Bay County Employees' Retirement System

Review of System Experience
January 1, 2017 through December 31, 2021

August 31, 2023

Board of Trustees
Bay County Employees'
    Retirement System
Bay City, Michigan

Dear Board Members:

Presented in this report are the results of a review of the actuarial assumptions used in the annual actuarial valuation of the Bay County Employees' Retirement System. The primary purpose of the study is to determine the continued appropriateness of the current actuarial assumptions used for the annual actuarial valuations by comparing actual experience to expected experience.

The investigation was based upon the data furnished for the annual actuarial valuations during the period *January 1, 2017 through December 31, 2021* and was carried out using generally accepted actuarial principles and techniques. We checked for internal reasonability and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by the County.

We have shown the expected impact of the proposed changes on County contributions as of December 31, 2021. This information is shown in Section D of this report.

We believe that the actuarial assumptions recommended in this experience study report represent individually and in the aggregate reasonable estimates of future experience of the Bay County Employees' Retirement System.

This report should not be relied on for any purpose other than that described above. It was prepared at the request of the Board and is intended for use by the Board and those designated or approved by the Board. This report may be provided to parties other than the Board only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. We certify that, to the best of our knowledge, this report is complete and accurate. All calculations have been made in conformity with generally accepted actuarial principals and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.
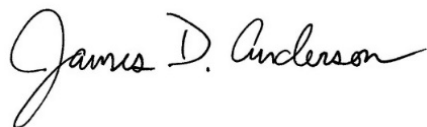
This report was prepared using our proprietary valuation model and related software which, in our professional judgment, has the capability to provide results that are consistent with the purposes of the valuation and has no material limitations or known weaknesses. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

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Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: System experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the System's funded status); and changes in plan provisions or applicable law.
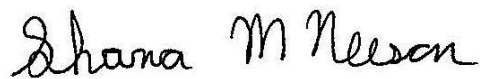
The signing actuaries are independent of the plan sponsor.

James D. Anderson, Shana M. Neeson, and Stephanie Sullivan are Members of the American Academy of Actuaries (MAAA) and meet the qualification standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

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Introduction

Each year, as of December 31st, the actuarial liabilities of the Bay County Employees' Retirement System are computed and reported in the annual actuarial valuation. In order to perform the valuation, assumptions must be made regarding the future experience of the System with regard to the following risk areas:

- Long-term rates of **investment return** to be generated by the assets of the Retirement System
- Patterns of **pay increases** to active members
- Rates of **retirement** among active members
- Rates of **disability** among active members
- Rates of **withdrawal** among active members
- Rates of **mortality** among active members, vested former members, and retirees and beneficiaries
- Effect of **optional forms of payment** at retirement
- Effect of **unused sick and vacation time**
- Effective of **administrative (non-investment) expenses** on the System

Assumptions should be carefully chosen and continually monitored. Continued use of outdated assumptions can lead to:

- Understated costs resulting in either an inability to pay benefits when due, or sharp increases in required contributions at some point in the future; or
- Overstated costs resulting in either benefit levels that are kept below the level that could be supported by the computed rate or an unnecessarily large burden on the current generation of members, employers and taxpayers.

A single set of assumptions will not be suitable indefinitely. Things change, and our understanding of things also changes. In recognition of this, assumptions used to value the liabilities of the Retirement System should be reviewed and adjusted periodically to recognize changes in experience trends, a changing economic environment (or changing perceptions of the economic environment) and to maintain consistency within the universe of public employee retirement systems. The results of this analysis are shown in Section A of this report.

A common practice among public employee retirement systems is that the actuary recommends a set of demographic assumptions and suggests a range of reasonable alternate economic assumptions. Following discussion involving the actuary, the system governing body, and other professionals, the system governing body makes a final choice from the various alternatives.

The scope of this report is limited to assumptions used in the pension actuarial valuation. While certain demographic assumptions (relating to rates of retirement, rates of mortality, etc.) will apply to the retiree health valuation, analysis of assumptions specific to the retiree health valuation (relating to trend, election percentages, etc.) is beyond the scope of this report.

Most of these assumptions were based on the information through December 31, 2021. This report reflects the impact of COVID-19 experience through December 31, 2021. Actual future experience will be reflected in each subsequent annual valuation, as experience emerges.

SECTION A

SUMMARY OF DEMOGRAPHIC ASSUMPTIONS

Retirement

Discussion: Rates of retirement are used to measure the probabilities of an eligible member retiring from County employment during the next year. During the study period, actual rates of retirement for the Bay County Employees' Retirement System have been higher than expected for every group except for the Medical Care Facility (MCF), Sheriff's Department, and Road Commission groups.

Summary of Experience: The experience during the study period is summarized below:

Number of Retirements Among Eligible System Members		
Department	**Actual**	**Expected**
General	88	79.2
DWS	13	5.6
Library	11	8.9
Medical Care Facility	44	47.0
Sheriff's Department	12	18.8
Road Commission	5	9.1
Total	**173**	**168.6**

Number of Retirements Among Eligible System Members		
Department	**Actual**	**Expected**
BABH	28	16.6

Proposal: We recommend an increase in the rates for the DWS, Library, and Mental Health (BABH) groups and a decrease in the rates for the Sheriff's Department and Road Commission groups. Although the General group had more retirements than expected, we saw an increase in retirements in the last two years. If we ignore the last two years of experience, due to COVID, the remaining three years are more in line with expectations. As a result, we are recommending no change to the rates for the General group. Additionally, no change is recommended for Medical Care Facility at this time. The current and proposed retirement rates are shown on the following pages. This change will put upward pressure on liabilities for the DWS, Library, and BABH groups and downward pressure on liabilities for the Sheriff's Department and Road Commission groups.

Retirement Rates

Current Rates

Retirement Ages	Percent of Active Members Retiring Within Next Year						
	General	DWS	Library	MCF	Sheriff's	Road Commission	BABH
50				20 %		20 %	
51				20		20	
52				20		30	
53				20		30	
54				20		30	
55	20 %	25 %	15 %	30		30	15 %
56	13	20	10	40		20	10
57	13	20	10	50		20	10
58	13	20	10	50		20	10
59	13	20	10	50		20	10
60	30	35	25	30	15 %	20	25
61	25	30	20	30	15	20	20
62	13	20	10	50	30	40	10
63	13	20	10	25	15	40	10
64	13	20	10	25	15	40	10
65	30	35	25	100	100	100	25
66	13	20	10				10
67	13	20	10				10
68	13	20	10				10
69	13	20	10				10
70	100	100	100				100

The following table shows the rates used for the Road Patrol, Road Patrol Supervisory Unit, and Elected Officials and Department Heads: Elected Sheriff and Appointed Undersheriff 25 & Out provision and the Correctional Facility Officers 55 & 25 provision.

25 & Out		55 & 25	
Years of Service	Sheriff's Road Patrol, Road Patrol Supervisory Unit, and Elected Sheriff and Appointed Undersheriff	Age	Correctional Facility Officers
25	35%	55	35%
26	35	56	35
27	35	57	35
28	25	58	25
29	25	59	25
30	25	60	25
31	25	61	25
32	25	62	25
33	25	63	25
34	100	64	100

Retirement Rates

Proposed Rates

Retirement Ages	Percent of Active Members Retiring Within Next Year						
	General	DWS	Library	MCF	Sheriff's	Road Commission	BABH
50				20 %		18 %	
51				20		18	
52				20		28	
53				20		28	
54				20		28	
55	20 %	28 %	17 %	30		28	18 %
56	13	23	12	40		18	13
57	13	23	12	50		18	13
58	13	23	12	50		18	13
59	13	23	12	50		18	13
60	30	38	27	30	13 %	18	28
61	25	33	22	30	13	18	23
62	13	23	12	50	28	38	13
63	13	23	12	25	13	38	13
64	13	23	12	25	13	38	13
65	30	38	27	100	100	100	28
66	13	23	12				13
67	13	23	12				13
68	13	23	12				13
69	13	23	12				13
70	100	100	100				100

The following table shows the rates used for the Road Patrol, Road Patrol Supervisory Unit, and Elected Officials and Department Heads: Elected Sheriff and Appointed Undersheriff 25 & Out provision and the Correctional Facility Officers 55 & 25 provision.

