Municipal Pensions Oversight Board

Municipal Policemen's and Firemen's Pension and Relief Funds of West Virginia

Experience and Assumption Study
July 1, 2017 to June 30, 2020 Experience

Bolton

Submitted by:

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July 7, 2023

Mr. Blair M. Taylor
Executive Director
West Virginia Municipal Pensions Oversight Board
301 Eagle Mountain Road, Suite 251
Charleston, WV 25311

Dear Blair,

This report presents the results of our experience study of the 53 Municipal Policemen's and Firemen's Pension and Relief Funds of West Virginia and includes our recommended changes to plan assumptions. These recommendations are generally based on:

- Our findings from the study of the demographic and economic experience of the plans for the period June 1, 2017 through June 30, 2020, and
- Our expectations, based on professional judgement, estimates inherent in market data, emerging trends, and expert opinions, of future experience.

We summarize our recommendations in the *Summary of Recommendations* section and provide details of our analysis in the *Demographic Assumptions* and *Economic Assumptions* sections. Finally, we present in the *Impact of Changes* section the effect of the proposed changes on plan liabilities and funding levels based on the July 1, 2021 actuarial valuations. The actual recommended changes will be implemented for the July 1, 2023 valuations in accordance with the West Virginia Municipal Pensions Oversight Board *Experience Study Procedure* issued June 16, 2017.

The actuarial methods, including the cost allocation, asset smoothing methods, amortization methods, and roll-forward methods, were changed as part of the recommendations of the prior experience study. We reviewed these methods during this study and do not recommend any changes to the actuarial methods.

Respectfully submitted,

James Ritchie, ASA, EA, FCA, MAAA

Jordan McClane, FSA, EA, FCA, MAAA

Table of Contents

Section I. Introduction

An actuarial valuation is based on certain future assumptions about demographic and economic experience that impacts the payment of future benefit payments and the liabilities of a pension plan. Actuarial Standards of Practice (ASOPs) numbers 27 and 35 require the actuary to select assumptions that are individually reasonable and consistent with other assumptions. In addition, both ASOPs require the actuary disclose the rationale for the assumptions used in the valuation. An experience study looks at both past experience and future expectations to assist an actuary in developing reasonable assumptions that are consistent with each other and to provide reasonable rationale for selecting each material assumption.

This report reviews the actuarial experience of the Municipal Policemen's and Firemen's Pension and Relief Funds of West Virginia during the three-year period from July 1, 2017 to June 30, 2020, in order to consider changes in actuarial assumptions or validate the assumptions currently being used in the annual valuations. Based on the review of plan experience and considerations regarding future expectations, several changes in actuarial assumptions were recommended for approval by the West Virginia Municipal Pensions Oversight Board (WV MPOB) and were approved at the Board meeting dated June 15, 2023.

This is the second experience study that Bolton has conducted for the Municipal Policemen's and Firemen's Pension and Relief Funds of West Virginia. The first study examined the data from July 1, 2014 through June 30, 2017. Based on that analysis, we recommended changes to nearly all of the actuarial assumptions. In the prior experience study we analyzed the termination, retirement, and salary scale assumptions separately for police and fire plans. Previous experience studies blended the experience of these assumptions for both police and fire plans. As a result of that analysis, we recommended separate retirement and termination rates for the police and the fire plans.

The current experience study only covered about four months of the COVID 19 pandemic. We did not make any additional adjustments to future expectations as a result of the pandemic. Overall, our analysis showed that the current assumptions were mostly justified by the experience during the study period. As a result, we have recommend only small changes to the current assumptions, which in turn, are anticipated to have a minor impact to the valuation results in total.

Section V of this report presents the impact of proposed assumption changes on the liabilities and funding levels had these new assumptions been in place for the July 1, 2021 valuation. Actual changes will first impact the July 1, 2023 valuation, which will develop the contributions for FY 2025.

The long-term cost of the plans is not dependent on assumptions but rather is based on actual plan experience, including changes in plan demographics and fluctuations in the general economy (such as variations in inflation or interest rate levels), which translate into tangible costs for the plan through:

(1) the plan benefits paid (including cost-of-living adjustments, COLAs, as applicable),
(2) the investment return on plan assets, and
(3) the payment of other plan-related expenses.

Despite the lack of influence that assumptions have on long-term plan costs, a current value of expected future plan benefits needs to be calculated regularly (generally, annually) to orderly determine an appropriate amount of money to set aside for prefunding benefits. Such a determination requires the use of assumptions about future events. As actual experience differs

from the assumptions, the expected cost of the plans and, consequently, the contributions to fund the plans generally[1] will gradually change. Ideally, the assumptions will closely track actual experience. However, for some assumptions (e.g., investment return), actual experience will commonly and materially vary from the assumption from year to year. As such, reasonable assumptions should not only be appropriate for the purpose of the measurement, but they should also be unbiased in nature such that they balance expected upward and downward deviations in experience.

While the cost of the plan will "self-adjust" to reflect actual experience, it is important to review and reset the assumptions from time to time to:

(1) minimize experience gains and losses,
(2) reduce contribution volatility, and
(3) achieve a better level of intergenerational taxpayer equity.

However, if a plan is not actuarially funded, such as the plans that use the Alternative and Conservation funding policies, the self-adjustment may not occur since experience might not impact plan funding.

For some assumptions (e.g., mortality), the experience of the plans alone is insufficient to be statistically significant, and as such, industry tables and experience should be considered when setting those assumptions.

Also, certain economic assumptions (e.g., inflation) require longer periods of experience to be considered in conjunction with future expectations. Three actuarial valuation assumptions tied to the economy are:

(1) COLAs or increases to the Consumer Price Index (CPI)
(2) salary increases, and
(3) investment return

In conducting this experience study, we emphasized the importance of developing assumptions that reflect a best estimate of *future* plan experience. Rather than change every assumption to exactly match actual recent experience, we have analyzed the *trends* inherent in that experience and have developed assumptions that reflect expectations of future experience.

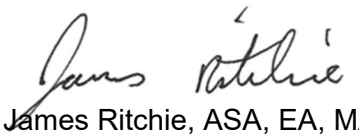
Bolton has prepared this report exclusively for the WV MPOB. The purpose of this report is to provide recommended assumption changes and the impact of those recommendations on plan liabilities and annual contributions for GASB 67/68 reporting. This report may not be used or relied upon by any other party or for any other purpose; Bolton Partners is not responsible for the consequences of any unauthorized use.

This report is based on 2017 data provided by the prior actuary, GRS, and the 2018 – 2020 data provided by the 53 municipal plans. The plans are solely responsible for the validity, accuracy and comprehensiveness of this information. If the data supplied are not accurate and complete, the experience study results may differ significantly from the results that would be obtained with accurate and complete information; such a scenario could require a later revision of this report. While we did not audit the data, we do find that the data is appropriate for the purpose being used.

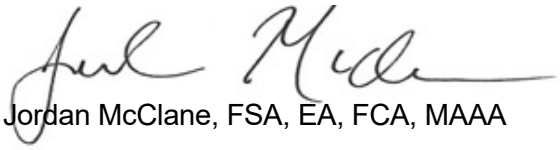
[1] If the contribution calculation methodology does not adhere to actuarial principles for developing Actuarially Determined Contributions (ADCs) or if the plan sponsor does not make contributions that align with the ADC, differences between experience and plan assumptions may not impact actual plan contributions.

Professional Qualifications

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



James Ritchie, ASA, EA, MAAA, FCA



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Section II. Summary of Recommendations

Time periods during and immediately following the period studied experienced a variety of high-impact events. For example: investment market highs and lows, fluctuations in the economy and government spending, COVID, and high inflation. Other than COVID, these events are not rare but subject the study to "starting point bias." The bias concern is that results based on averaging past data points (e.g., salary increases, mortality) during periods of high volatility may depend largely on the start and end points of the period studied. Thus, the average may not represent our expectations for the future. Deciding what is an outlier versus a new reality requires judgement. For example, the Society of Actuaries tracked higher mortality due to COVID but recently decided against using the data in developing the latest mortality improvement scale. Furthermore, recent inflation might not yet be fully reflected in wages and, as such, wages may change in the future. For this study we have relied on experience, judgement, and caution when making recommendations.

Although the study period briefly overlapped (March 2020 – June 2020) with COVID, demographic experience for the fiscal year ending June 30, 2020 did not appear to drastically differ from prior years. Thus, we did not make special adjustments to the actual experience or recommended assumptions for the impact of the pandemic. If a noticeable impact exists, it may be easier to identify in the next experience study.

We have the following recommendations related to the demographic assumptions:

- Update the mortality projection scale from Scale MP-2019 to MP-2021.
- Update the retirement rate assumption by increasing rates at ages 50 and 57-59 for police officers and decreasing rates at ages 57-59 for firefighters.
- Update the turnover rate assumption by increasing rates at ages 21-24 and 27-28 for police officers and increasing rates for ages 29 and younger for firefighters.
- Scale down all disability rates by 25% but keep the line-of-duty disability percentage assumption unchanged at 50% of total disabilities.

We have the following recommendations related to the economic assumptions:

- Decrease the COLA assumption from 2.50% to 2.45%.

We recommend no changes to the following assumptions:

- Marriage percentage and spouse age difference
- Inflation
- Salary scale
- Discount rate
- Expense load
- Premium tax allocation inflation
- New hire pay growth (i.e. general wage inflation excluding merit and promotion)
- Actuarial cost method
- Asset method
- Amortization policy
- Contribution timing

We discuss the actual experience and the reasons for these recommended assumption changes in Sections III (*Demographic Assumptions*) and IV (*Economic Assumptions*) and show the effect of these changes on the pension funding levels in Section V (*Impact of Changes*).

Section III. Demographic Assumptions

This section addresses our review and recommendations regarding all demographic assumptions.

Mortality

The current assumption is:

Healthy (Post-Retirement):
PubS-2010 (B) Healthy Retiree Mortality Table projected generationally from the 2010 base year using Scale MP-2019

Disabled
PubS-2010 Disabled Retiree Mortality Table with base rates set forward 5 years and projected generationally from the 2010 base year using Scale MP-2019

Healthy (Pre-Retirement):
PubS-2010 (B) Employee Mortality Table projected generationally from the 2010 base year using Scale MP-2019

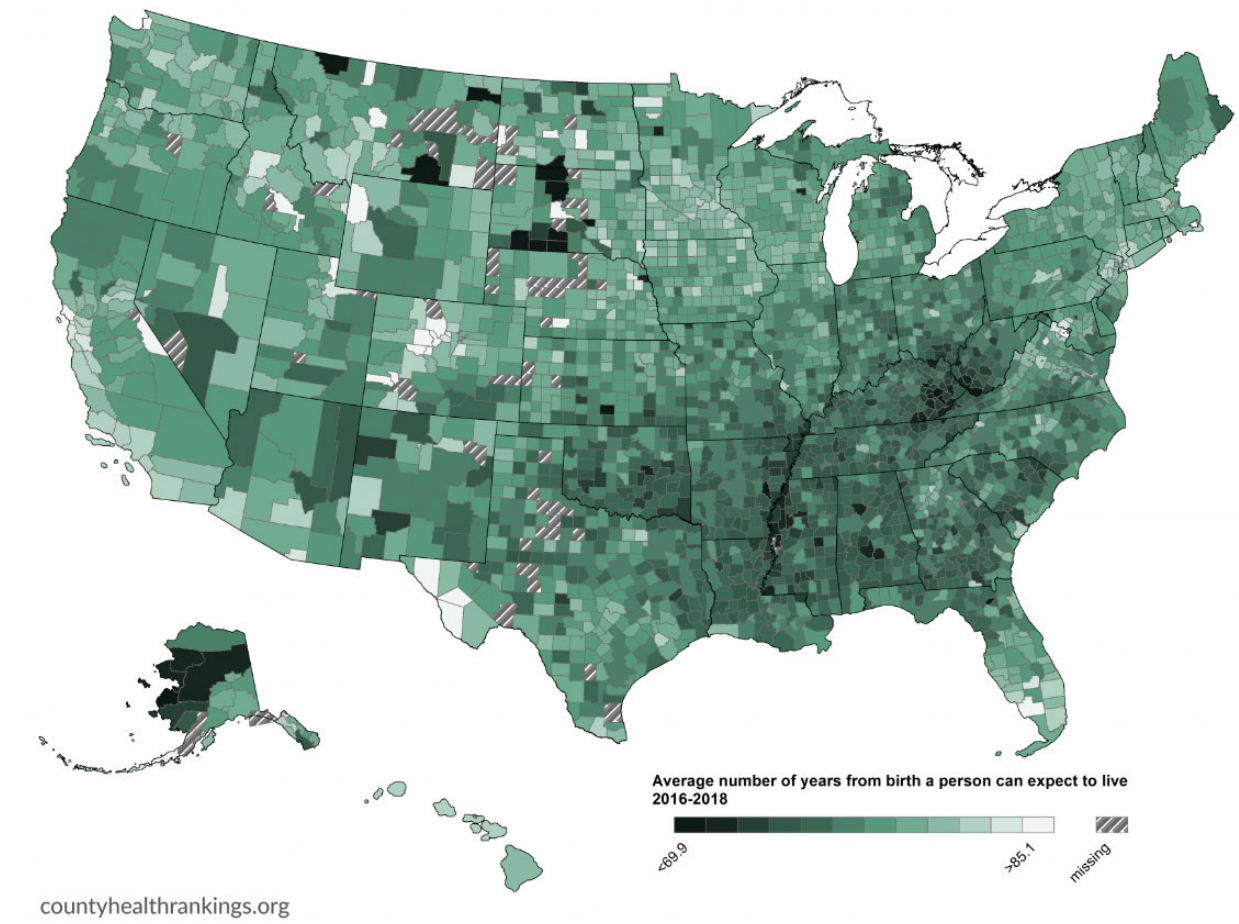
The mortality experience over the last three years is as follows:

	Number of Deaths		
Population	Expected	Actual	Actual/Expected
Healthy Retirees and Beneficiaries	169.9	207	122%
Disabled Retirees	22.4	22	98%
Pre-Retirement	4.4	2	45%

The above results are based on headcounts (i.e. the number of deaths). However, numerous studies (including by the Society of Actuaries and mortality data analytics firm ClubVita) have shown that mortality rates are correlated with income level. Members with larger pensions are generally expected to live longer, on average, than members with lower pensions. The actual-to-expected ratios generally decline when weighting mortality experience by benefit amounts:

	Amount-Weighted Deaths		
Population	Expected	Actual	Actual/Expected
Healthy Retirees and Beneficiaries	$4.110M	$4.802M	117%
Disabled Retirees	$0.487M	$0.455M	93%
Pre-Retirement	$0.152M	$0.091M	60%

On both a headcount-weighted and amount-weighted basis, the post-retirement healthy mortality deaths (headcounts and dollars) were higher than expected. This result is consistent with higher general mortality in West Virginia compared to national averages. The following graphic from the *2020 County Health Rankings Key Findings Report* illustrates this point.



