.75%	2.25%		**10**	3.00%
11	6.50%	3.50%	2.00%		**11**	2.75%
12	6.25%	3.25%	1.75%		**12**	2.50%
13+	6.00%	3.00%	1.50%		**13**	2.25%
					14	2.00%
					15	1.75%
					16	1.50%
					17	1.25%
					18	1.00%
					19+	0.75%

Benefit Commencement Age. Terminated vested members eligible for a deferred benefit are assumed to commence benefits at the following ages:

Employees' Retirement System
- Age 60

Employees' Pension System
- Age 60 with 15 or more years of eligibility service
- Age 62 with less than 15 years of eligibility service

Administrative Expenses. Assumed administrative expenses were added to the Normal Cost and are equal to 105% of the average administrative expenses over the past three years. (First effective with the actuarial valuation as of July 1, 2017.)

Valuation	Actual Administrative Expenses				Assumed Expenses
Year	**3 Years Prior**	**2 Years Prior**	**1 Year Prior**	**3-Year Average**	**Added to Normal Cost**
2017	$ 2,217,291	$ 2,012,071	$ 1,151,736	$ 1,793,699	$ 1,883,400
2018	2,012,071	1,151,736	1,209,068	1,457,625	1,530,500

Actuarial Valuation Assumptions

Unused Sick Leave. Benefit service is increased by 1.7% to take into account benefit service credited for unused sick leave.

Marital Status. 80% of active members are assumed to be married.

Spouse Age. The female spouse is assumed to be three years younger than the male spouse.

Part Time Employees.
Employees' Retirement System
- o Assumed to annually earn a full year of credited service. Benefit equals scheduled pay times credited service.

Employees' Pension System
- o Assumed to annually earn a full year of eligibility service and a partial year of credited service. The partial year of credited service is based on the employee's full time equivalent factor. Benefit equals full time equivalent pay times credited service.

Form of Payment Election. Members are assumed to elect a life annuity.

Benefit Service. Exact fractional years of service are used to determine the amount of benefit payable.

Decrement Timing. Retirements and terminations are assumed to occur at the end of the year and deaths and disabilities are assumed to occur in the middle of the year. (First effective with the actuarial valuation as of July 1, 2017.)

Decrement Operation. Turnover decrements do not operate after the member reaches retirement eligibility. Disability decrements operate during retirement eligibility.

Pay Increase rates are applied based on credited service.

Retirement rates are applied based on eligibility service.

Termination rates are applied based on the difference between participant age based on Date of Birth and hire age based on Plan Entry Date.

Eligibility Testing. Eligibility for benefits is determined based upon the exact age and service on the date the decrement is assumed to occur.

Pay Increase Timing. Beginning of the (fiscal) year. (First effective with the actuarial valuation as of July 1, 2017.)

Healthcare Related Assumptions

Health Care Trend Assumptions

Year	Medical	Rx	Dental	Vision
2019	8.00%	10.00%	4.50%	3.50%
2020	7.50%	9.50%	4.50%	3.50%
2021	7.00%	9.00%	4.50%	3.50%
2022	6.50%	8.50%	4.50%	3.50%
2023	6.00%	8.00%	4.50%	3.50%
2024	5.50%	7.50%	4.50%	3.50%
2025	5.00%	7.00%	4.50%	3.50%
2026	4.50%	6.50%	4.50%	3.50%
2027	4.50%	6.00%	4.50%	3.50%
2028	4.50%	5.50%	4.50%	3.50%
2029	4.50%	5.00%	4.50%	3.50%
2030+	4.50%	4.50%	4.50%	3.50%

Trend is assumed to increase January 1 each year.

Medicare Coverage. Assumed to be available for all covered employees on attainment of age 65. Disabled retirees were assumed to be eligible for Medicare coverage at age 65.

Election Percentage. It was assumed that 80% of future retirees would elect retiree health care benefits. Of the retirees assumed to elect retiree health care benefits, retirees were assumed to elect one-person or two-person coverage as follows:

	1 Person Coverage	2 Person Coverage
Under 65 at Retirement		
Males	30%	70%
Females	40%	60%
65+ at Retirement		
Males	30%	70%
Females	50%	50%

For those that elect two-person coverage, it was assumed that coverage would continue to the spouse upon death of the retiree, if eligible.

Adjustments Due to the Estimated Impact of Excise Tax under Healthcare Reform

Beginning in 2022, the Patient Protection and Affordable Care Act (PPACA) imposes a 40% excise tax on healthcare plan costs over certain statutory limits. The annual statutory limits for 2018 depend on the age and coverage tier as shown below:

	Age Less Than 55 or Greater Than 64	Age Greater Than 54 and Less Than 65
Single Person Coverage	$10,200	$11,850
All Other Coverage Types	27,500	30,950

These thresholds will be updated before the tax takes effect in 2022, and after 2022 the statutory limits are increased by the Consumer Price Index for all Urban Consumers (CPI-U) rate. The statutory limits don't recognize differences due to region, health status of the group or plan design. Healthcare plan costs may be blended among active members, pre-Medicare retirees and Medicare retirees if members are covered by the same plan, and similar benefits are provided. Healthcare plan costs subject to the excise tax include: medical, prescription and employer Health Savings Accounts and Health Reimbursement Accounts.

For the July 1, 2018, actuarial valuation, the impact of the excise tax was estimated by:

1) Averaging costs separately for the PPO plans and HMO plans;
2) Projecting average plan costs based on the assumed actuarial valuation trend rate;
3) Projecting the statutory limits assuming a CPI-U rate of 3.0%;
4) Estimating the projected excise tax based on the projected average costs and statutory limits; and
5) Developing a load on actuarial accrued liabilities, applied to the explicit costs, to approximate the impact of the additional excise tax costs. **The additional load was 5.9%, which was applied to the medical and prescription drug total actuarial accrued liability.**