25 & Out		55 & 25	
Years of Service	Sheriff's Road Patrol, Road Patrol Supervisory Unit, and Elected Sheriff and Appointed Undersheriff	Age	Correctional Facility Officers
25	35%	55	35%
26	35	56	35
27	35	57	35
28	25	58	25
29	25	59	25
30	25	60	25
31	25	61	25
32	25	62	25
33	25	63	25
34	100	64	100

Early Retirement Rates

Current & Proposed Rates

55 & 8 and/or 55 & 10 Early Retirement

Retirement Ages	General	DWS	Library	Retirement Ages	BABH
55	8 %	15 %	5 %	55	5 %
56	8	15	5	56	5
57	8	15	5	57	5
58	8	15	5	58	5
59	8	15	5	59	5
60	8	15	5	60	5
61	8			61	5

Turnover

Discussion: Rates of turnover are used to measure the probabilities of an eligible member terminating from County employment during the next year. These rates were studied separately for members with less than five years of service and members with five or more years of service. During the study period, actual rates of turnover have been higher than expected for Medical Care Facility (MCF) and Mental Health (BABH) employees and lower than expected for General and DWS employees during the years before being vested. Turnover rates have been higher than expected for General, DWS, Medical Care Facility (MCF), and Mental Health (BABH) employees during the years following vesting.

Summary of Experience: The experience during the study period is summarized below:

Number of Employee Terminations from County Employment						
	Non-Vested: <5 Years of Service		Vested: 5+ Years of Service		Total Terminations	
Department	Actual	Expected	Actual	Expected	Actual	Expected
General	66	74.8	20	17.0	86	91.8
DWS	5	9.7	3	0.7	8	10.4
Library	0	0.6	1	0.6	1	1.2
Medical Care Facility	190	155.5	44	16.9	234	172.4
Sheriff's Department	6	5.9	3	2.5	9	8.4
Road Commission	2	2.7	1	0.8	3	3.5
Total	**269**	**249.2**	**72**	**38.5**	**341**	**287.7**

Number of Employee Terminations from County Employment						
	Non-Vested: <5 Years of Service		Vested: 5+ Years of Service		Total Terminations	
Department	Actual	Expected	Actual	Expected	Actual	Expected
BABH	73	55.4	21	13.4	94	68.8

Proposal: We recommend a change from the current turnover rates for General, DWS, Medical Care Facility, and Mental Health (BABH) to the proposed rates summarized on the following pages. In general, increasing the assumed rates of termination will put downward pressure on liabilities and vice-versa. The current and proposed termination rates are shown on the following pages.

Turnover Rates

Current Rates

Sample Ages	Years of Service	% of Active Members Separating within Next Year						
		General	DWS	Library	MCF	Sheriff's*	Road Commission*	BABH
ALL	0	15.00%	9.00%	8.25%	26.25%	N/A	N/A	16.50%
	1	9.00	5.40	4.95	26.25	N/A	N/A	9.90
	2	9.00	5.40	4.95	15.75	N/A	N/A	9.90
	3	8.00	4.80	4.40	13.13	N/A	N/A	8.80
	4	8.00	4.80	4.40	9.19	N/A	N/A	8.80
20	5 & Over	7.50	4.50	4.13	7.88	4.50	4.50	8.25
25		7.50	4.50	4.13	7.88	4.50	4.50	8.25
30		7.00	4.20	3.85	5.25	3.75	3.90	7.70
35		7.00	4.20	3.85	5.25	2.25	2.30	7.70
40		4.00	2.40	2.20	3.94	1.50	0.90	4.40
45		3.00	1.80	1.65	2.63	1.50	0.50	3.30
50		2.00	1.20	1.10	2.10	1.25	0.50	2.20
55		2.00	1.20	1.10	2.10	0.75	0.50	2.20
60		2.00	1.20	1.10	2.10	0.75	0.50	2.20

*   *These groups do not have service-based rates of separation. All rates of separation are based on ages.*

Turnover Rates

Proposed Rates

Sample Ages	Years of Service	% of Active Members Separating within Next Year						
		General	DWS	Library	MCF	Sheriff's*	Road Commission*	BABH
ALL	0	15.00%	8.10%	8.25%	31.50%	N/A	N/A	19.80%
	1	9.00	4.86	4.95	31.50	N/A	N/A	11.88
	2	9.00	4.86	4.95	18.90	N/A	N/A	11.88
	3	8.00	4.32	4.40	15.76	N/A	N/A	10.56
	4	8.00	4.32	4.40	11.03	N/A	N/A	10.56
20	5 & Over	6.00	4.50	4.13	5.91	4.50	4.50	8.25
25		6.00	4.50	4.13	5.91	4.50	4.50	8.25
30		5.60	4.20	3.85	3.94	3.75	3.90	7.70
35		5.60	4.20	3.85	3.94	2.25	2.30	7.70
40		3.20	2.40	2.20	2.95	1.50	0.90	4.40
45		2.40	1.80	1.65	1.97	1.50	0.50	3.30
50		1.60	1.20	1.10	1.58	1.25	0.50	2.20
55		1.60	1.20	1.10	1.58	0.75	0.50	2.20
60		1.60	1.20	1.10	1.58	0.75	0.50	2.20

*   *These groups do not have service-based rates of separation. All rates of separation are based on age.*

Disability

Discussion: The assumed rates of disablement (leaving active service entitled to a disability pension) are usually a minor ingredient in cost calculations. The actual number of disability retirements was slightly higher than expected for all groups except the Library group during the study period.

Number of Active Members Separating During Next Year		
Department	**Actual**	**Expected**
General	3	2.4
DWS	1	0.3
Library	0	0.2
Medical Care Facility	4	1.9
Sheriff's Department	2	1.4
Road Commission	2	0.9
Total	**12**	**7.1**

Number of Active Members Separating During Next Year		
Department	**Actual**	**Expected**
BABH	2	1.1

Proposal: Given the limited System experience, we recommend no change in the present probabilities of disability retirement for all of the groups. The current rates are shown below.

Current Rates

Sample Ages	Percent Becoming Disabled within Next Year	
	Sheriff	**All Other Groups***
20	0.15 %	0.07 %
25	0.15	0.07
30	0.15	0.07
35	0.15	0.07
40	0.38	0.19
45	0.50	0.25
50	0.92	0.46
55	1.67	0.84
60	2.65	1.33

* Includes BABH.

Mortality

Mortality Experience: The size of the Bay County Employees' Retirement System is too small to provide credible experience data for selecting a mortality assumption, so we propose generally accepted tables for the System's use. 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, if at all.

Actuarial Standards of Practice: Mortality rates among retired public employees have been declining for years. Additionally, and perhaps consequently, 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.

New Mortality Tables and Projection Scale: In 2019, the Society of Actuaries (SOA) published a mortality study specific to public sector retirement systems. This very comprehensive study includes numerous mortality tables, generally called Pub-2010, created by classification of employee (General members, Public Safety, Teachers, Survivors, Juvenile, headcount-weighted, benefit weighted, above median, below median). In addition, the SOA updates mortality projection scales annually. The latest published table is called the MP-2021 Projection Scale, the SOA has been issuing improvement scales since 2014, which account for future improvements in mortality that are expected to occur. Lastly, the SOA recommends the use of "fully generational" (2-dimensional) projection scales.

Discussion: Pre-retirement mortality is used to measure the probabilities of members dying before retirement. Post-retirement mortality is used to measure the probabilities of each benefit payment being made after retirement. While there were more deaths than expected (145 actual vs. 134.1 expected) among retirees over the experience period, the membership in this group is not sufficiently large to set mortality expectations for the future. Additionally, during the study period, the COVID-19 pandemic influenced mortality experience. The impact of the COVID-19 pandemic varies considerably by occupation, income, geography, etc. We considered some recognition of the impact of COVID-19 on the mortality assumption; however, the impact would have been minimal at this time so no adjustment has been made. Actual experience will continue to be reflected in each future valuation as experience emerges.

As noted previously, the SOA released a series of public sector specific mortality tables in 2019, generally called Pub-2010. Historically, for the Retirement System, Public Safety participants have been valued with the same mortality tables as Non-Public Safety participants because mortality experience had not been investigated to create tables that differentiated between the groups. The Pub-2010 Mortality Tables produced by the SOA allow the ability to distinguish between General members and Public Safety members to reflect that Public Safety members and General members exhibit differing mortality patterns. Additionally, the SOA has been releasing updated projection scales each year to refine the projection of mortality improvements into the future based on updated information.