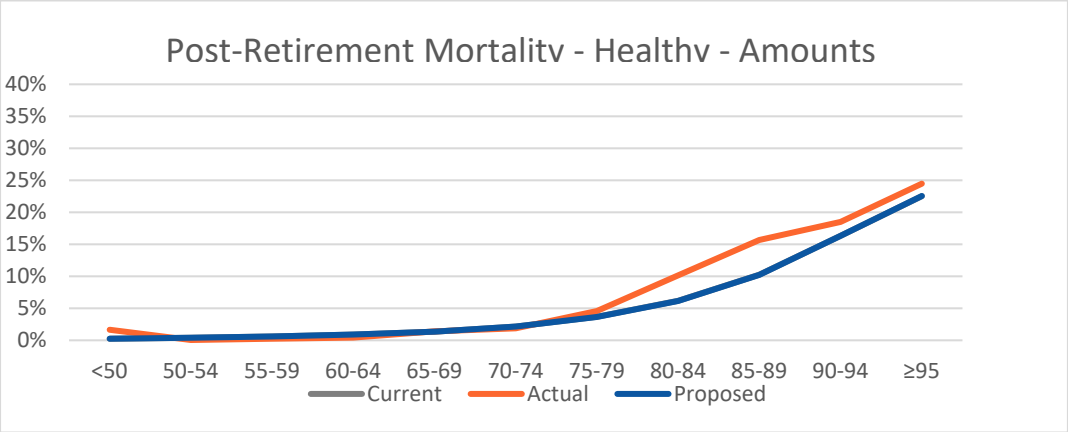
The Board's June 16, 2017 *Experience Study* procedure includes the following statement:

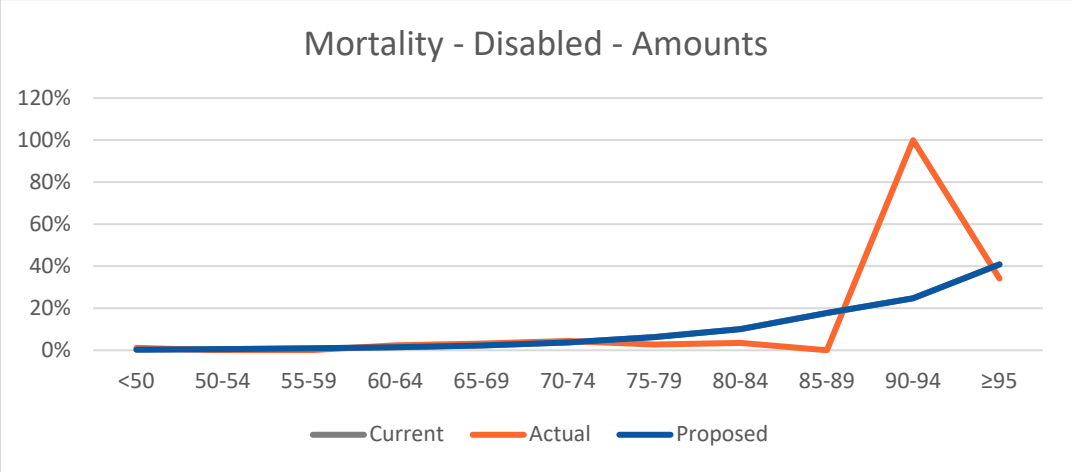
> "The actuary must use the most recent accepted mortality tables as directed by the Actuarial Standards of Practice (ASOP) in effect at the time of the experience study. It is expected the mortality tables used will at a minimum be two-dimensional tables, which include a generational mortality component."

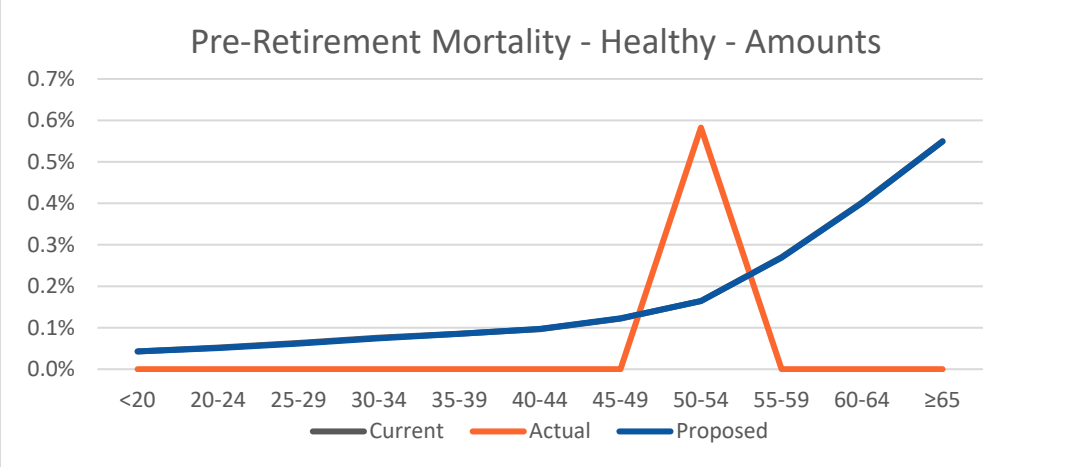
The PubS-2010 base mortality tables are the Society of Actuaries' (SOA's) most recently published mortality tables for public safety personnel. The current assumption uses the below median income version[2] (i.e. the "(B)" in the name of the table) of the public safety mortality tables. These tables were recommended in the prior experience study to capture the higher state mortality rates compared to the national averages. Although recent mortality experience for healthy retirees and beneficiaries shows more deaths than anticipated by the below median income versions of the tables, the experience over the last three years lacks the number of deaths required for credibility in creating custom mortality tables. **Thus, we recommend no changes to the base mortality tables. However, we recommend updating the mortality improvement scale from MP-2019 to MP-2021 (the most recent scale published by the SOA).**

The following three graphs show the amount-weighted mortality rates for the actual experience, as well as the current assumptions and proposed assumptions. Note that the change to the improvement scale had such a minor impact on the expected number of deaths, that the difference is imperceivable from the current assumptions (blue line overlays grey line).

[2] a below median income version for disabled retirees was not produced by the SOA


Post-Retirement Mortalitv - Healthv - Amounts
40%
35%
30%
25%
20%
15%
10%
5%
0%
<50
50-54
55-59
60-64
65-69
70-74
75-79
80-84
85-89
90-94
≥95
Current
Actual
Proposed


Mortality - Disabled - Amounts
120%
100%
80%
60%
40%
20%
0%
<50
50-54
55-59
60-64
65-69
70-74
75-79
80-84
85-89
90-94
≥95
Current
Actual
Proposed


Pre-Retirement Mortality - Healthy - Amounts
0.7%
0.6%
0.5%
0.4%
0.3%
0.2%
0.1%
0.0%
<20
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
≥65
Current
Actual
Proposed

Retirement

Normal retirement is defined as the earlier of (1) age 50 and the completion of 20 years of service and (2) age 65. The plans do not have early retirement benefits. Current retirement assumptions are based on age for those who have the required service:

Age	Current Police Rate	Current Fire Rate
50	60%	55%
51	40%	35%
52	40%	35%
53	40%	25%
54	40%	25%
55	50%	25%
56	50%	25%
57	40%	25%
58	40%	25%
59	40%	25%
60+	100%	100%

The experience (see tables on the following pages) shows that (1) more retirement-eligible Police members are retiring at ages 50 and 57-59 than expected and (2) fewer retirement-eligible Fire members are retiring at ages 57-59.

We recommend the following proposed rates, which are reflected in the "Actual/Expected (Proposed Rates)" columns of the tables on the following pages:

Age	Current Police Rate	Proposed Police Rate	Current Fire Rate	Proposed Fire Rate
50	60%	70%	55%	55%
51	40%	40%	35%	35%
52	40%	40%	35%	35%
53	40%	40%	25%	25%
54	40%	40%	25%	25%
55	50%	50%	25%	25%
56	50%	50%	25%	25%
57	40%	50%	25%	15%
58	40%	50%	25%	15%
59	40%	50%	25%	15%
60+	100%	100%	100%	100%

The following two tables show, by age, the number of retirement exposures, the expected number of retirements using the current assumptions, the actual number of retirements, the actual-to-expected ratios using the current assumptions, the expected number of retirements using the proposed assumptions, and the actual-to-expected ratios using the proposed assumptions.

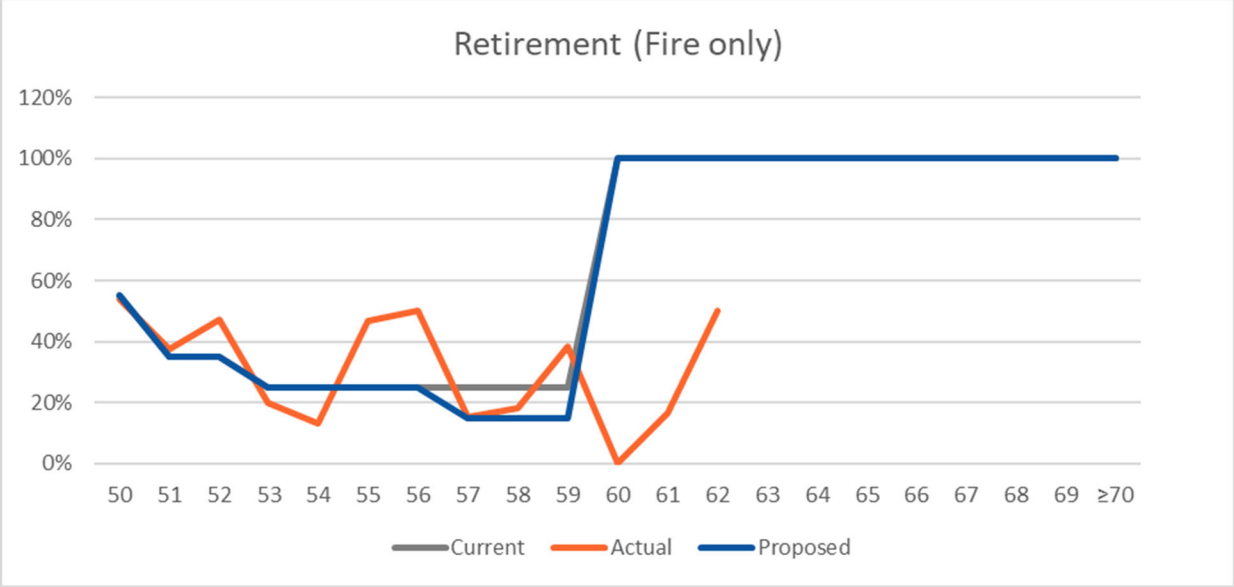
Presented beneath each table is a graph of the rates of retirement based on actual experience, the current retirement assumptions, and the proposed retirement assumptions.