Mortality

The current mortality assumption is based on the RP-2014 Generational Mortality Tables, with adjustments and extended via cubic spline. These tables are adjusted backwards to 2006 with the MP-2014 scale, resulting in a base year of 2006 with future mortality improvements assumed each year using scale MP-2016.

Number of Deaths Among Retired Members		
Department	**Actual**	**Expected**
General	59	52.4
DWS	5	4.9
Library	7	7.8
Medical Care Facility	31	27.2
Sheriff's Department	6	10.7
Road Commission	28	19.3
Total	**136**	**122.3**

Number of Deaths Among Retired Members		
Department	**Actual**	**Expected**
BABH	9	11.8

Proposal: We recommend the use of the Pub-2010 amount-weighted General tables for the non-public safety groups and the Pub-2010 amount-weighted Safety tables for the Sheriff's Department group, in conjunction with the MP-2021 projection scale on a fully generational basis. We recommend that the mortality improvement scale remain unchanged until the next experience study. The change in mortality tables will increase measured liabilities. Below and on the following pages is a full disclosure of the proposed mortality tables.

Non-Public Safety (All Groups except Sheriff's Department)

- **Pre-Retirement:** Pub-2010 General Employee Mortality Tables, amount weighted, and projected with mortality improvements using the fully generational MP-2021 projection scale from a base year of 2010.
- **Healthy Post-Retirement:** Pub-2010 General Healthy Annuitant Mortality Tables, amount-weighted, and projected with mortality improvements using the fully generational MP-2021 projection scale from a base year of 2010.
- **Disability Retirement:** Pub-2010 General Disabled Retiree Mortality Tables, amount-weighted, and projected with mortality improvements using the fully generational MP-2021 projection scale from a base year of 2010.

Mortality

Public Safety (Sheriff's Department)

- **Pre-Retirement:** Pub-2010 Safety Employee Mortality Tables, amount weighted, and projected with mortality improvements using the fully generational MP-2021 projection scale from a base year of 2010.
- **Healthy Post-Retirement:** Pub-2010 Safety Healthy Annuitant Mortality Tables, amount-weighted, and projected with mortality improvements using the fully generational MP-2021 projection scale from a base year of 2010.
- **Disability Retirement:** Pub-2010 Safety Disabled Retiree Mortality Tables, amount-weighted, and projected with mortality improvements using the fully generational MP-2021 projection scale from a base year of 2010.

Summary of Life Expectancies under the Current Tables

Sample Ages	Healthy Pre-Retirement Future Life Expectancy (Years)^		Healthy Post-Retirement Future Life Expectancy (Years)^		Disabled Retirement Future Life Expectancy (Years)^	
	Men	Women	Men	Women	Men	Women
50	35.24	40.46	33.78	36.79	25.01	29.43
55	30.19	35.35	28.99	31.85	21.82	25.56
60	25.33	30.34	24.41	27.11	18.71	21.94
65	20.81	25.46	20.10	22.58	15.75	18.45
70	16.69	20.73	16.12	18.29	12.94	15.04
75	12.92	16.20	12.49	14.31	10.29	11.85
80	9.52	11.92	9.30	10.76	7.87	9.07

^ Based on retirements in 2021. Retirements in future years will reflect improvements in life expectancy.

Mortality (Concluded)

Summary of Life Expectancies under the Proposed Tables

Non-Public Safety (All Groups except Sheriff's Department)

Sample Ages	Healthy Pre-Retirement Future Life Expectancy (Years)^		Healthy Post-Retirement Future Life Expectancy (Years)^		Disabled Retirement Future Life Expectancy (Years)^	
	Men	Women	Men	Women	Men	Women
50	39.02	41.19	35.35	38.30	26.06	28.97
55	34.01	36.08	30.46	33.32	22.56	25.39
60	29.11	31.07	25.76	28.46	19.41	22.12
65	24.37	26.15	21.28	23.76	16.54	18.89
70	19.73	21.32	17.05	19.24	13.77	15.54
75	15.20	16.61	13.14	14.99	11.02	12.25
80	10.79	12.07	9.67	11.19	8.45	9.34

^ *Based on retirements in 2021. Retirements in future years will reflect improvements in life expectancy.*

Public Safety (Sheriff's Department)

Sample Ages	Healthy Pre-Retirement Future Life Expectancy (Years)^		Healthy Post-Retirement Future Life Expectancy (Years)^		Disabled Retirement Future Life Expectancy (Years)^	
	Men	Women	Men	Women	Men	Women
50	38.39	40.84	35.40	37.44	33.99	36.16
55	33.31	35.74	30.35	32.33	29.13	31.27
60	28.31	30.71	25.47	27.43	24.45	26.66
65	23.46	25.73	20.89	22.81	20.12	22.34
70	18.76	20.82	16.63	18.43	16.12	18.22
75	14.30	16.09	12.73	14.36	12.41	14.32
80	10.13	11.64	9.32	10.77	9.20	10.77

^ *Based on retirements in 2021. Retirements in future years will reflect improvements in life expectancy.*

Merit and Longevity Portion of Pay Increases

Discussion: Pay increases granted to individual active members consist in principle of two parts. The first part is an across-the-board economic type of increase related to inflation or cost-of-living changes. The second part, merit and/or longevity increases, relates to the performance of individual active members during a given year. Merit and longevity may include promotions and pay increases related to years of experience. Overall, merit and longevity pay increases were close to the expected rates while the overall wage inflation was lower than expected during the experience period.

Proposal: We recommend no change to the merit and longevity increases. We recommend lowering the base wage inflation rate from 3.25% to 3.00% (this is discussed further in Section B of this report). This change exerts downward pressure on liabilities. The current merit and longevity rates shown below, do not include any base wage inflation amounts.

Current Rates

Annual Rate of Pay Increase for Merit & Longevity

Years of Service	General	DWS	Library	MCF	Sheriff's	Road Commission	BABH
1	3.00%	3.00%	3.00%	0.50%	5.25%	5.25%	3.00%
2	2.25%	2.25%	2.25%	0.50%	4.50%	3.00%	2.25%
3	1.50%	1.50%	1.50%	0.50%	4.50%	3.00%	1.50%
4	1.50%	1.50%	1.50%	0.50%	3.75%	3.00%	1.50%
5	0.75%	0.75%	0.75%	0.50%	3.00%	0.75%	0.75%
6+	0.75%	0.75%	0.75%	0.50%	0.75%	0.75%	0.75%

SECTION B

ECONOMIC ASSUMPTIONS

Economic Assumptions

Economic assumptions include long-term rates of investment return (net of investment expenses), price inflation, wage inflation (the across-the-board portion of salary increases), and pay increases due to merit and seniority. Unlike demographic activities, economic activities do not lend themselves to analysis solely on the basis of internal historical patterns because both salary increases and investment return are more affected by external forces; namely inflation (both wage and price), general productivity changes and the local economic environment which defy accurate long-term prediction. Estimates of economic activities are generally selected on the basis of the expectations in an inflation-free environment and then both long-term rates of investment return and wage inflation are increased by some provision for long-term price inflation.

If price inflation and/or productivity increases are lower than expected, it will probably result in both actual rates of salary increases and investment return below the assumed rates. Salaries increasing at rates less than expected will generally produce lower liabilities. However, actual investment returns below the assumed rates (whether due to manager performance, change in the mix of assets, or general market conditions) results in lower than expected asset amounts.

Sources considered in the analysis of the price inflation assumption included:
- Congressional Budget Office's expectations;
- Expectations from the Federal Reserve Banks of Philadelphia, Cleveland, and St. Louis;
- Comparisons of Treasury yields and Treasury Inflation Protected Securities (TIPS);
- Social Security Trustees report;
- Future expectations of the System's current investment consultant (i.e., AndCo); and
- Future expectations of other investment consultants.

Sources considered in the analysis of the investment return assumption included:
- Future expectations of the System's current investment consultant (i.e., AndCo); and
- Future expectations of other investment consultants.

Sources considered in the wage inflation and merit and longevity pay increase included:
- Actual experience over the last 5 years (i.e., merit and seniority pay increases); and
- Historical observations of inflation statistics (both price and wage) nationally.