B

Retirement Rates (Police Only)						
Age	Exposures	Expected from Current Assumptions	Actual	Actual / Expected	Expected from Proposed Assumption	Actual / Expected (Proposed Rates)
50	63	37.8	45	119%	44.1	102%
51	23	9.2	10	109%	9.2	109%
52	13	5.2	7	135%	5.2	135%
53	10	4.0	7	175%	4.0	175%
54	7	2.8	-	0%	2.8	0%
55	6	3.0	6	200%	3.0	200%
56	4	2.0	4	200%	2.0	200%
57	1	0.4	-	0%	0.5	0%
58	1	0.4	1	250%	0.5	200%
59	1	0.4	1	250%	0.5	200%
60	-	-	-	-	-	-
61	-	-	-	-	-	-
62	2	2.0	2	100%	2.0	100%
63	1	1.0	-	0%	1.0	0%
64	1	1.0	-	0%	1.0	0%
65	1	1.0	1	100%	1.0	100%
66	-	-	-	-	-	-
67	-	-	-	-	-	-
68	-	-	-	-	-	-
69	-	-	-	-	-	-
≥70	-	-	-	-	-	-
Total	**134**	**70.2**	**84**	**120%**	**76.8**	**109%**

B

Retirement Rates (Fire Only)						
Age	Exposures	Expected from Current Assumptions	Actual	Actual / Expected	Expected from Proposed Assumption	Actual / Expected (Proposed Rates)
50	50	27.5	27	98%	27.5	98%
51	24	8.4	9	107%	8.4	107%
52	17	6.0	8	134%	6.0	134%
53	15	3.8	3	80%	3.8	80%
54	15	3.8	2	53%	3.8	53%
55	15	3.8	7	187%	3.8	187%
56	8	2.0	4	200%	2.0	200%
57	13	3.3	2	62%	2.0	103%
58	11	2.8	2	73%	1.7	121%
59	13	3.3	5	154%	2.0	256%
60	8	8.0	-	0%	8.0	0%
61	6	6.0	1	17%	6.0	17%
62	2	2.0	1	50%	2.0	50%
63	-	-	-	-	-	-
64	-	-	-	-	-	-
65	-	-	-	-	-	-
66	-	-	-	-	-	-
67	-	-	-	-	-	-
68	-	-	-	-	-	-
69	-	-	-	-	-	-
≥70	-	-	-	-	-	-
Total	**197**	**80.4**	**71**	**88%**	**76.7**	**93%**



Assumed retirement rates are generally different for plans that have a Deferred Retirement Option Program (DROP). As of the July 1, 2021 actuarial valuations, four plans (Beckley Fire, Beckley Police, Clarksburg Fire, and Wheeling Fire) have DROPs. Within these plans, there have only been a handful of retirements since implementing the DROPs. As such, we have drawn on our experience with other plans throughout the nation that offer DROPs in developing a methodology to adjust the retirement rates for plans without a DROP (above) to accommodate shifting retirement behavior under DROPs. The methodology is the same as that used to develop the DROP entry retirement rates used in the 2021 valuations for these four DROP plans.

The philosophy underlying the adjustment methodology is that the implementation of DROPs may make some members enter DROP earlier than they would have otherwise retired and may make some members stay longer (through DROP exit) than they would have otherwise in the absence of a DROP.

All four current DROPs have a maximum DROP participation period of five years. The current assumption is that members currently in DROP as of the valuation date are assumed to exit DROP upon the earlier of attaining 5 years of DROP participation and attaining age 60. If a member is at least age 60 on the valuation date but has fewer than 5 years of DROP service, the member is assumed to exit DROP in one year. Upon DROP exit, a member is assumed to receive the DROP account balance as a lump sum and start receiving annuity payments. For active members who are not currently in DROP as of the valuation date, the same methodology is applied.

Based on that methodology, we propose the following DROP entry retirement rates and DROP election percentages (the percentage of total retirements that represent members entering DROP versus leaving employment) for plans that have a five-year maximum DROP participation period.

B

Police Plans with DROP

Proposed DROP Entry Retirement Rates

	Years of Service										
Age	20	21	22	23	24	25	26	27	28	29	30
50	91%	91%	91%	91%	91%	91%	91%	91%	91%	91%	91%
51	82%	62%	62%	62%	62%	62%	62%	62%	62%	62%	62%
52	82%	62%	54%	54%	54%	54%	54%	54%	54%	54%	54%
53	82%	61%	54%	69%	69%	69%	69%	69%	69%	69%	69%
54	81%	61%	51%	67%	76%	76%	76%	76%	76%	76%	76%
55	86%	74%	68%	84%	100%	100%	100%	100%	100%	100%	100%
56	86%	71%	62%	80%	100%	100%	100%	100%	100%	100%	100%
57	85%	70%	62%	80%	100%	100%	100%	100%	100%	100%	100%
58	85%	67%	57%	80%	100%	100%	100%	100%	100%	100%	100%
59	80%	67%	50%	67%	100%	100%	100%	100%	100%	100%	100%
60	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Proposed DROP Election Rates

	Years of Service										
Age	20	21	22	23	24	25	26	27	28	29	30
50	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%
51	80%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%
52	81%	14%	25%	25%	25%	25%	25%	25%	25%	25%	25%
53	81%	12%	22%	22%	22%	22%	22%	22%	22%	22%	22%
54	80%	10%	19%	19%	32%	32%	32%	32%	32%	32%	32%
55	77%	14%	24%	24%	38%	100%	100%	100%	100%	100%	100%
56	77%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
57	76%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
58	76%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
59	75%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
60	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Fire Plans with DROP

Proposed DROP Entry Retirement Rates

	Years of Service										
Age	20	21	22	23	24	25	26	27	28	29	30
50	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%
51	73%	47%	47%	47%	47%	47%	47%	47%	47%	47%	47%
52	71%	42%	31%	31%	31%	31%	31%	31%	31%	31%	31%
53	64%	32%	24%	27%	27%	27%	27%	27%	27%	27%	27%
54	62%	31%	24%	26%	21%	21%	21%	21%	21%	21%	21%
55	89%	88%	90%	95%	100%	100%	100%	100%	100%	100%	100%
56	87%	67%	61%	82%	100%	100%	100%	100%	100%	100%	100%
57	80%	36%	45%	70%	100%	100%	100%	100%	100%	100%	100%
58	80%	26%	23%	70%	100%	100%	100%	100%	100%	100%	100%
59	66%	26%	15%	26%	100%	100%	100%	100%	100%	100%	100%
60	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Proposed DROP Election Rates

	Years of Service										
Age	20	21	22	23	24	25	26	27	28	29	30
50	73%	73%	73%	73%	73%	73%	73%	73%	73%	73%	73%
51	81%	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%
52	80%	18%	31%	31%	31%	31%	31%	31%	31%	31%	31%
53	84%	29%	45%	45%	45%	45%	45%	45%	45%	45%	45%
54	84%	31%	48%	48%	65%	65%	65%	65%	65%	65%	65%
55	89%	78%	87%	87%	93%	100%	100%	100%	100%	100%	100%
56	89%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
57	93%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
58	93%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
59	91%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
60	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Termination of Employment

Current and proposed termination assumptions, which vary based on age, are displayed below:

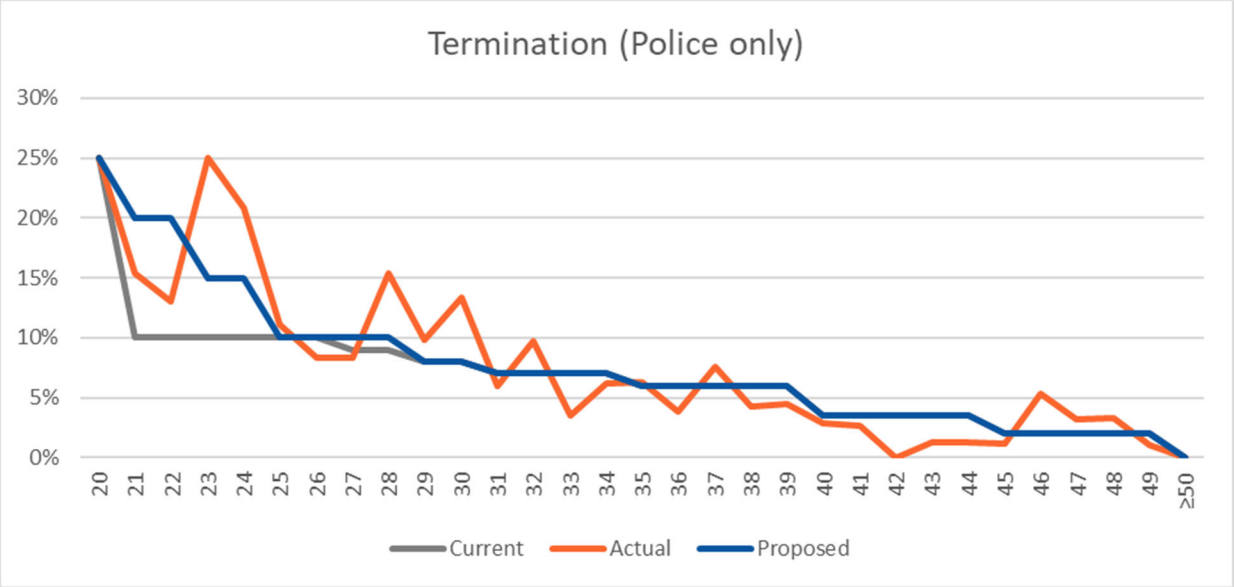
Current Assumption					
Age	Police	Fire	Age	Police	Fire
<20	25%	15%	35	6%	2%
20	25%	15%	36	6%	2%
21	10%	15%	37	6%	2%
22	10%	15%	38	6%	2%
23	10%	9%	39	6%	2%
24	10%	8%	40	3.5%	2%
25	10%	7%	41	3.5%	2%
26	10%	6%	42	3.5%	2%
27	9%	5%	43	3.5%	2%
28	9%	5%	44	3.5%	2%
29	8%	5%	45	2%	1%
30	8%	5%	46	2%	1%
31	7%	4%	47	2%	1%
32	7%	4%	48	2%	1%
33	7%	4%	49	2%	1%
34	7%	4%	>=50	0%	0%

Proposed Assumption					
Age	Police	Fire	Age	Police	Fire
<20	25%	20%	35	6%	2%
20	25%	20%	36	6%	2%
21	20%	20%	37	6%	2%
22	20%	20%	38	6%	2%
23	15%	20%	39	6%	2%
24	15%	20%	40	3.5%	2%
25	10%	10%	41	3.5%	2%
26	10%	9%	42	3.5%	2%
27	10%	8%	43	3.5%	2%
28	10%	7%	44	3.5%	2%
29	8%	6%	45	2%	1%
30	8%	5%	46	2%	1%
31	7%	4%	47	2%	1%
32	7%	4%	48	2%	1%
33	7%	4%	49	2%	1%
34	7%	4%	>=50	0%	0%

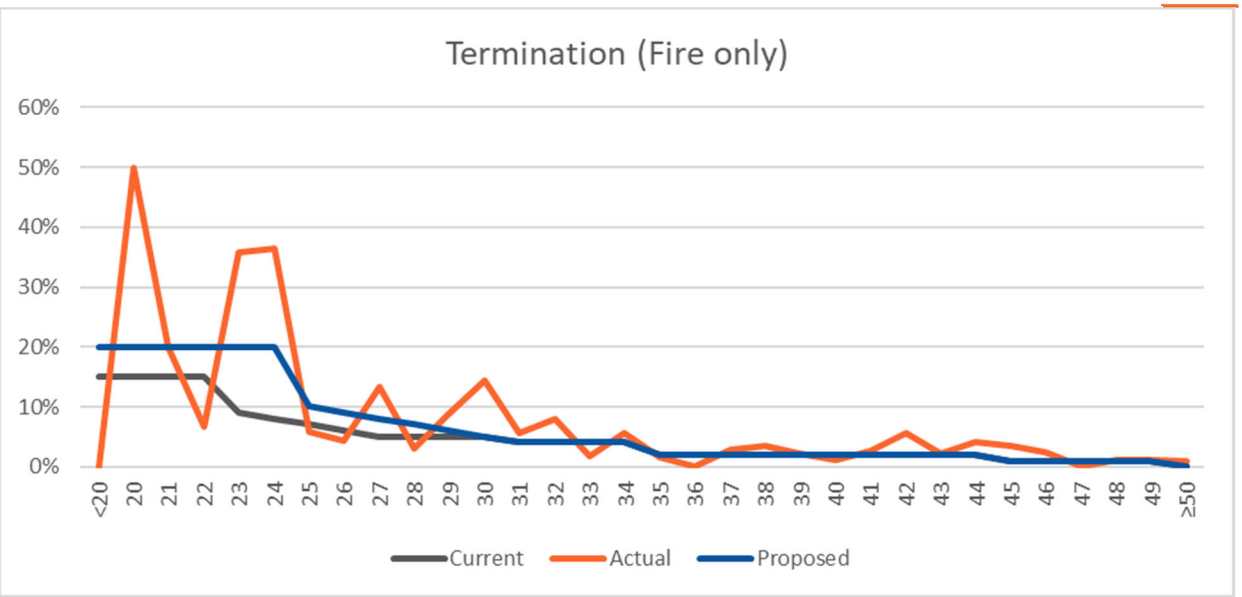
The following two tables show, by age, the number of termination exposures, the expected number of terminations using the current assumptions, the actual number of terminations, the actual-to-expected ratios using the current assumptions, the expected number of terminations using the proposed assumptions, and the actual-to-expected ratios using the proposed assumptions. Presented beneath each table is a graph of the rates of termination based on

actual experience, the current termination assumptions, and the proposed termination assumptions.

Termination Rates (Police Only)						
Age	Exposures	Expected from Current Assumptions	Actual	Actual / Expected	Expected from Proposed Assumptions	Actual / Expected (Proposed Rates)
<20	-	-	-	-	-	-
20-24	128	13.4	26	194%	21.4	121%
25-29	310	28.3	33	116%	29.6	112%
30-34	365	26.2	27	103%	26.2	103%
35-39	374	22.4	20	89%	22.4	89%
40-44	370	13.0	6	46%	13.0	46%
45-49	454	9.1	13	143%	9.1	143%
Total	**2,001**	**112.4**	**125**	**111%**	**121.6**	**103%**



Termination Rates (Fire Only)						
Age	Exposures	Expected from Current Assumptions	Actual	Actual / Expected	Expected from Proposed Assumptions	Actual / Expected (Proposed Rates)
<20	1	0.2	-	0%	0.2	0%
20-24	49	5.7	13	226%	9.8	133%
25-29	137	7.4	10	135%	10.5	95%
30-34	251	10.4	16	154%	10.4	154%
35-39	375	7.5	8	107%	7.5	107%
40-44	437	8.7	14	160%	8.7	160%
45-49	446	4.5	7	157%	4.5	157%
Total	**1,696**	**44.4**	**68**	**153%**	**51.6**	**132%**



The current termination rates for both Police and Fire are highest at younger ages, with rates gradually declining with increases in age. This pattern (higher rates at younger ages and for members with fewer years of service) is common among public safety plans. Since recent experience shows more than anticipated terminations at earlier ages for both Police and Fire, we have proposed increasing the termination rates for these age groups.

Disability Incidence

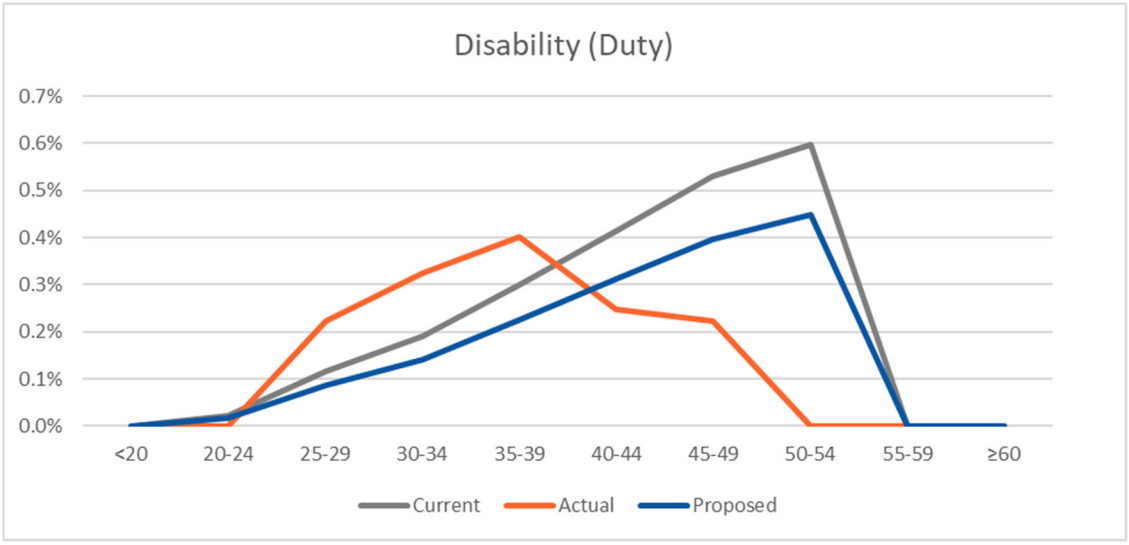
Current disability assumptions are based on age. The assumed disability incidence rates at a few sample ages are presented below:

Age	Rates
30	0.19%
40	0.41%
50	0.60%

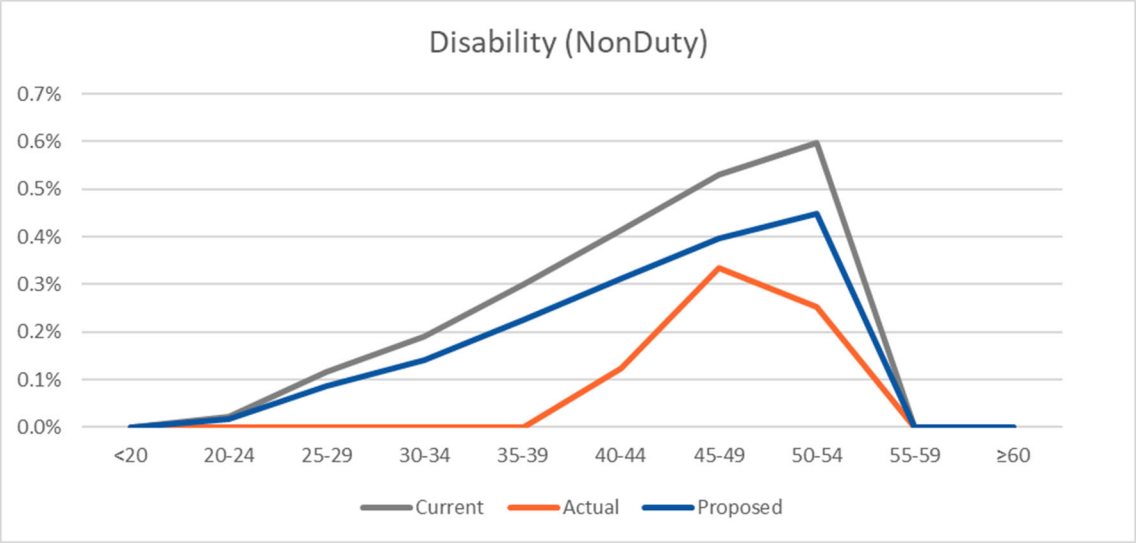
Disability rates generally increase with age. The current assumption is that 50% of all disabilities are duty related and 50% are non-duty related and that 5% of non-duty disabled members receive a 20% reduction in benefits due to gainful employment only through age 65.

Experience from July 1, 2017 through June 30, 2020 is as follows:

Disability Rates (Duty)						
Age	Exposures	Expected from Current Assumptions	Actual	Actual / Expected	Expected from Proposed Assumptions	Actual / Expected (Proposed Rates)
<20	1	-	-	100%	-	100%
20-24	177	0.04	-	0%	0.03	0%
25-29	447	0.52	1	192%	0.39	256%
30-34	616	1.17	2	171%	0.88	228%
35-39	749	2.25	3	134%	1.69	178%
40-44	807	3.35	2	60%	2.51	80%
45-49	900	4.77	2	42%	3.58	56%
50-54	394	2.35	-	0%	1.76	0%
55-59	99	-	-	100%	-	100%
≥60	-	-	-	-	-	-
Totals	**4,190**	**14.45**	**10**	**69%**	**10.83**	**92%**



Disability Rates (Non-Duty)						
Age	Exposures	Expected from Current Assumptions	Actual	Actual / Expected	Expected from Proposed Assumption	Actual / Expected (Proposed Rates)
<20	1	-	-	100%	-	100%
20-24	177	0.04	-	0%	0.03	0%
25-29	447	0.52	-	0%	0.39	0%
30-34	616	1.17	-	0%	0.88	0%
35-39	749	2.25	-	0%	1.69	0%
40-44	807	3.35	1	30%	2.51	40%
45-49	900	4.77	3	63%	3.58	84%
50-54	394	2.35	1	43%	1.76	57%
55-59	99	-	-	100%	-	100%
≥60	-	-	-	-	-	-
Totals	**4,190**	**14.45**	**5**	**35%**	**10.83**	**46%**



Overall, the ratio of actual-to-expected disabilities was approximately 52% (15/29) and 67% were duty related. We recommend lowering the combined (duty plus non-duty related) disability rates by 25% to better align the assumption with recent experience.

Using recent experience to estimate the percentage of expected total disabilities that will be duty related versus non-duty related is difficult due to the small number of actual disabilities over the study period. The previous two experience studies have shown fluctuations in duty related versus non-duty related disabilities in both directions. **Given these historical fluctuations, we recommend keeping the assumption evenly split: 50% duty related and 50% non-duty related.**

Further, given that the plan benefit for non-duty disabilities is partially offset for gainful employment ($1 for every $3 of other income above $18,200 [in 2021; indexed by state minimum wage]), the current valuation assumption for disabilities also includes an additional assumption that 5% of non-duty disabled members receive a 20% reduction in benefits due to gainful employment through age 65. Of all 146 members on non-duty disability in the July 1, 2021 database, 72 were under age 65 on the valuation date and 9 had offsets in the data. In the

prior experience study period, only two members had gainful employment offsets. Given the small sample size and the minimal impact on the valuation results, we suggest keeping the percentage assumption for disabled members with gainful employment offsets at 5% with a 20% reduction in benefits.

Survivor Benefit Assumptions

Marriage Assumptions

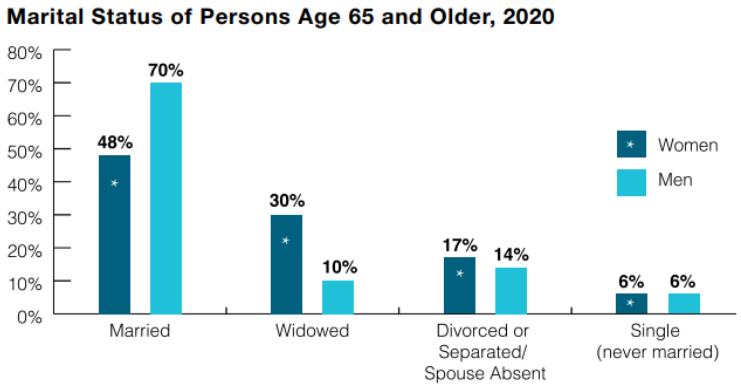
The plan provides the same basic benefit, equal to 60% of the member's accrued benefit[3], for death both pre- and post- retirement. Currently, the actuarial valuation uses an assumption for the percentage of members who are married (70%) and applies a 6% load to pre-retirement death benefits and a 1% load to post-retirement death benefits to capture expected benefits for non-spouse dependent beneficiaries (children, parents, and siblings).

Nationally, rates of marriage vary by age and have generally decreased over time. One survey[4] noted in our prior experience study showed that, in 1960, over 80% of men were married by age 30 and the rate stayed above 80% until about age 80. In 2013, only 40% were married by age 30 and the rate never reached 80%. During the retirement ages, the rate eventually declines as spouses die. Another survey[5] based on the 2010 census showed the percentage married at ages 65 and above as:

Percent Living with a Spouse

	Total	Males	Females
Age 65+	56.6%	70.7%	45.8%
Age 65 to 74	64.2%	73.6%	56.0%
Age 75 to 84	52.7%	70.1%	40.0%
Age 85 & older	33.2%	55.4%	21.7%

Finally, a May 2021 report titled *2020 Profile of Older Americans*, which was published by the Administration for Community Living using data from U.S. Census Bureau, found that 70% of males over age 65 were married in 2020:



[3] If a member has not reached the age and service eligibility requirements for retirement upon death, then for the purposes of the death benefit, the member is assumed to have been normal retirement eligible such that the member's accrued benefit would have been equal to 60% of average annual compensation.

[4] American Community Survey from US Department of Commerce (US Census)

[5] The Department of Commerce publishes reports based on 2010 census data for living arrangements of the household for the population age 65 and over

We also looked at the number of retirees who died in FY18, FY19, and FY20 and had a corresponding non-child beneficiary. The results were the following:

- Retiree deaths with a beneficiary[6]/all retiree deaths = 93/140 = 66%

Based on this recent experience and national marriage trends, **we recommend keeping the percentage marriage assumption at 70%**. For actives, the marriage assumption is generally applied at the date of decrement, while for retirees, the assumption is generally applied on the valuation date.

Non-Spouse Load Assumption

We also considered the load to provide benefits to dependent, non-spouse beneficiaries. Our understanding is that the benefits paid to those dependent individuals are:

- Child: 20% of the participant's benefit until[7] the child attains 18 or marries
- Orphaned child: 25% of the participant's benefit until[8] the child attains 18 or marries
- Parent: 10% of the participant's benefit for life
- Sibling: the sum of fifty dollars per month (but a total not to exceed $100 per month) until such individual attains the age of 18 or marries

There are more details to these provisions (e.g. cap of 100% of member's benefit), but for the purposes of this experience study, the above outlined provisions contain enough detail for our analysis. The benefits to dependent, non-spouse beneficiaries (excluding dependent parents) end at age 18 and the percentage payable to these dependents is less than the 60% paid to a spouse. These benefits are paid in addition to the 60% spousal benefit (i.e. they are additive).

The three benefits which end at age 18 have relatively little cost and are most likely to occur when an employee dies prior to retirement. Depending on when an employee dies and assuming the spouse lives to age 85, the child and sibling benefits would likely be paid for no more than 35% of the time that the spouse benefit would be paid and, in most cases, the non-spouse child or sibling would be over age 18 when the member dies.

Given that the amount of the child benefit[9] is often only 33% of the spouse benefit (20%/60%) and the sibling benefit is much less, and considering the length of time these beneficiary benefits would likely be paid, a load of 5% on the value of the spousal pre-retirement death benefits is probably conservative for estimating the value of these benefits for active members.

Using a similar assumption development methodology, a load of 0.5% should be sufficient for post-retirement death benefits due to the older ages at death postretirement, the corresponding older ages of dependent beneficiaries, and, consequently, the shorter payment periods for those child and sibling dependent beneficiaries.

We expect that only a small percentage of parents are legally dependent on their children. The parent benefit is most likely to apply to retirees since that is when most deaths occur and a load for this would need to be less than 10%/60% = 16.7% due to the older ages of the parents and the possibility they may predecease the member. We recommend a load of 1.0% for pre-retirement and 0.5% for post-retirement deaths.

[6] For this purpose, we combined disabled retirees with other retirees. Some of the counted beneficiaries might not necessarily be spouses.
[7] If the child is disabled, the payment continues beyond age 18 or marriage so long as the child remains disabled.
[8] If the orphaned child is disabled, the payment continues beyond age 18 or marriage so long as the orphaned child remains disabled.
[9] We give little value to the dependent brother/sister benefit

To summarize this section, we recommend keeping the total pre-retirement death benefit load at 6.0% (5% + 1%) and total post-retirement death benefit load at 1.0% (0.5% + 0.5%).