Current economic assumptions for the Bay County Employees' Retirement System are as follows:

Price Inflation	2.50%
Wage Inflation	3.25%
Net Investment Return	7.25%

Economic Assumptions

Guidance regarding the selection of economic assumptions for measuring pension obligations is provided by Actuarial Standards of Practice (ASOP) No. 27. The standard requires that the selected economic assumptions be consistent with each other. That is, the selection of the investment return assumption should be consistent with the selection of the wage inflation and price inflation assumptions. ASOP No. 27 (Doc. No. 197) adopted by the Actuarial Standards Board (ASB) in June 2020 defines a reasonable economic assumption as an assumption that has the following characteristics:

(a) It is appropriate for the purpose of the measurement;
(b) It reflects the actuary's professional judgment;
(c) It takes into account current and historical data that is relevant to selecting the assumption for the measurement date, to the extent such relevant data is reasonably available;
(d) It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data (if any), or a combination thereof; and
(e) It is expected to have no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included (as discussed in Section 3.5.1) or when alternative assumptions are used for the assessment of risk, in accordance with ASOP No. 51, Assessment and Disclosure of Risk Associated with measuring Pension Obligations and Determining Pension Plan Contributions.

Public Act 202. Under Public Act 202 of the State of Michigan, Michigan municipalities are required to report liabilities under new uniform assumption guidelines. While the current guidelines are only for reporting purposes (and not funding), city governments may be encouraged to use these new assumptions for funding. The recommendations include the following (for fiscal year 2023 reporting):

- Investment return no higher than 6.85%;
- Assumed wage inflation no lower than 3.25%*;
- Mortality assumption that uses a version of the Pub-2010 table with future mortality improvement projected generationally using Scale MP-2021*; and
- Amortization period no longer than 16 years for Pension Plans and 26 years for Retiree Health Plans.

* Or based on an actuarial experience study conducted within the last five years.

Economic Assumptions – Price Inflation

Price Inflation is a key component of the underlying wage inflation and interest rate assumptions and must be disclosed in actuarial reports. We recommend that a specific price inflation assumption be adopted in conjunction with this Experience Study. The current price inflation assumption is 2.50%. The table below shows forward-looking price inflation forecasts.

Forward-Looking Price Inflation Forecasts[a]	
Congressional Budget Office[b]	
5-Year Annual Average	2.83%
10-Year Annual Average	2.57%
Federal Reserve Bank of Philadelphia[c]	
5-Year Annual Average	2.50%
10-Year Annual Average	2.36%
Federal Reserve Bank of Cleveland[d]	
10-Year Expectation	1.66%
20-Year Expectation	1.88%
30-Year Expectation	2.05%
Federal Reserve Bank of St. Louis[e]	
10-Year Breakeven Inflation	2.20%
20-Year Breakeven Inflation	2.48%
30-Year Breakeven Inflation	2.23%
U.S. Department of the Treasury[f]	
10-Year Breakeven Inflation	2.10%
20-Year Breakeven Inflation	2.40%
30-Year Breakeven Inflation	2.19%
50-Year Breakeven Inflation	2.29%
100-Year Breakeven Inflation	2.37%
Social Security Trustees[g]	
Ultimate Intermediate Assumption	2.40%

a   *End of the Second Quarter, 2023. Version 2023-07-10 by Gabriel, Roeder, Smith & Company.*
b   *The Budget and Economic Outlook: 2023 to 2033, Release Date: February 2023, Consumer Price Index (CPI-U), Percentage Change from Year to Year, 5-Year Annual Average (2023 - 2027), 10-Year Annual Average (2023 - 2032).*
c   *Second Quarter 2023 Survey of Professional Forecasters, Release Date: May 12, 2023, Headline CPI, Annualized Percentage Points, 5-Year Annual Average (2023 - 2027), 10-Year Annual Average (2023 - 2032).*
d   *Inflation Expectations, Model output date: June 1, 2023.*
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, 2023.*
f   *The Treasury Breakeven Inflation (TBI) Curve, Monthly Average Rates, June, 2023.*
g   *The 2023 Annual Report of The Board of Trustees of The Federal Old-Age And Survivors Insurance and Federal Disability Insurance Trust Funds, March 31, 2023, p. 10, Key Assumptions and Summary Measures for the Last 65 Years of the Long-Range (75-year) Projection Period, Intermediate, Consumer Price Index (CPI-W).*

Economic Assumptions – Price Inflation (Concluded)

The previous table shows forward-looking price inflation forecasts at various time horizons. The Congressional Budget Office and Federal Reserve Bank of Philadelphia's 5-year annual average inflation assumptions are 2.83% and 2.50% respectively, while their 10-year annual average assumptions are 2.57% and 2.36% respectively. This suggests that price inflation is expected to decrease and stabilize in years 6 through 10.

For the firms included in the 2023 version of the GRS Capital Market Assumptions Modeler (CMAM), the average price inflation assumption used in the forward-looking capital market expectations was 2.52% over the next 10 years (with a range of 2.26% to 2.90%) and 2.56% over the next 20 to 30 years.

The chart below shows historical averages of both price and wage inflation.

| Year | Annual Increase in | | |
	Prices (CPI-U)	Wages (NAE)	Difference
3-Year Avg	4.9%	5.0%	0.1%
5-Year Avg	3.8%	4.5%	0.7%
10-Year Avg	2.6%	3.5%	0.9%
20-Year Avg	2.5%	3.2%	0.7%
30-Year Avg	2.5%	3.4%	0.9%
50-Year Avg	4.0%	4.4%	0.4%

While the very current CPI rates are well above 2.50% and future expectations for inflation have been rising, the current assumption is in line with inflation forecasters' and investment firms' forward-looking expectations. **Therefore, we recommend no change to the current price inflation assumption of 2.50%.**

Economic Assumptions – Wage Inflation

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 chart on page 18 shows historical averages of wage inflation. Over the past 50 years, wage inflation (as measured by increases in the National Average Earnings) has averaged 4.4%. This would imply a real growth rate of 0.4% over the past 50 years (i.e., 4.4% - 4.0%). The past decade saw a real growth rate of wages of 0.9% (i.e., 3.5% - 2.6%).

The current payroll growth assumption is 3.25%, which is comprised of a 2.50% price inflation assumption, plus a real wage growth assumption of 0.75%. Average salaries for active members participating in the System have increased approximately 2.2% annually over the last five years, 0.9% annually over the last 10 years and 1.6% annually over the last 20 years.

We are generally comfortable with the wage inflation assumption exceeding the price inflation assumption by 0.50% to 1.00%. Given our suggested price inflation assumption of 2.50%, we suggest the wage inflation assumption exceed the price inflation assumption by 0.50%. **We recommend decreasing the current wage inflation assumption from 3.25% to 3.00%.** This change will exert downward pressure on liabilities.

Economic Assumptions – Investment Return

Investment Return is the actuarial assumption that has the largest effect on actuarial valuation results. As more of the actuarial accrued liabilities are related to non-active members, the nominal (as opposed to real) investment return assumption becomes a more prominent factor. Since one of the System's fundamental financial objectives is the receipt of level contributions over time, the discount rate assumption is set equal to the investment return assumption.

The review of the investment return assumption in this report is a forward-looking measure of likely investment return outcomes for the asset classes under the current investment policy.

Presented below is the approximate current asset allocation for the System (as provided in the System's December 31, 2021 asset information):

Asset Class	Target
Domestic Equity	78%
Broad Market Fixed Income	19%
Real Estate	1%
Alternatives	0%
Cash	2%

Because GRS is a benefits consulting firm and does not develop or maintain its own capital market expectations, we monitor forward-looking expectations developed by several investment firms. Our analysis is based on the GRS Capital Market Assumptions Modeler (CMAM). For the 2023 GRS CMAM, 10-year capital market expectations were provided by 11 investment firms and 20- to 30-year capital market expectations were provided by 7 investment firms. It is important to understand that in general no two investment consultants will consider the same asset classes. Moreover, there are differences in investment horizons, price inflation, treatment of investment expenses, excess manager performance (i.e., alpha), geometric vs. arithmetic averages, and other technical issues. We have attempted to align the various assumption sets from the different investment consultants to be as consistent as possible.