Remarriage rate

Our understanding is that spousal benefits end on remarriage. There is no explicit assumption for this purpose. There is some available US Census data[10] but it is not all relevant. For example, for females aged 60-69, we know:

- 5.9% were never married
- 64.0% were married once
- 22.4% were married twice
- 7.6% were married three or more times

Many of the marriages would be after divorce and not after the death of a spouse. This also does not tell us the likelihood that a surviving spouse will remarry when there is a pension incentive not to get remarried. Certainly, age when the member dies is a factor.

We recommend continuing the current assumption of no remarriages after member death.

Timing of Decrements

Currently, decrements (termination, retirement, disability, and death) are assumed to occur mid-year, except for ages at which there is a 100% retirement assumption, in which case retirement is assumed to occur at the beginning of the year. For example, for the 7/1/2021 valuation, the first decrements (other than 100% retirement) would be assumed to occur on 12/31/21. The timing of when a person leaves during the year is not very material when calculating normal cost and actuarial liabilities for most plans. However, when forecasting short-term cash flow or when valuing small, closed plans, the differences may be noticeable. **We do not recommend changing the mid-year timing assumption.**

[10] American Community Survey from US Department of Commerce (2010 US Census)

Section IV. Economic Assumptions

Inflation and COLA

The inflation assumption is one of the principle building blocks for all other economic assumptions, including the Cost-of-Living Adjustment (COLA), salary improvement, and investment return assumptions. Thus, our economic experience analysis starts with the inflation assumption. The current inflation assumption is 2.50%.

Unlike demographic assumptions where recent past experience is the primary predictor of future experience, economic assumptions reflect future expectations as much as past experience. When reviewing economic assumptions, we look at future expectations as well as past experience. For the inflation assumption, we considered the following:

- Past experience – based on the Consumer Price Index for all Urban Consumers (CPI-U) over the last 5, 10, 15, 20 and 25 years
- Current expectations of future experience – based on investment experts' analysis and the Federal Reserve forecasts of future expected inflation.

The Supplemental Pension Benefits (i.e., COLAs) are also tied to increases in the CPI (with a cap). West Virginia Code §8-22-26a requires that all retirees, surviving beneficiaries, disability pensioners or future retirees receive a COLA payable on the first day of July, based on a percentage increase equal to any increase in the consumer price index as calculated by the United States Department of Labor, Bureau of Statistics for the preceding year. The COLA shall not exceed 4% per year and is not payable to a retiree until the first day of July after the second anniversary of the retiree's date of retirement. Additionally, the COLA shall only be calculated on the first $15,000 of the annual benefit paid and on the COLAs accumulated by the retiree since benefit commencement.

If, at any time after the COLA becomes applicable, the total accumulated percentage increase in benefit on the allowable amount becomes less than 75% of the total accumulated percentage increase in the consumer price index over that same period of time, the 4% limitation shall be inapplicable until such time as the supplemental benefits paid equals 75% of the accumulated increase in the consumer price index. The consumer price index used to determine the COLA is the CPI-U US City Average all items with a base of 1982-1984 equal to 100. The increase is measured as the increase in the annual average from the second prior calendar year to the annual average from the prior calendar year. Based on guidance received from the West Virginia Municipal Pensions Oversight Board during their December 15, 2022 meeting, the 4% limit is compared to this change in annual average CPI. Thus, if the CPI change is between 4.0% and 5.3% (equal to 4.0% / 75%), the COLA is limited to 4.0%, but if the CPI change is greater than 5.3%, then the 4.0% limit does not apply.

Past Inflation Experience

We first considered historical experience in developing our recommendation for the inflation assumption. Presented below are the average annual increases in the CPI-U, the same basis used for the determining the COLA percentage, over multiple time periods (ending with the annual average for calendar year 2022):

	Averaging Period				
	10 years	20 years	25 years	30 years	35 years
CPI-U Annual Average	2.46%	2.46%	2.43%	2.48%	2.74%

Experts' Inflation Expectations

Next, we considered the inflation assumption built into investment return assumptions. The 2022 edition of the *Horizon Survey of Capital Market Assumptions* (Horizon Survey), which encompasses capital market assumptions from 40 investment advisors, shows an average 10-year future expected inflation rate of 2.46% and a 20-year rate of 2.44%[11].

Further, we considered the inflation expectations from Federal Reserve Banks:

- In May 2023, the Philadelphia Federal Reserve published its Survey of Professional Forecasters, which summarized the expectations from 38 panelists. Over the next 10 years, the forecasters predict annual average headline CPI inflation of 2.36%.
- The Federal Reserve Bank of St. Louis' prediction as of May 1, 2023 of the 10-year breakeven inflation rate was 2.23%.
- The Federal Reserve Bank of Cleveland estimates inflation using a model based on Treasury yields, inflation data, inflation swaps, and survey-based measures of inflation expectations. Their May 2023 estimate of 30-year inflation is 2.3%.

Finally, in their 2023 Trustees Report, the Social Security Administration uses a long-term intermediate inflation assumption of 2.4%.

We note that the economy has experienced high levels of inflation over the past three years, driven, in part, by supply chain and workforce disruptions as well as consumer behavior changes after the onset of the COVID pandemic. To combat inflation, the Federal Reserve has raised the federal funds rate 10 times from March 2022 to March 2023 from roughly 0.25% to over 5.00%.

Recommended Inflation Assumption

Given the historical long-term annual averages, expectations of future inflation from investment managers and Federal Reserve Banks, and sustained higher levels of inflation over the past year, **we recommend keeping the current inflation assumption of 2.50%.**

Past COLA Experience

We compared the past changes in CPI versus the COLA with the cap:

	Averaging Period				
	10 years	20 years	25 years	30 years	35 years
CPI-U Annual Average	2.46%	2.46%	2.43%	2.48%	2.74%
COLA	2.38%	2.42%	2.40%	2.46%	2.69%
Difference	-0.08%	-0.04%	-0.03%	-0.02%	-0.05%

[11] When considering all 40 survey respondents. The rates are 2.51% and 2.44%, respectively, when considering only the 24 survey respondents who provided both a 10-year and 20-year inflation expectation.

Recommended COLA Assumption

To account for the COLA cap that applies when the increase in CPI is between 4.0% and 5.3%, we recommend a five basis-point reduction in the inflation assumption to arrive at a **COLA assumption of 2.45%**.

Investment Return / Discount Rate

The single assumption that has the largest effect on the determination of plan liabilities, funding levels and actuarially determined contributions (ADCs) is the investment return / discount rate assumption. This is not only an assumption about future expected returns on plan assets but also generally is the basis for setting the discount rate used to measure pension plan liabilities. The Board sets this assumption and it is the actuary's duty to provide information to the Board to help set all assumptions. Actuaries are also required to comply with Actuarial Standards of Practice No. 27 *Selection of Economic Assumptions for Measuring Pension Obligations* (ASOP 27) when setting the investment return / discount rate assumption that they recommend and use for the actuarial reports.

The most common way to set this assumption for a *single* plan is to look at the investment mix and expected future returns. We analyzed expected returns of the current aggregate investment mix of the plans using the Horizon Survey capital market assumptions. Based on this analysis, if this were a single plan that used a funding policy which adhered to actuarial principles and practices, the 20 year expected geometric return is 6.10% (see the Appendix for additional details). We would like to note that the investment mix, in the aggregate, is more conservative than investment allocations for most other public sector plans, and therefore, results in lower expected returns.

Separately we used the Horizon Survey capital market assumptions to model the portfolio geometric return for a typical allocation for the West Virginia Investment Management Board (IMB), the investment manager for several of the police and fire funds. Based on that allocation, the expected 20 year geometric return is 7.00% (see the Appendix for additional details).

However, this experience study does not cover just a single plan, but rather the 53 pension and relief funds for West Virginia municipal policemen and firemen, many of which have separate asset allocations and investment strategies. Since the actual investment return achieved for each fund is dependent on the asset allocation of each fund independently (not in the aggregate), an assumption needs to be determined for each plan individually.

For a review of how the current matrix was developed, please see the prior experience study. From that study, we reiterate that, by design, the Standard and Optional funding policies incorporate the relationship of plan assets to liabilities in the contribution development, and therefore, these plans can self-adjust to match experience though the amortization of gains and losses. The Alternative funding policy, by contrast, does not incorporate this relationship, and consequently, plans using this policy can suffer significant depreciation in funded status over time. Since the 15-year projection for the discount rate matrix considers neither the severe impact of unfavorable experience on the long term funded status for plans using the Alternative or Conservation funding policies nor the sustainability of contributing the developed contributions, we developed separate discount rate matrices, which incorporates an approach similar to that used for setting the discount rate for GASB accounting, for plans using these policies. To develop our recommended rates, we blended the portfolio expected returns with a hypothetical AA municipal bond rate based on the projected funded status in 15 years.

Our current assumption utilizes the following matrices to set the discount rate for each plan:

Discount Rate Matrix for Plans Not Investing with the IMB				
Funded Ratio as of Valuation Date[12]	Equity Exposure[13]	Projected Funded Ratio after 15 Years[14]	Discount Rate – Standard and Optional Policies	Discount Rate – Alternative and Conservation Policies
30% or more	60% or more	70% or more	6.50%	6.25%
30% or more	50% or more	70% or more	6.25%	6.00%
30% or more	40% or more	60% or more	6.00%	5.50%
15% or more	30% or more	50% or more	5.75%	5.00%
15% or more	20% or more	40% or more	5.50%	4.75%
Less than 15%	Less than 20%	15% or more	5.00%	4.25%
Less than 15%	Less than 20%	Less than 15%	5.00%	4.00%

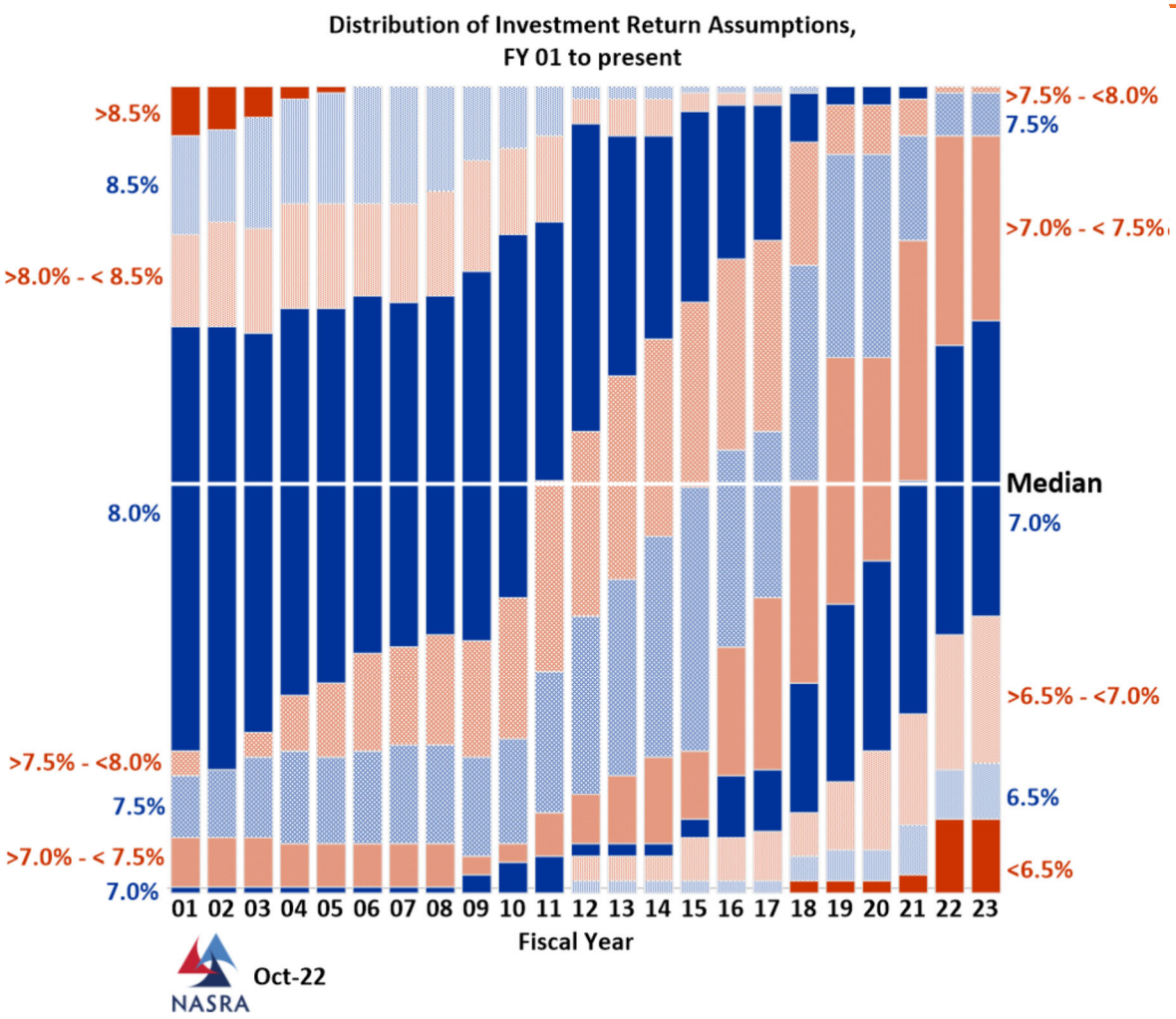
Discount Rate Matrix for Plans Investing with the IMB				
Funded Ratio as of Valuation Date[14]	Equity Exposure[15]	Projected Funded Ratio after 15 Years[14]	Discount Rate – Standard and Optional Policies	Discount Rate – Alternative and Conservation Policies
30% or more	N/A	70% or more	7.00%	6.50%
30% or more	N/A	70% or more	7.00%	6.00%
15% or more	N/A	50% or more	7.00%	5.50%
15% or more	N/A	40% or more	7.00%	5.25%
Less than 15%	N/A	15% or more	7.00%	4.75%
Less than 15%	N/A	Less than 15%	7.00%	4.50%

In analyzing this structure used for the discount rate selection process, we considered the following factors:

1. Funded ratio on the valuation date
2. Investment policy, including allocation to equities, alternative investments and other return-seeking asset classes
3. Projected funded ratio
4. Contribution policy (Alternative, Standard, Optional or Conservation)
5. The West Virginia Investment Management Board, which generally has a more aggressive investment strategy with higher allocations to public and private equity and lower investment fees than the median plan not using the IMB.

The MPOB might also find interesting the NASRA survey of discount rates that follows. These rates tend to be higher than those used by the West Virginia plans. The primary reason for this discrepancy is the differences in funded ratios (West Virginia plans have lower funding levels than most of the plans in the survey) and funding policies (not all West Virginia plans fund the Actuarially Determined Contribution, i.e. a contribution that is developed based on actuarial practices and principles).

[12] Funded ratios based on a 6.0% investment return assumption for plans using an actuarially sound policy (Standard or Optional) and a 5.0% investment return assumption for other plans (Alternative or Conservation).
[13] Based on target allocation percentage outlined in the investment policy.



We do not recommend any changes to the current discount matrices for determining the discount rate assumption for all 53 plans.

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

The Actuarial Standards Board recently published a revised Actuarial Standard of Practice No. 4 which requires the disclosure of a *Low-Default-Risk Obligation Measure* (LDROM) in the actuarial valuation reports for plan years after February 15, 2023. Thus, the first valuation impacted will be the July 1, 2023 valuation completed in the fall of 2024. The LDROM is a calculation of plan liabilities discounted at rate(s) based on high-quality bond yields, rather than the expected return on plan assets. It is a disclosure requirement but does not impact the development of the funding policy contributions.

Administrative Expenses

The current assumption for the amount of administrative (non-investment) expenses for the contribution year is the average of the expenses from the prior two fiscal years, adjusted for inflation to the year of the contribution.

We do not recommend any changes to the current assumption for administrative expenses as this method is auto-adjusting and easily explained.

Pay Increases

The current pay increase assumption has three components. The values for each of these components are added together. The current assumptions are:

1. General Inflation: 2.50% *plus*
2. Wage Inflation Increment: 1.00% *plus*
3. Service-based Increase:

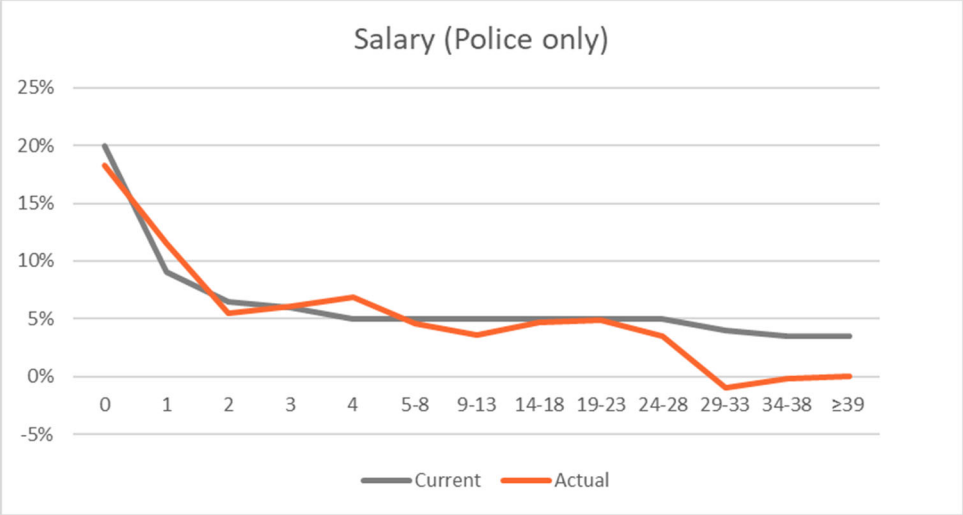
Years of Service	Increase
0	16.50%
1	5.50%
2	3.00%
3	2.50%
4-8	1.50%
9-28	1.50%
29-33	0.50%
34+	0.00%

This results in a final salary scale assumption of:

Years of Service	Increase
0	20.00%
1	9.00%
2	6.50%
3	6.00%
4-8	5.00%
9-28	5.00%
29-33	4.00%
34+	3.50%

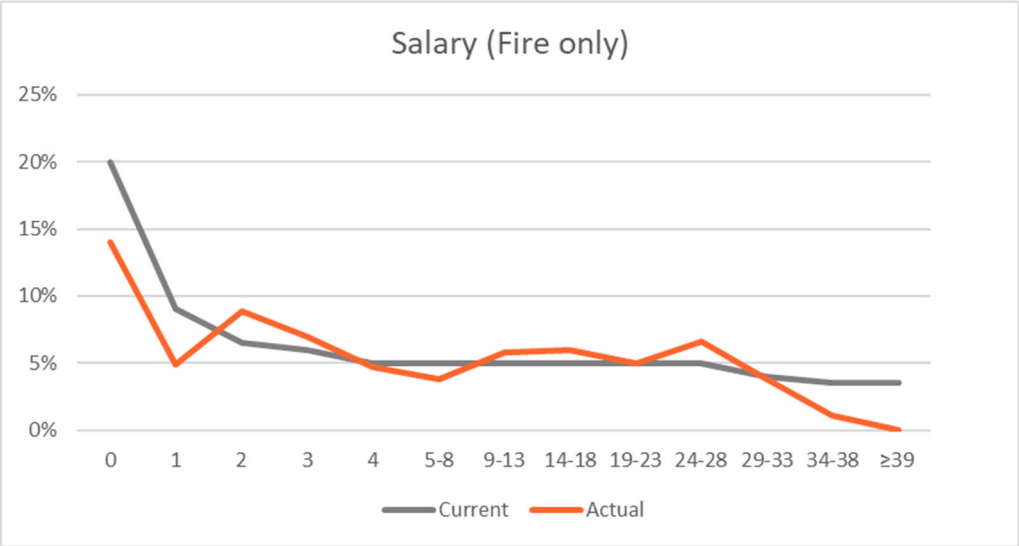
The following two tables show, by years of service, the number of exposures, the expected salary increase using the current assumptions, the actual salary increase, and the actual-to-expected ratios using the current assumptions, Presented beneath each table is a graph of the rates of salary increases based on actual experience and the current salary increase assumptions.

Years of Service	Salary Increases (Police Only) Exposures	Expected from Current Assumptions	Actual	Actual / Expected
0	80	20.00%	18.27%	91%
1	106	9.00%	11.54%	128%
2	102	6.50%	5.50%	85%
3	106	6.00%	6.07%	101%
4	79	5.00%	6.87%	137%
5-8	273	5.00%	4.56%	91%
9-13	504	5.00%	3.59%	72%
14-18	395	5.00%	4.69%	94%
19-23	295	5.00%	4.84%	97%
24-28	54	5.00%	3.53%	71%
29-33	2	4.00%	(0.99%)	(25%)
34-38	2	3.50%	(0.15%)	(4%)
≥39	0	3.50%	-	0%
Total:	**1,998**	**5.94%**	**5.48%**	**92%**



We note that the years of service groupings after 28 years of service are based on only two exposures. The negative salary increase (i.e. decrease in salary) for those years of service are likely due to a change in compensation other than base salary (e.g., overtime). A similar observation is present in the data for fire after 33 years of service, but again, is based on limited exposures (five).

Years of Service	Salary Increases (Fire Only) Exposures	Expected from Current Assumptions	Actual	Actual / Expected
0	59	20.00%	13.97%	70%
1	65	9.00%	4.85%	54%
2	47	6.50%	8.83%	136%
3	38	6.00%	6.98%	116%
4	44	5.00%	4.72%	94%
5-8	213	5.00%	3.83%	77%
9-13	473	5.00%	5.76%	115%
14-18	463	5.00%	6.00%	120%
19-23	308	5.00%	4.97%	99%
24-28	101	5.00%	6.64%	133%
29-33	29	4.00%	3.79%	95%
34-38	5	3.50%	1.10%	31%
≥39	0	3.50%	0.00%	100%
Total:	**1,845**	**5.66%**	**5.78%**	**102%**



We recommend no changes to the current salary assumption since it is reasonably in line with recent experience and expected future experience.

New Hire Pay Growth Assumption

We assume the average pay for new hires will be 3.50% higher than the prior year's average new hire pay[14]. The 3.50% assumption is the sum of the general inflation assumption of 2.50% and the wage inflation increment of 1.00%.

We recommend the continued use of 3.50% assumption.

Note that this assumption generally aligns with the final rate of salary increase in the salary scale assumption since employees nearing the end of long careers generally have reached their peak job proficiency/abilities, and likewise, are not expected to receive many increases that

[14] The ratio of pay for a new hire to the pay of a different new hire brought on board a year earlier.

exceed the sum of the general and additional wage inflation increases (i.e. no additional merit increases at those later years).

The final rate of assumed salary increase and the new hire pay growth assumption are also often related to an overall payroll growth assumption. Such is the case for plans that are assumed to have achieved a steady state population in which the number of actives in the plan remains level throughout a projection period. Plans (other than the WV plans) that develop contributions which include amortizations calculated as a level percentage of payroll use this assumption to determine amortization amounts. However, the WV plans use level dollar, rather than level percentage of pay, amortizations, and as such, the payroll growth assumption is not used for these valuations.

Pay Spiking at Retirement

In the prior experience study, we looked at the level of increases in average compensation associated with the inclusion of unused accrued leave balances when determining a members' pension. Our sample size of data included only the members eligible for the Beckley Fire DROP. Additionally, a majority of the municipalities provided a general estimate of the average percentage of final compensation that is attributable to accrued leave time. Based on our analysis of that information and the Beckley Fire DROP data, we recommended the use of a 6% load to average annual compensation in the computation of active retirement and termination pension benefits.

The valuation data used in this experience study does not contain the data points necessary to ascertain the amount of pay-spiking in the final year of employment. Since the data lacks this information and we do not perform the benefit calculations, **we do not recommend any changes to the current 6% load to average annual compensation in the computation of active retirement and termination pension benefits**.

Premium tax increase assumption:

Historical net premium tax amounts (after expenses) for 2002 and the last nine years (2014-2022) are presented below. For this table, we have ignored reallocations but there may be some reallocations in the 2002 value. We show the amount for the year 2002 in addition to the nine most recent years in order to provide a longer-term average increase rate:

Year	Amount	Annual Increase in Premium Tax Amounts	Avg Compounded Increase to 2022	Avg Compounded CPI-U Increase to 2022 (based on Annual index)
2002	$9,9xx,xxx[15]	N/A	≈ 3.0%	2.5%
…	…	…	…	…
2014	16,382,554	N/A	1.3%	2.7%
2015	16,619,183	1.4%	1.3%	3.1%
2016	17,406,426	4.7%	0.7%	3.4%
2017	17,899,708	2.8%	0.3%	3.6%
2018	18,280,163	2.1%	-0.2%	3.9%
2019	19,500,066	6.7%	-2.4%	4.6%
2020	19,968,579	2.4%	-4.7%	6.3%
2021	19,502,393	-2.3%	-7.0%	8.0%
2022	18,133,819	-7.0%	N/A	N/A

[15] From page 11 of the Consolidated Actuarial Valuation Report for the Year Beginning July 1, 2011 prepared by GRS.

Prior to the start of the COVID-19 pandemic, it appears that the premium tax amount increased on average faster than CPI. However, premium tax revenue was down in 2021 and 2022, likely due to the aftermath of the pandemic.

The current assumption is that the premium taxes as well as the CPI will increase by 2.50% annually. During discussions with the MPOB, we debated whether increases in premium revenues could continue to outpace inflation. The MPOB staff, as well as the experience study subcommittee, believe that sustained premium revenue increases in excess of inflation were unlikely in the future and that the decreases seen in 2021 and 2022 were outliers resulting from the pandemic. As such, for consistency with the inflation assumption, **we recommend the continued use of 2.50% as the premium tax increase assumption**.

Section V. Impact of Changes

The estimated cost for the changes recommended in this report were developed based on the July 1, 2021 census and asset information. Below is a list of the impact on the actuarial accrued liability, the employer normal cost, the unfunded actuarial accrued liability, and the funded ratio. The tables that follow on this page present these metrics in total for each of Police, Fire, and Total, while the tables on the pages that follow present the metrics by plan. Note the assumption changes will first take effect for the July 1, 2023 valuation, which will develop the contribution FY 2025.