Based upon the System's approximate target asset allocation, future return expectations of the various investment consultants that GRS monitors were analyzed. The next few exhibits show the results of this analysis. Final expected nominal investment return results are based upon a 2.50% price inflation assumption. We used the actuarial assumption for price inflation rather than the consultant assumption, in order to be consistent with the calculation of liabilities. In the following charts, all returns are net of investment expenses and administrative expenses and have no assumption for excess manager performance (alpha) in excess of active management fees.

Economic Assumptions – Investment Return

The arithmetic expected return developed from the approximate target asset allocation is shown in the table below. 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 long-term price inflation assumption of 2.50% (column 5) to get the adjusted nominal return (column 6). Note that this return has not yet been adjusted for risk or "volatility drag." We have shown the standard deviation of returns as the investment risk (column 7).

GRS 2023 CMAM						
Capital Market Assumption Set (CMA)	CMA Expected Nominal Return	CMA Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	6.93%	2.50%	4.43%	2.50%	6.93%	13.82%
2	7.37%	2.90%	4.47%	2.50%	6.97%	13.78%
3	7.63%	2.50%	5.13%	2.50%	7.63%	14.43%
4	7.55%	2.26%	5.28%	2.50%	7.78%	14.07%
5	7.80%	2.31%	5.49%	2.50%	7.99%	15.30%
6	8.25%	2.90%	5.35%	2.50%	7.85%	14.01%
7	8.06%	2.51%	5.55%	2.50%	8.05%	15.18%
8	8.06%	2.41%	5.65%	2.50%	8.15%	15.05%
9	8.24%	2.28%	5.96%	2.50%	8.46%	13.78%
10	8.83%	2.54%	6.29%	2.50%	8.79%	14.14%
11	9.00%	2.62%	6.38%	2.50%	8.88%	14.10%
Average	**7.97%**	**2.52%**	**5.45%**	**2.50%**	**7.95%**	**14.33%**
				Average from last 3 CMAMs	**6.94%**	**14.23%**

The average expected nominal return from column 6 is 7.95% before adjustment for volatility drag. Note that the expected rate of return shown in the table above represents the average future expected return which is higher than the median future expected. Setting the valuation assumption at the arithmetic expected return means that over time the average accumulated assets are expected to grow at this rate. However, in any given year it is less than 50% likely that this return will be achieved. From the perspective of the Actuarial Standards of Practice, this may be considered a reasonable assumption. Adjusting for volatility (as we do on the following page) is also reasonable.

Next, we compare the probabilities of achieving returns over a 10-year horizon. We compute the 40th, 50th, and 60th percentiles of returns as well as the probability of achieving the current assumption of 7.25% over a 10-year horizon. Note that the investment horizon for most of the capital market assumption sets is between 5 and 10 years.

Economic Assumptions – Investment Return (Concluded)

GRS 2023 CMAM				
Capital Market Assumption Set (CMA)	Distribution of 10-Year Average Geometric Net Nominal Return			Probability of Exceeding
	40th	50th	60th	7.25%
(1)	(2)	(3)	(4)	(5)
1	4.96%	6.05%	7.15%	39.09%
2	5.01%	6.09%	7.19%	39.45%
3	5.54%	6.67%	7.82%	44.93%
4	5.77%	6.88%	7.99%	46.61%
5	5.72%	6.92%	8.13%	47.25%
6	5.84%	6.95%	8.06%	47.25%
7	5.81%	7.00%	8.20%	47.88%
8	5.94%	7.12%	8.31%	48.87%
9	6.51%	7.60%	8.70%	53.23%
10	6.77%	7.89%	9.01%	55.75%
11	6.87%	7.98%	9.10%	56.59%
Average	5.89%	7.01%	8.15%	47.90%
Average from last 3 CMAMs over 10-year horizon	6.01%			

The 50th percentile return is also the geometric average return. This is the expected return adjusted for volatility drag and is a reasonable rate of return for purposes of the valuation. The average of 50th percentile returns is 7.01% per year.

The table below summarizes the average geometric and arithmetic returns based upon the System's approximate current asset allocation for 2021, 2022 and 2023 CMAMs. Due to the volatility in forecasted returns, the table also provides a 3-year average of results.

CMAM Scenarios	Average Returns	
	Geometric	Arithmetic
2021 CMAM	5.65%	6.59%
2022 CMAM	5.36%	6.29%
2023 CMAM	7.02%	7.95%
3-year Average	6.01%	6.94%

Based upon the results of our analysis and given the variation of future expectations, we believe that investment return assumptions of 7.00% or 7.25% are reasonable. GRS recommends 7.25% but to assist the Board with decision making, on page 21 we provide illustrative computed contribution rates based on 7.00% and 7.25% assumptions. Lastly, the Board may want to seek advice from Bay County Employees' Retirement System's investment consultants prior to making a significant change in the investment return assumption.

Nothing in this report should be construed as GRS giving investment advice.

SECTION C

MISCELLANEOUS ASSUMPTIONS AND METHODS

Miscellaneous Assumptions and Methods

Amortization Policy

The amortization policy is to compute contribution amounts using a 21-year closed amortization period (decreasing by 1 each year) for groups that are underfunded and a 20-year open amortization period for overfunded groups. **We recommend no change to the amortization method.**

Asset Valuation Method

The asset valuation method uses a 5-year asset smoothing method with no corridor. The Funding Value of Assets recognizes assumed investment income fully each year. Differences between actual and assumed investment income are phased-in over a closed 5-year period. This is a very common method among public retirement systems. Most systems use an averaging period between 3 and 10 years with 5 being the most common. **We do not recommend any changes at this time.** If, however, the Board has concerns over the volatility of contributions, a smoothing period of 6 or 7 years could be considered. If the smoothing period was lengthened, we would recommend establishing a 'corridor', so that the Funding Value will not diverge too far from the actual Market Value. Systems which use a corridor will vary on the amount of the corridor, but it is typically between 10% and 30%.

Load in Final Average Compensation for Unused Sick and Vacation Time

This load is due to unused vacation and sick leave that is rolled into final average compensation at time of retirement. As a result, our valuation includes a percent load to account for this provision. We analyzed the final average compensation with and without the unused vacation and sick leave for all members who retired during the period 2017 to 2021. Based on the results of this analysis **we recommend the following changes:**

Division	Actual	Current Assumption	Proposed Assumption
General	2.85%	3.50%	**3.25%**
DWS	2.06	7.00	**6.00**
Library	4.62	4.50	4.50
MCF	2.54	5.00	**4.00**
Sheriff's Department	3.97	5.00	**4.50**
Road Commission	5.88	8.50	**7.75**

Division	Actual	Current Assumption	Proposed Assumption
BABH	2.86%	4.50%	**4.00%**

Additionally, currently this adjustment applies to future normal and early retirements only. As part of this experience study **we recommend applying this adjustment to normal, early, deferred and disability retirement.**

Miscellaneous Assumptions and Methods (Continued)

Administrative Expenses

Non-investment administrative expenses are assumed to average 0.50% of payroll annually. We analyzed the administrative expenses as a percentage of payroll during the period 2017 to 2021. Based on the results of this analysis below, we recommend a change in administrative expense from 0.50% to 0.45%.

Valuation Year	Administrative Expenses	Total Valuation Payroll	Expense as Percent of Payroll
2017	$ 345,465	$ 49,297,119	0.70%
2018	193,917	50,435,136	0.38%
2019	249,848	53,016,775	0.47%
2020	233,211	53,610,531	0.44%
2021	193,015	55,419,522	0.35%
Total	$ 1,215,456	$ 261,779,083	0.46%

Option Factors

Optional forms of payment are calculated using an interest assumption and assumed rates of mortality. If a retiring member elects an optional form of benefit, the assumed benefit is multiplied by the appropriate option factor to produce the benefit actually payable. As a matter of common practice, option factors are usually revised to correspond to the new interest and mortality assumptions adopted with an experience study.

Currently, option factors for survivor benefits are calculated using a 7.50% interest rate assumption and assumed rates of post-retirement mortality (RP-2000 Mortality Combined Healthy Tables, projected 20 years with U.S. Projection Scale BB, multiplied by 110%) from prior to the 2015 Experience Study with a 50% male/50% female unisex mix. **We recommend all option factors be updated for new mortality, interest rate assumptions, and unisex mix.** Examples of option factors calculated using the present assumptions and our proposed assumptions (including 7.25% interest, the new non-public safety post-retirement mortality assumptions, and a change to a unisex mix of 40% male/60% female) are shown below. The proposed factors include a static mortality improvement projection to 2026, which should coincide with the next experience study. If the new assumptions are adopted, we recommend the new option factors be adopted for retirements on or after January 1, 2024 to allow time for administrative changes. We would also recommend that any such change be reviewed by legal counsel.

Age		Option A-120 10-Year Certain and Life		Option B-100 100% Joint & Survivor with Pop-up		Option C-50 50% Joint & Survivor with Pop-up	
Ret.	Ben.	Present	Proposed 7.25%	Present	Proposed 7.25%	Present	Proposed 7.25%
50	45	0.99349	0.99330	0.92401	0.92982	0.96051	0.96364
55	50	0.98847	0.98989	0.89948	0.91088	0.94708	0.95336
60	55	0.97896	0.98430	0.86853	0.88693	0.92964	0.94008
65	60	0.96183	0.97444	0.83103	0.85649	0.90772	0.92270

Miscellaneous Assumptions and Methods (Concluded)

Early Retirement Reduction Factors

Early retirement reduction factors are used if a retiring member elects to commence benefits before meeting normal retirement eligibility; the assumed benefit is multiplied by the appropriate early retirement reduction factor to produce the benefit actually payable. As a matter of common practice, early retirement reduction factors are usually revised to correspond to the new interest and mortality assumptions adopted with an experience study.

Currently, early retirement reduction factors are calculated using a 7.50% interest rate assumption and assumed rates of post-retirement mortality (RP-2000 Mortality Combined Healthy Tables, projected 20 years with U.S. Projection Scale BB, multiplied by 110%) from prior to the 2015 Experience Study with a 30% male/70% female unisex mix. **We recommend all early retirement reduction factors be updated for new mortality, interest rate assumptions, and unisex mix. We propose the new factors be based on 7.25% interest, the new non-public safety post-retirement mortality assumptions, and a unisex mix of 30% male/70% female.** The proposed factors would include a static mortality improvement projection to 2026, which should coincide with the next experience study. If the new assumptions are adopted, we recommend the new early retirement reduction factors be adopted for retirements on or after January 1, 2024 to allow time for administrative changes. We would also recommend that any such change be reviewed by legal counsel.

Early Retirement Factors for an Employee Whose:

Age Ret.	Normal Retirement Age is 60		Age Ret.	Normal Retirement Age is 55	
	Present	Proposed 7.25%		Present	Proposed 7.25%
45	0.280428	0.296482	45	0.437969	0.452678
50	0.420135	0.437491	50	0.656161	0.667974
55	0.640292	0.654952			

SECTION D

SUMMARY OF VALUATION RESULTS

Summary of Current and Proposed Assumptions

	Economic Assumptions			Non-Economic Assumptions
	Net Rate of Investment Return	**Rate of Inflation**		
Assumption Set		**Wage**	**Spread**	**Demographic**
A. Base	7.25%	3.25%	4.00%	Current
B. Proposed Demographic	7.25	3.00	4.25	Proposed
C. Alternate I Economic	7.00	3.00	4.00	Proposed

Illustrative Contribution Rates as of December 31, 2021
Comparison of Current and Proposed Assumptions

	Funded Percent (BCERS - Excluding BABH)		
	A	B	C
	Current Assumptions	Proposed Demographic & Economic Assumptions	
	7.25% / 3.25%	7.25% / 3.00%	7.00% / 3.00%
General	133.6 %	130.2 %	126.9 %
DWS	91.2 %	89.3 %	87.0 %
Library	125.5 %	121.5 %	118.8 %
MCF	126.8 %	122.7 %	119.3 %
Sheriff	138.0 %	135.1 %	131.5 %
Road Commission	101.1 %	98.9 %	96.6 %
Total	125.1 %	122.0 %	118.8 %

	Employer Normal Cost Percent (BCERS - Excluding BABH)		
	A	B	C
	Current Assumptions	Proposed Demographic & Economic Assumptions	
	7.25% / 3.25%	7.25% / 3.00%	7.00% / 3.00%
General	5.43 %	5.78 %	6.39 %
DWS	9.82 %	9.99 %	10.74 %
Library	$91,887	$92,685	$99,942
MCF	5.29 %	5.30 %	5.87 %
Sheriff	9.09 %	9.23 %	10.07 %
Road Commission	9.95 %	9.90 %	10.74 %
Total	$2,961,039	$3,027,160	$3,319,944

	Employer Contribution Rate (BCERS - Excluding BABH)		
	A	B	C
	Current Assumptions	Proposed Demographic & Economic Assumptions	
	7.25% / 3.25%	7.25% / 3.00%	7.00% / 3.00%
General	0.00 %	0.00 %	0.00 %
DWS	12.99 %	14.14 %	15.92 %
Library	$0	$0	$0
MCF	0.00 %	0.00 %	0.00 %
Sheriff	0.00 %	0.00 %	0.00 %
Road Commission	8.91 %	10.51 %	13.25 %
Total	$799,393	$894,226	$1,056,177

	BABH		
	A	B	C
	Current Assumptions	Proposed Demographic & Economic Assumptions	
	7.25% / 3.25%	7.25% / 3.00%	7.00% / 3.00%
Funded Percent	110.0 %	106.5 %	103.4 %
Employer Normal Cost Percent	6.41 %	6.36 %	6.92 %
Unfunded Accrued Liability ERIP[*]	1.28 %	1.29 %	1.29 %
Employer Contribution Rate	4.17 %	5.19 %	6.88 %

* Unfunded accrued liability associated with the Early Retirement Incentive Program (ERIP).

SECTION E

COMPLETE LISTING OF DEMOGRAPHIC ASSUMPTIONS

Proposed Retirement Rates

Retirement Ages	Percent of Active Members Retiring Within Next Year						
	General	DWS	Library	MCF	Sheriff's	Road Commission	BABH
50				20 %		18 %	
51				20		18	
52				20		28	
53				20		28	
54				20		28	
55	20 %	28 %	17 %	30		28	18 %
56	13	23	12	40		18	13
57	13	23	12	50		18	13
58	13	23	12	50		18	13
59	13	23	12	50		18	13
60	30	38	27	30	13 %	18	28
61	25	33	22	30	13	18	23
62	13	23	12	50	28	38	13
63	13	23	12	25	13	38	13
64	13	23	12	25	13	38	13
65	30	38	27	100	100	100	28
66	13	23	12				13
67	13	23	12				13
68	13	23	12				13
69	13	23	12				13
70	100	100	100				100

The following table shows the rates used for the Road Patrol, Road Patrol Supervisory Unit, and Elected Officials and Department Heads: Elected Sheriff and Appointed Undersheriff 25 & Out provision and the Correctional Facility Officers 55 & 25 provision.

25 & Out			55 & 25	
Years of Service	Sheriff's Road Patrol, Road Patrol Supervisory Unit, and Elected Sheriff and Appointed Undersheriff		Age	Correctional Facility Officers
25	35%		55	35%
26	35		56	35
27	35		57	35
28	25		58	25
29	25		59	25
30	25		60	25
31	25		61	25
32	25		62	25
33	25		63	25
34	100		64	100

Proposed Early Retirement Rates

55 & 8 and/or 55 & 10 Early Retirement

Retirement Ages	General	DWS	Library	Retirement Ages	BABH
55	8 %	15 %	5 %	55	5 %
56	8	15	5	56	5
57	8	15	5	57	5
58	8	15	5	58	5
59	8	15	5	59	5
60	8	15	5	60	5
61	8			61	5