	Police			
($, in millions)	Actuarial Accrued Liability	Total Normal Cost	Unfunded Accrued Liability	Funded Ratio
A. Current Assumptions	761.3	12.8	458.8	39.7%
B. Proposed Assumptions	759.0	12.4	456.5	39.9%
C. Dollar Difference (B. – A.)	(2.3)	(0.4)	(2.3)	0.1%
D. Percentage Difference (B. / A. - 1)	(0.3%)	(3.1%)	(0.5%)	0.3%

	Fire			
($, in millions)	Actuarial Accrued Liability	Total Normal Cost	Unfunded Accrued Liability	Funded Ratio
A. Current Assumptions	784.3	15.6	554.8	29.3%
B. Proposed Assumptions	780.8	14.9	551.3	29.4%
C. Dollar Difference (B. – A.)	(3.6)	(0.6)	(3.6)	0.1%
D. Percentage Difference (B. / A. - 1)	(0.5%)	(4.1%)	(0.6%)	0.5%

	Total			
($, in millions)	Actuarial Accrued Liability	Total Normal Cost	Unfunded Accrued Liability	Funded Ratio
A. Current Assumptions	1,545.6	28.4	1,013.6	34.4%
B. Proposed Assumptions	1,539.7	27.4	1,007.8	34.6%
C. Dollar Difference (B. – A.)	(5.9)	(1.0)	(5.9)	0.1%
D. Percentage Difference (B. / A. - 1)	(0.4%)	(3.6%)	(0.6%)	0.4%

Results by Plan

Plan	Assets	Current Assumptions					Proposed Assumptions				
		Discount Rate	Actuarial Accrued Liability	Employer Normal Cost	Unfunded Accrued Liability	Funded Ratio	Discount Rate	Actuarial Accrued Liability	Employer Normal Cost	Unfunded Accrued Liability	Funded Ratio
Beckley Fire	21,053,982	5.50%	41,102,256	692,165	20,048,274	51%	5.50%	40,934,078	659,306	19,880,096	51%
Beckley Police	26,609,005	6.25%	36,178,203	527,374	9,569,198	74%	6.25%	36,068,234	500,342	9,459,229	74%
Belle Police	1,497,009	7.00%	1,349,765	923	(147,244)	111%	7.00%	1,339,419	923	(157,590)	112%
Bluefield Fire	4,670,419	5.00%	16,794,330	182,770	12,123,911	28%	5.00%	16,700,628	171,956	12,030,209	28%
Bluefield Police	7,895,045	6.25%	13,266,378	236,848	5,371,333	60%	6.25%	13,214,118	226,467	5,319,073	60%
Charles Town Police	562,968	5.75%	1,043,440	987	480,472	54%	5.75%	1,035,088	987	472,120	54%
Charleston Fire	27,375,651	4.75%	192,094,519	2,330,113	164,718,868	14%	4.75%	191,176,106	2,221,028	163,800,455	14%
Charleston Police	30,034,620	5.25%	167,083,969	1,535,753	137,049,349	18%	5.25%	166,528,252	1,480,983	136,493,632	18%
Chester Police	1,855,263	7.00%	2,036,875	15,067	181,612	91%	7.00%	2,027,162	14,462	171,899	92%
Clarksburg Fire	13,845,980	6.00%	33,101,082	482,412	19,255,102	42%	6.00%	32,843,475	448,070	18,997,495	42%
Clarksburg Police	13,428,595	6.00%	26,563,023	438,522	13,134,428	51%	6.00%	26,471,142	419,957	13,042,547	51%
Dunbar Fire	2,045,736	4.25%	15,650,325	307,528	13,604,589	13%	4.25%	15,557,213	296,140	13,511,477	13%
Dunbar Police	6,941,764	6.00%	8,337,898	95,952	1,396,134	83%	6.00%	8,307,158	93,195	1,365,394	84%
Elkins Fire	2,225,240	6.00%	1,808,216	57,723	(417,024)	123%	6.00%	1,798,515	55,747	(426,725)	124%
Elkins Police	4,195,075	6.25%	4,545,077	23,412	350,002	92%	6.25%	4,517,775	22,264	322,700	93%
Fairmont Fire	6,047,674	4.25%	47,316,248	903,813	41,268,574	13%	4.25%	47,120,177	860,289	41,072,503	13%
Fairmont Police	9,199,578	5.50%	26,909,620	236,445	17,710,042	34%	5.50%	26,818,155	225,229	17,618,577	34%
Grafton Fire	1,989,793	6.00%	2,216,322	1,195	226,529	90%	6.00%	2,198,514	1,195	208,721	91%
Grafton Police	1,989,062	6.00%	1,705,797	14,451	(283,265)	117%	6.00%	1,703,516	13,964	(285,546)	117%
Huntington Fire	36,637,272	5.50%	102,682,110	967,555	66,044,838	36%	5.50%	102,170,799	921,596	65,533,527	36%
Huntington Police	47,443,373	5.75%	103,363,597	692,681	55,920,224	46%	5.75%	103,089,908	663,373	55,646,535	46%
Logan Fire	1,395,653	6.50%	2,168,149	88,498	772,496	64%	6.50%	2,169,406	84,248	773,753	64%
Logan Police	1,159,578	6.50%	2,220,622	34,598	1,061,044	52%	6.50%	2,219,521	31,796	1,059,943	52%
Martinsburg Fire	3,595,003	4.25%	37,945,468	917,074	34,350,465	9%	4.25%	37,934,144	862,369	34,339,141	9%
Martinsburg Police	10,252,950	4.25%	44,993,431	1,010,991	34,740,481	23%	4.25%	44,878,755	978,134	34,625,805	23%
Morgantown Fire	14,995,169	4.25%	53,445,583	1,637,905	38,450,414	28%	4.25%	53,188,118	1,571,334	38,192,949	28%
Morgantown Police	17,809,371	4.25%	72,930,845	1,388,635	55,121,474	24%	4.25%	72,782,863	1,337,763	54,973,492	24%
Moundsville Fire	1,651,737	6.25%	2,661,369	32,382	1,009,632	62%	6.25%	2,642,095	31,221	990,358	63%
Moundsville Police	5,876,418	6.50%	8,431,524	65,287	2,555,106	70%	6.50%	8,408,916	62,436	2,532,498	70%
Nitro Fire	2,667,544	4.25%	12,378,889	403,008	9,711,345	22%	4.25%	12,416,277	379,305	9,748,733	21%
Nitro Police	5,218,801	5.00%	12,245,954	296,106	7,027,153	43%	5.00%	12,217,879	286,734	6,999,078	43%
Oak Hill Police	5,208,972	6.25%	4,179,059	38,942	(1,029,913)	125%	6.25%	4,171,278	37,486	(1,037,694)	125%
Parkersburg Fire	24,283,441	5.75%	57,303,621	683,950	33,020,180	42%	5.75%	57,007,626	651,303	32,724,185	43%
Parkersburg Police	22,856,371	5.75%	52,182,411	571,125	29,326,040	44%	5.75%	52,015,486	545,528	29,159,115	44%
Point Pleasant Police	2,178,483	7.00%	3,578,118	19,050	1,399,635	61%	7.00%	3,562,788	18,318	1,384,305	61%

Plan	Assets	Current Assumptions					Proposed Assumptions				
		Discount Rate	Actuarial Accrued Liability	Employer Normal Cost	Unfunded Accrued Liability	Funded Ratio	Discount Rate	Actuarial Accrued Liability	Employer Normal Cost	Unfunded Accrued Liability	Funded Ratio
Princeton Fire	3,173,645	4.25%	12,686,619	253,321	9,512,974	25%	4.25%	12,614,010	237,371	9,440,365	25%
Princeton Police	5,060,817	5.00%	13,105,215	314,858	8,044,398	39%	5.00%	13,080,070	300,189	8,019,253	39%
South Charleston Fire	4,310,322	4.25%	40,366,253	1,248,068	36,055,931	11%	4.25%	40,233,775	1,183,365	35,923,453	11%
South Charleston Police	4,136,537	4.25%	30,447,222	787,478	26,310,685	14%	4.25%	30,339,387	757,504	26,202,850	14%
St. Albans Fire	2,674,240	4.25%	20,500,328	504,177	17,826,088	13%	4.25%	20,435,084	475,176	17,760,844	13%
St. Albans Police	8,229,519	5.50%	16,832,263	290,903	8,602,744	49%	5.50%	16,762,420	279,046	8,532,901	49%
Star City Police	2,232,756	6.50%	1,702,965	33,523	(529,791)	131%	6.50%	1,698,030	32,304	(534,726)	131%
Vienna Police	10,950,759	6.25%	12,881,261	189,590	1,930,502	85%	6.25%	12,870,425	182,017	1,919,666	85%
Weirton Fire	13,796,289	6.50%	17,737,737	355,667	3,941,448	78%	6.50%	17,638,250	341,735	3,841,961	78%
Weirton Police	10,881,100	5.50%	33,830,948	428,024	22,949,848	32%	5.50%	33,754,634	405,475	22,873,534	32%
Welch Police	3,281,296	6.50%	2,481,481	35,790	(799,815)	132%	6.50%	2,483,810	33,655	(797,486)	132%
Weston Fire	1,549,536	6.25%	1,764,176	27,681	214,640	88%	6.25%	1,754,005	26,514	204,469	88%
Weston Police	1,730,740	6.25%	1,461,178	24,841	(269,562)	118%	6.25%	1,464,406	23,544	(266,334)	118%
Westover Police	2,941,095	6.25%	3,029,842	19,528	88,747	97%	6.25%	3,015,330	18,964	74,235	98%
Wheeling Fire	37,613,007	6.00%	69,045,287	833,133	31,432,280	54%	6.00%	68,679,580	803,165	31,066,573	55%
Wheeling Police	29,408,645	6.00%	50,010,543	400,414	20,601,898	59%	6.00%	49,801,928	386,635	20,393,283	59%
Williamson Fire	1,887,724	7.00%	3,564,515	19,392	1,676,791	53%	7.00%	3,546,405	18,013	1,658,681	53%
Williamson Police	1,441,722	7.00%	2,347,864	20,522	906,142	61%	7.00%	2,341,846	19,471	900,124	62%

Difference by Plan

Plan	Assets	Difference (Proposed - Current) in Dollars					Difference (Proposed - Current) as a Percentage				
		Discount Rate	Actuarial Accrued Liability	Employer Normal Cost	Unfunded Accrued Liability	Funded Ratio	Discount Rate	Actuarial Accrued Liability	Employer Normal Cost	Unfunded Accrued Liability	Funded Ratio
Beckley Fire	N/A	N/A	(168,178)	(32,859)	(168,178)	N/A	0.00%	-0.4%	-4.7%	-0.8%	0.21%
Beckley Police	N/A	N/A	(109,969)	(27,032)	(109,969)	N/A	0.00%	-0.3%	-5.1%	-1.1%	0.22%
Belle Police	N/A	N/A	(10,346)	-	(10,346)	N/A	0.00%	-0.8%	0.0%	7.0%	0.86%
Bluefield Fire	N/A	N/A	(93,702)	(10,814)	(93,702)	N/A	0.00%	-0.6%	-5.9%	-0.8%	0.16%
Bluefield Police	N/A	N/A	(52,260)	(10,381)	(52,260)	N/A	0.00%	-0.4%	-4.4%	-1.0%	0.24%
Charles Town Police	N/A	N/A	(8,352)	-	(8,352)	N/A	0.00%	-0.8%	0.0%	-1.7%	0.44%
Charleston Fire	N/A	N/A	(918,413)	(109,085)	(918,413)	N/A	0.00%	-0.5%	-4.7%	-0.6%	0.07%
Charleston Police	N/A	N/A	(555,717)	(54,770)	(555,717)	N/A	0.00%	-0.3%	-3.6%	-0.4%	0.06%
Chester Police	N/A	N/A	(9,713)	(605)	(9,713)	N/A	0.00%	-0.5%	-4.0%	-5.3%	0.44%
Clarksburg Fire	N/A	N/A	(257,607)	(34,342)	(257,607)	N/A	0.00%	-0.8%	-7.1%	-1.3%	0.33%
Clarksburg Police	N/A	N/A	(91,881)	(18,565)	(91,881)	N/A	0.00%	-0.3%	-4.2%	-0.7%	0.18%
Dunbar Fire	N/A	N/A	(93,112)	(11,388)	(93,112)	N/A	0.00%	-0.6%	-3.7%	-0.7%	0.08%
Dunbar Police	N/A	N/A	(30,740)	(2,757)	(30,740)	N/A	0.00%	-0.4%	-2.9%	-2.2%	0.30%
Elkins Fire	N/A	N/A	(9,701)	(1,976)	(9,701)	N/A	0.00%	-0.5%	-3.4%	2.3%	0.67%
Elkins Police	N/A	N/A	(27,302)	(1,148)	(27,302)	N/A	0.00%	-0.6%	-4.9%	-7.8%	0.56%
Fairmont Fire	N/A	N/A	(196,071)	(43,524)	(196,071)	N/A	0.00%	-0.4%	-4.8%	-0.5%	0.05%
Fairmont Police	N/A	N/A	(91,465)	(11,216)	(91,465)	N/A	0.00%	-0.3%	-4.7%	-0.5%	0.11%
Grafton Fire	N/A	N/A	(17,808)	-	(17,808)	N/A	0.00%	-0.8%	0.0%	-7.9%	0.73%
Grafton Police	N/A	N/A	(2,281)	(487)	(2,281)	N/A	0.00%	-0.1%	-3.4%	0.8%	0.15%
Huntington Fire	N/A	N/A	(511,311)	(45,959)	(511,311)	N/A	0.00%	-0.5%	-4.8%	-0.8%	0.18%
Huntington Police	N/A	N/A	(273,689)	(29,308)	(273,689)	N/A	0.00%	-0.3%	-4.2%	-0.5%	0.12%
Logan Fire	N/A	N/A	1,257	(4,250)	1,257	N/A	0.00%	0.1%	-4.8%	0.2%	-0.04%
Logan Police	N/A	N/A	(1,101)	(2,802)	(1,101)	N/A	0.00%	0.0%	-8.1%	-0.1%	0.02%
Martinsburg Fire	N/A	N/A	(11,324)	(54,705)	(11,324)	N/A	0.00%	0.0%	-6.0%	0.0%	0.01%
Martinsburg Police	N/A	N/A	(114,676)	(32,857)	(114,676)	N/A	0.00%	-0.3%	-3.2%	-0.3%	0.06%
Morgantown Fire	N/A	N/A	(257,465)	(66,571)	(257,465)	N/A	0.00%	-0.5%	-4.1%	-0.7%	0.13%
Morgantown Police	N/A	N/A	(147,982)	(50,872)	(147,982)	N/A	0.00%	-0.2%	-3.7%	-0.3%	0.05%
Moundsville Fire	N/A	N/A	(19,274)	(1,161)	(19,274)	N/A	0.00%	-0.7%	-3.6%	-1.9%	0.46%
Moundsville Police	N/A	N/A	(22,608)	(2,851)	(22,608)	N/A	0.00%	-0.3%	-4.4%	-0.9%	0.18%
Nitro Fire	N/A	N/A	37,388	(23,703)	37,388	N/A	0.00%	0.3%	-5.9%	0.4%	-0.07%
Nitro Police	N/A	N/A	(28,075)	(9,372)	(28,075)	N/A	0.00%	-0.2%	-3.2%	-0.4%	0.09%
Oak Hill Police	N/A	N/A	(7,781)	(1,456)	(7,781)	N/A	0.00%	-0.2%	-3.7%	0.8%	0.24%
Parkersburg Fire	N/A	N/A	(295,995)	(32,647)	(295,995)	N/A	0.00%	-0.5%	-4.8%	-0.9%	0.22%
Parkersburg Police	N/A	N/A	(166,925)	(25,597)	(166,925)	N/A	0.00%	-0.3%	-4.5%	-0.6%	0.14%
Point Pleasant Police	N/A	N/A	(15,330)	(732)	(15,330)	N/A	0.00%	-0.4%	-3.8%	-1.1%	0.27%