Proposed Withdrawal Rates

Percent Separating Within Next Year

Sample Ages		General	DWS	Library	MCF	Sheriff's*	Road Commission*	BABH
ALL	0	15.00%	8.10%	8.25%	31.50%	N/A	N/A	19.80%
	1	9.00	4.86	4.95	31.50	N/A	N/A	11.88
	2	9.00	4.86	4.95	18.90	N/A	N/A	11.88
	3	8.00	4.32	4.40	15.76	N/A	N/A	10.56
	4	8.00	4.32	4.40	11.03	N/A	N/A	10.56
20 & under		6.00	4.50	4.13	5.91	4.50%	4.50%	8.25
21		6.00	4.50	4.13	5.91	4.50	4.50	8.25
22		6.00	4.50	4.13	5.91	4.50	4.50	8.25
23		6.00	4.50	4.13	5.91	4.50	4.50	8.25
24		6.00	4.50	4.13	5.91	4.50	4.50	8.25
25		6.00	4.50	4.13	5.91	4.50	4.50	8.25
26		6.00	4.50	4.13	5.51	4.25	4.50	8.25
27		6.00	4.50	4.13	5.12	4.25	4.50	8.25
28		6.00	4.50	4.13	4.73	4.00	4.40	8.25
29		6.00	4.50	4.13	4.33	4.00	4.20	8.25
30		5.60	4.20	3.85	3.94	3.75	3.90	7.70
31		5.60	4.20	3.85	3.94	3.50	3.60	7.70
32		5.60	4.20	3.85	3.94	3.25	3.30	7.70
33		5.60	4.20	3.85	3.94	2.75	3.00	7.70
34		5.60	4.20	3.85	3.94	2.50	2.70	7.70
35		5.60	4.20	3.85	3.94	2.25	2.30	7.70
36		5.60	4.20	3.85	3.74	2.00	1.90	7.70
37		5.60	4.20	3.85	3.54	2.00	1.50	7.70
38		5.60	4.20	3.85	3.35	1.75	1.20	7.70
39		5.60	4.20	3.85	3.15	1.75	1.00	7.70
40		3.20	2.40	2.20	2.95	1.50	0.90	4.40
41		3.04	2.28	2.09	2.76	1.50	0.80	4.18
42		2.88	2.16	1.98	2.56	1.50	0.70	3.96
43		2.72	2.04	1.87	2.36	1.50	0.60	3.74
44		2.56	1.92	1.76	2.17	1.50	0.55	3.52
45		2.40	1.80	1.65	1.97	1.50	0.50	3.30
46		2.24	1.68	1.54	1.97	1.50	0.50	3.08
47		2.08	1.56	1.43	1.77	1.25	0.50	2.86
48		1.92	1.44	1.32	1.77	1.25	0.50	2.64
49		1.76	1.32	1.21	1.58	1.25	0.50	2.42
50		1.60	1.20	1.10	1.58	1.25	0.50	2.20
51		1.60	1.20	1.10	1.58	1.00	0.50	2.20
52		1.60	1.20	1.10	1.58	1.00	0.50	2.20
53		1.60	1.20	1.10	1.58	1.00	0.50	2.20
54		1.60	1.20	1.10	1.58	0.75	0.50	2.20
55		1.60	1.20	1.10	1.58	0.75	0.50	2.20
56		1.60	1.20	1.10	1.58	0.75	0.50	2.20
57		1.60	1.20	1.10	1.58	0.75	0.50	2.20
58		1.60	1.20	1.10	1.58	0.75	0.50	2.20
59		1.60	1.20	1.10	1.58	0.75	0.50	2.20
60		1.60	1.20	1.10	1.58	0.75	0.50	2.20
61		1.44	1.08	0.99	1.58	0.75	0.50	1.98
62		1.28	0.96	0.88	1.58	0.75	0.50	1.76
63		1.12	0.84	0.77	1.58	0.75	0.50	1.54
64		0.96	0.72	0.66	1.58	0.75	0.50	1.32
65		0.80	0.60	0.55	1.58	0.75	0.50	1.10
66		0.80	0.60	0.55	1.58	0.75	0.50	1.10
67		0.80	0.60	0.55	1.58	0.75	0.50	1.10
68		0.80	0.60	0.55	1.58	0.75	0.50	1.10
69		0.80	0.60	0.55	1.58	0.75	0.50	1.10
70 & over		0.80	0.60	0.55	1.58	0.75	0.50	1.10

These groups do not have service-based rates of separation. All rates of separation are based on ages.

Proposed Disability Rates

Percent Becoming Disabled within Next Year

Sample Ages	Sheriff	All Other Groups*	Sample Ages	Sheriff	All Other Groups*
20 & Under	0.15 %	0.07 %	40	0.38 %	0.19 %
21	0.15	0.07	41	0.39	0.19
22	0.15	0.07	42	0.40	0.20
23	0.15	0.07	43	0.42	0.21
24	0.15	0.07	44	0.46	0.23
25	0.15	0.07	45	0.50	0.25
26	0.15	0.07	46	0.55	0.28
27	0.15	0.07	47	0.62	0.31
28	0.15	0.07	48	0.71	0.35
29	0.15	0.07	49	0.81	0.41
30	0.15	0.07	50	0.92	0.46
31	0.15	0.07	51	1.05	0.53
32	0.15	0.07	52	1.19	0.60
33	0.15	0.07	53	1.34	0.67
34	0.15	0.07	54	1.50	0.75
35	0.15	0.07	55	1.67	0.84
36	0.24	0.12	56	1.85	0.93
37	0.30	0.15	57	2.04	1.02
38	0.34	0.17	58	2.24	1.12
39	0.36	0.18	59	2.44	1.22
			60	2.65	1.33

Includes BABH.

Proposed Merit and Longevity Rates

Annual Rate of Pay Increase for Merit & Longevity

Years of Service	General	DWS	Library	MCF	Sheriff's	Road Commission	BABH
1	3.00%	3.00%	3.00%	0.50%	5.25%	5.25%	3.00%
2	2.25%	2.25%	2.25%	0.50%	4.50%	3.00%	2.25%
3	1.50%	1.50%	1.50%	0.50%	4.50%	3.00%	1.50%
4	1.50%	1.50%	1.50%	0.50%	3.75%	3.00%	1.50%
5	0.75%	0.75%	0.75%	0.50%	3.00%	0.75%	0.75%
6+	0.75%	0.75%	0.75%	0.50%	0.75%	0.75%	0.75%

Proposed Pre-Retirement Mortality Rates

Non-Public Safety (All Groups except Sheriff's Department)

Age	% Dying Next Year* Male	% Dying Next Year* Female	Age	% Dying Next Year* Male	% Dying Next Year* Female
50	0.1400%	0.0766%	86	8.9384%	6.7048%
51	0.1515%	0.0840%	87	10.0160%	7.6255%
52	0.1638%	0.0919%	88	11.1893%	8.6574%
53	0.1780%	0.1013%	89	12.4604%	9.7919%
54	0.1932%	0.1113%	90	13.8219%	11.0178%
55	0.2113%	0.1236%	91	15.2638%	12.3138%
56	0.2313%	0.1360%	92	16.7675%	13.6602%
57	0.2541%	0.1494%	93	18.3275%	15.0532%
58	0.2784%	0.1633%	94	19.9344%	16.4864%
59	0.3036%	0.1785%	95	21.5731%	17.9767%
60	0.3305%	0.1946%	96	23.3619%	19.6086%
61	0.3581%	0.2103%	97	25.2102%	21.3384%
62	0.3861%	0.2265%	98	27.1233%	23.1704%
63	0.4151%	0.2442%	99	29.1026%	25.1073%
64	0.4437%	0.2632%	100	31.1243%	27.1435%
65	0.4730%	0.2831%	101	33.1587%	29.2428%
66	0.5031%	0.3059%	102	35.1760%	31.3606%
67	0.5353%	0.3320%	103	37.1807%	33.4899%
68	0.5699%	0.3609%	104	39.1399%	35.5981%
69	0.6096%	0.3940%	105	41.0368%	37.6853%
70	0.6534%	0.4325%	106	42.8762%	39.7125%
71	0.7041%	0.4766%	107	44.6453%	41.6804%
72	0.7606%	0.5265%	108	46.3184%	43.5755%
73	0.8257%	0.5833%	109	47.9181%	45.3807%
74	0.8993%	0.6479%	110	49.2058%	47.0925%
75	0.9825%	0.7206%	111	49.3538%	48.7054%
76	1.0755%	0.8020%	112	49.5023%	49.6064%
77	1.1801%	0.8921%	113	49.6511%	49.7307%
78	1.2953%	0.9939%	114	49.8103%	49.8502%
79	1.4238%	1.1060%	115	49.9600%	49.9700%
80	1.5665%	1.2303%	116	49.9800%	49.9850%
81	2.0931%	1.6351%	117	49.9900%	49.9950%
82	2.7986%	2.1710%	118	50.0000%	50.0000%
83	3.7402%	2.8807%	119	50.0000%	50.0000%
84	5.0001%	3.8205%	120	100.0000%	100.0000%
85	6.6857%	5.0626%			

Applicable to calendar year 2021. Rates in future years are determined by the MP-2021 projection scale.