Plan	Assets	Difference (Proposed - Current) in Dollars					Difference (Proposed - Current) as a Percentage				
		Discount Rate	Actuarial Accrued Liability	Employer Normal Cost	Unfunded Accrued Liability	Funded Ratio	Discount Rate	Actuarial Accrued Liability	Employer Normal Cost	Unfunded Accrued Liability	Funded Ratio
Princeton Fire	N/A	N/A	(72,609)	(15,950)	(72,609)	N/A	0.00%	-0.6%	-6.3%	-0.8%	0.14%
Princeton Police	N/A	N/A	(25,145)	(14,669)	(25,145)	N/A	0.00%	-0.2%	-4.7%	-0.3%	0.07%
South Charleston Fire	N/A	N/A	(132,478)	(64,703)	(132,478)	N/A	0.00%	-0.3%	-5.2%	-0.4%	0.03%
South Charleston Police	N/A	N/A	(107,835)	(29,974)	(107,835)	N/A	0.00%	-0.4%	-3.8%	-0.4%	0.04%
St. Albans Fire	N/A	N/A	(65,244)	(29,001)	(65,244)	N/A	0.00%	-0.3%	-5.8%	-0.4%	0.05%
St. Albans Police	N/A	N/A	(69,843)	(11,857)	(69,843)	N/A	0.00%	-0.4%	-4.1%	-0.8%	0.21%
Star City Police	N/A	N/A	(4,935)	(1,219)	(4,935)	N/A	0.00%	-0.3%	-3.6%	0.9%	0.38%
Vienna Police	N/A	N/A	(10,836)	(7,573)	(10,836)	N/A	0.00%	-0.1%	-4.0%	-0.6%	0.07%
Weirton Fire	N/A	N/A	(99,487)	(13,932)	(99,487)	N/A	0.00%	-0.6%	-3.9%	-2.5%	0.44%
Weirton Police	N/A	N/A	(76,314)	(22,549)	(76,314)	N/A	0.00%	-0.2%	-5.3%	-0.3%	0.08%
Welch Police	N/A	N/A	2,329	(2,135)	2,329	N/A	0.00%	0.1%	-6.0%	-0.3%	-0.12%
Weston Fire	N/A	N/A	(10,171)	(1,167)	(10,171)	N/A	0.00%	-0.6%	-4.2%	-4.7%	0.51%
Weston Police	N/A	N/A	3,228	(1,297)	3,228	N/A	0.00%	0.2%	-5.2%	-1.2%	-0.26%
Westover Police	N/A	N/A	(14,512)	(564)	(14,512)	N/A	0.00%	-0.5%	-2.9%	-16.4%	0.47%
Wheeling Fire	N/A	N/A	(365,707)	(29,968)	(365,707)	N/A	0.00%	-0.5%	-3.6%	-1.2%	0.29%
Wheeling Police	N/A	N/A	(208,615)	(13,779)	(208,615)	N/A	0.00%	-0.4%	-3.4%	-1.0%	0.25%
Williamson Fire	N/A	N/A	(18,110)	(1,379)	(18,110)	N/A	0.00%	-0.5%	-7.1%	-1.1%	0.27%
Williamson Police	N/A	N/A	(6,018)	(1,051)	(6,018)	N/A	0.00%	-0.3%	-5.1%	-0.7%	0.15%

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

We used participant data initially prepared for the actuarial valuations for the years beginning:

- July 1, 2017
- July 1, 2018
- July 1, 2019
- July 1, 2020

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

Appendix

When examining the investment return / discount rate assumption, we determined the aggregate investment mix among all 53 municipal Police and Fire plans as of July 1, 2022 and mapped that allocation to the asset classes in the Horizon Survey. Since a detailed allocation of assets was not available for all plans, we made assumptions regarding the breakdown of broad categories into their more granular component units. For example, we assumed that the total equity allocation of approximately 52% comprises approximately 55% U.S. large cap and 45% U.S. small/mid cap equities. Furthermore, we assumed total alternative and other investment classes comprises 80% Other Private Equity, 10% Real Estate, and 10% Hedge Funds. While the investment return / discount rate assumption should be determined independently for all 53 plans, should generally have a long horizon (typically 10 to 30 years), and be based on target allocations, we believe that using the July 1, 2022 current aggregate allocation is a useful exercise in understanding plan investments in total.

	10 Year	20 Year
Horizon Inflation	2.47%	2.45%
Bolton WV MPOB Recommendation	2.50%	2.50%

		Real Return (Net of Infl)		Horizon Inflation Assumption		Horizon Arithmetic Return		Horizon Geometric Return			Weighted
Mapped to Horizon Asset Classes	Traget										
Asset Class	Allocation	10 Year	20 Year	10 Year	20 Year	10 Year	20 Year	10 Year	20 Year	St. Dev	St. Dev
US Equity - Large Cap	28.66%	4.70%	5.37%	2.47%	2.45%	7.17%	7.82%	5.91%	6.54%	16.33%	4.68%
US Equity - Small/Mid Cap	23.45%	6.04%	6.53%	2.47%	2.45%	8.51%	8.98%	6.58%	6.99%	20.34%	4.77%
Non-US Equity - Developed	0.00%	5.61%	6.22%	2.47%	2.45%	8.08%	8.67%	6.54%	7.08%	18.09%	0.00%
Non-US Equity - Emerging	0.00%	7.52%	8.22%	2.47%	2.45%	9.99%	10.67%	7.30%	7.89%	23.92%	0.00%
US Corp Bonds - Core	25.29%	0.31%	1.20%	2.47%	2.45%	2.78%	3.65%	2.63%	3.49%	5.36%	1.36%
US Corp Bonds - Long Dur.	0.00%	0.61%	1.57%	2.47%	2.45%	3.08%	4.02%	2.62%	3.45%	10.48%	0.00%
US Corp Bonds - High Yield	0.00%	2.00%	2.98%	2.47%	2.45%	4.47%	5.43%	3.99%	4.95%	9.90%	0.00%
Non-US Debt - Developed	0.00%	-0.39%	0.32%	2.47%	2.45%	2.08%	2.77%	1.84%	2.47%	7.51%	0.00%
Non-US Debt - Emerging	0.00%	2.77%	3.43%	2.47%	2.45%	5.24%	5.88%	4.65%	5.26%	10.92%	0.00%
US Treasuries (Cash Equiv)	12.49%	-0.98%	-0.45%	2.47%	2.45%	1.49%	2.00%	1.48%	1.99%	1.12%	0.14%
TIPS (Inflation-Protected)	0.00%	-0.30%	0.39%	2.47%	2.45%	2.17%	2.84%	2.00%	2.64%	5.79%	0.00%
Real Estate	1.01%	4.33%	4.87%	2.47%	2.45%	6.80%	7.32%	5.37%	5.98%	17.00%	0.17%
Hedge Funds	1.01%	2.67%	3.39%	2.47%	2.45%	5.14%	5.84%	4.81%	5.48%	7.99%	0.08%
Commodities	0.00%	2.84%	3.41%	2.47%	2.45%	5.31%	5.86%	3.74%	4.23%	17.78%	0.00%
Infrastructure	0.00%	5.42%	5.73%	2.47%	2.45%	7.89%	8.18%	6.39%	6.90%	16.63%	0.00%
Other - Private Equity	8.09%	9.13%	10.05%	2.47%	2.45%	11.60%	12.50%	9.22%	9.84%	22.13%	1.79%
Other - Private Debt	0.00%	5.09%	5.38%	2.47%	2.45%	7.56%	7.83%	6.89%	7.12%	11.49%	0.00%
	100.00%										
Portfolio Arithmetic Return						6.00%	6.66%				
Portfolio Variance										1.23%	
Portfolio Geometric Return (Net of Inv. Expenses)								5.38%	6.05%		
Adjustment for Bolton WV MPOB Inflation Recommendation								0.03%	0.05%		
Adjusted Portfolio Geometric Return (Net of Inv. Expenses)								**5.41%**	**6.10%**		

We performed a similar exercise using a standard IMB allocation.

	10 Year	20 Year
Horizon Inflation	2.47%	2.45%
Bolton WV MPOB Recommendation	2.50%	2.50%

Mapped to Horizon Asset Classes	Traget	**Real Return (Net of Infl)**		**Horizon Inflation Assumption**		**Horizon Arithmetic Return**		**Horizon Geometric Return**			Weighted
Asset Class	Allocation	10 Year	20 Year	10 Year	20 Year	10 Year	20 Year	10 Year	20 Year	St. Dev	St. Dev
US Equity - Large Cap	27.50%	4.70%	5.37%	2.47%	2.45%	7.17%	7.82%	5.91%	6.54%	16.33%	4.49%
US Equity - Small/Mid Cap	3.00%	6.04%	6.53%	2.47%	2.45%	8.51%	8.98%	6.58%	6.99%	20.34%	0.61%
Non-US Equity - Developed	18.50%	5.61%	6.22%	2.47%	2.45%	8.08%	8.67%	6.54%	7.08%	18.09%	3.35%
Non-US Equity - Emerging	6.00%	7.52%	8.22%	2.47%	2.45%	9.99%	10.67%	7.30%	7.89%	23.92%	1.44%
US Corp Bonds - Core	15.00%	0.31%	1.20%	2.47%	2.45%	2.78%	3.65%	2.63%	3.49%	5.36%	0.80%
US Corp Bonds - Long Dur.	0.00%	0.61%	1.57%	2.47%	2.45%	3.08%	4.02%	2.62%	3.45%	10.48%	0.00%
US Corp Bonds - High Yield	0.00%	2.00%	2.98%	2.47%	2.45%	4.47%	5.43%	3.99%	4.95%	9.90%	0.00%
Non-US Debt - Developed	0.00%	-0.39%	0.32%	2.47%	2.45%	2.08%	2.77%	1.84%	2.47%	7.51%	0.00%
Non-US Debt - Emerging	0.00%	2.77%	3.43%	2.47%	2.45%	5.24%	5.88%	4.65%	5.26%	10.92%	0.00%
US Treasuries (Cash Equiv)	0.00%	-0.98%	-0.45%	2.47%	2.45%	1.49%	2.00%	1.48%	1.99%	1.12%	0.00%
TIPS (Inflation-Protected)	0.00%	-0.30%	0.39%	2.47%	2.45%	2.17%	2.84%	2.00%	2.64%	5.79%	0.00%
Real Estate	10.00%	4.33%	4.87%	2.47%	2.45%	6.80%	7.32%	5.37%	5.98%	17.00%	1.70%
Hedge Funds	10.00%	2.67%	3.39%	2.47%	2.45%	5.14%	5.84%	4.81%	5.48%	7.99%	0.80%
Commodities	0.00%	2.84%	3.41%	2.47%	2.45%	5.31%	5.86%	3.74%	4.23%	17.78%	0.00%
Infrastructure	0.00%	5.42%	5.73%	2.47%	2.45%	7.89%	8.18%	6.39%	6.90%	16.63%	0.00%
Other - Private Equity	10.00%	9.13%	10.05%	2.47%	2.45%	11.60%	12.50%	9.22%	9.84%	22.13%	2.21%
Other - Private Debt	0.00%	5.09%	5.38%	2.47%	2.45%	7.56%	7.83%	6.89%	7.12%	11.49%	0.00%
	100.00%										
Portfolio Arithmetic Return						7.09%	7.78%				
Portfolio Variance										1.66%	
Portfolio Geometric Return (Net of Inv. Expenses)								6.26%	6.95%		
Adjustment for Bolton WV MPOB Inflation Recommendation								0.03%	0.05%		
Adjusted Portfolio Geometric Return (Net of Inv. Expenses)								**6.29%**	**7.00%**		