Proposed Pre-Retirement Mortality Rates (Concluded)

Public Safety (Sheriff's Department)

	% Dying Next Year*			% Dying Next Year*	
Age	Male	Female	Age	Male	Female
50	0.1127%	0.0840%	86	9.5073%	7.2676%
51	0.1206%	0.0905%	87	10.6701%	8.1277%
52	0.1310%	0.0976%	88	11.9573%	9.0881%
53	0.1422%	0.1052%	89	13.3794%	10.1522%
54	0.1542%	0.1142%	90	14.9411%	11.3324%
55	0.1688%	0.1236%	91	16.5391%	12.5920%
56	0.1862%	0.1340%	92	18.1036%	13.9048%
57	0.2043%	0.1452%	93	19.6128%	15.2612%
58	0.2258%	0.1549%	94	21.0668%	16.6538%
59	0.2493%	0.1659%	95	22.4779%	18.1028%
60	0.2735%	0.1758%	96	24.0099%	19.6947%
61	0.2998%	0.1844%	97	25.6068%	21.3892%
62	0.3278%	0.1939%	98	27.3150%	23.1944%
63	0.3561%	0.2021%	99	29.1587%	25.1140%
64	0.3843%	0.2104%	100	31.1243%	27.1435%
65	0.4144%	0.2181%	101	33.1587%	29.2428%
66	0.4623%	0.2451%	102	35.1760%	31.3606%
67	0.5138%	0.2752%	103	37.1807%	33.4899%
68	0.5728%	0.3113%	104	39.1399%	35.5981%
69	0.6379%	0.3530%	105	41.0368%	37.6853%
70	0.7120%	0.4015%	106	42.8762%	39.7125%
71	0.7968%	0.4589%	107	44.6453%	41.6804%
72	0.8942%	0.5265%	108	46.3184%	43.5755%
73	1.0062%	0.6053%	109	47.9181%	45.3807%
74	1.1347%	0.6975%	110	49.2058%	47.0925%
75	1.2836%	0.8053%	111	49.3538%	48.7054%
76	1.4537%	0.9304%	112	49.5023%	49.6064%
77	1.6494%	1.0758%	113	49.6511%	49.7307%
78	1.8736%	1.2447%	114	49.8103%	49.8502%
79	2.1303%	1.4385%	115	49.9600%	49.9700%
80	2.4222%	1.6624%	116	49.9800%	49.9850%
81	3.0414%	2.1295%	117	49.9900%	49.9950%
82	3.8207%	2.7255%	118	50.0000%	50.0000%
83	4.7977%	3.4860%	119	50.0000%	50.0000%
84	6.0265%	4.4560%	120	100.0000%	100.0000%
85	7.5706%	5.6920%			

Applicable to calendar year 2021. Rates in future years are determined by the MP-2021 projection scale.

Proposed Healthy Post-Retirement Mortality Rates

Non-Public Safety (All Groups except Sheriff's Department)

Age	% Dying Next Year*		Age	% Dying Next Year*	
---	Male	Female	---	Male	Female
50	0.2799%	0.2050%	86	8.9384%	6.7048%
51	0.3002%	0.2174%	87	10.0160%	7.6255%
52	0.3238%	0.2330%	88	11.1893%	8.6574%
53	0.3503%	0.2499%	89	12.4604%	9.7919%
54	0.3817%	0.2678%	90	13.8219%	11.0178%
55	0.4158%	0.2874%	91	15.2638%	12.3138%
56	0.4538%	0.3079%	92	16.7675%	13.6602%
57	0.4953%	0.3299%	93	18.3275%	15.0532%
58	0.5397%	0.3517%	94	19.9344%	16.4864%
59	0.5878%	0.3759%	95	21.5731%	17.9767%
60	0.6371%	0.4018%	96	23.3619%	19.6086%
61	0.6882%	0.4310%	97	25.2102%	21.3384%
62	0.7421%	0.4632%	98	27.1233%	23.1704%
63	0.7971%	0.5003%	99	29.1026%	25.1073%
64	0.8567%	0.5402%	100	31.1243%	27.1435%
65	0.9228%	0.5864%	101	33.1587%	29.2428%
66	0.9972%	0.6380%	102	35.1760%	31.3606%
67	1.0823%	0.6971%	103	37.1807%	33.4899%
68	1.1792%	0.7661%	104	39.1399%	35.5981%
69	1.2909%	0.8468%	105	41.0368%	37.6853%
70	1.4184%	0.9402%	106	42.8762%	39.7125%
71	1.5633%	1.0491%	107	44.6453%	41.6804%
72	1.7303%	1.1754%	108	46.3184%	43.5755%
73	1.9212%	1.3209%	109	47.9181%	45.3807%
74	2.1418%	1.4881%	110	49.2058%	47.0925%
75	2.3943%	1.6793%	111	49.3538%	48.7054%
76	2.6842%	1.8958%	112	49.5023%	49.6064%
77	3.0162%	2.1425%	113	49.6511%	49.7307%
78	3.3956%	2.4237%	114	49.8103%	49.8502%
79	3.8285%	2.7429%	115	49.9600%	49.9700%
80	4.3228%	3.1082%	116	49.9800%	49.9850%
81	4.8863%	3.5262%	117	49.9900%	49.9950%
82	5.5278%	4.0049%	118	50.0000%	50.0000%
83	6.2468%	4.5508%	119	50.0000%	50.0000%
84	7.0537%	5.1766%	120	100.0000%	100.0000%
85	7.9519%	5.8904%			

Applicable to calendar year 2021. Rates in future years are determined by the MP-2021 projection scale.

Proposed Healthy Post-Retirement Mortality Rates (Concluded)

Public Safety (Sheriff's Department)

Age	% Dying Next Year* Male	% Dying Next Year* Female	Age	% Dying Next Year* Male	% Dying Next Year* Female
50	0.1803%	0.1376%	86	9.5073%	7.2676%
51	0.1973%	0.1558%	87	10.6701%	8.1277%
52	0.2162%	0.1762%	88	11.9573%	9.0881%
53	0.2383%	0.1998%	89	13.3794%	10.1522%
54	0.2646%	0.2275%	90	14.9411%	11.3324%
55	0.2952%	0.2592%	91	16.5391%	12.5920%
56	0.3303%	0.2946%	92	18.1036%	13.9048%
57	0.3707%	0.3330%	93	19.6128%	15.2612%
58	0.4172%	0.3748%	94	21.0668%	16.6538%
59	0.4688%	0.4190%	95	22.4779%	18.1028%
60	0.5262%	0.4667%	96	24.0099%	19.6947%
61	0.5893%	0.5149%	97	25.6068%	21.3892%
62	0.6567%	0.5652%	98	27.3150%	23.1944%
63	0.7288%	0.6184%	99	29.1587%	25.1140%
64	0.8065%	0.6752%	100	31.1243%	27.1435%
65	0.8905%	0.7366%	101	33.1587%	29.2428%
66	0.9813%	0.8026%	102	35.1760%	31.3606%
67	1.0814%	0.8778%	103	37.1807%	33.4899%
68	1.1917%	0.9637%	104	39.1399%	35.5981%
69	1.3163%	1.0616%	105	41.0368%	37.6853%
70	1.4574%	1.1754%	106	42.8762%	39.7125%
71	1.6193%	1.3055%	107	44.6453%	41.6804%
72	1.8030%	1.4554%	108	46.3184%	43.5755%
73	2.0141%	1.6271%	109	47.9181%	45.3807%
74	2.2568%	1.8232%	110	49.2058%	47.0925%
75	2.5332%	2.0467%	111	49.3538%	48.7054%
76	2.8500%	2.2990%	112	49.5023%	49.6064%
77	3.2109%	2.5832%	113	49.6511%	49.7307%
78	3.6222%	2.9042%	114	49.8103%	49.8502%
79	4.0901%	3.2628%	115	49.9600%	49.9700%
80	4.6208%	3.6651%	116	49.9800%	49.9850%
81	5.2218%	4.1157%	117	49.9900%	49.9950%
82	5.9005%	4.6174%	118	50.0000%	50.0000%
83	6.6577%	5.1768%	119	50.0000%	50.0000%
84	7.5080%	5.8008%	120	100.0000%	100.0000%
85	8.4555%	6.4951%			

Applicable to calendar year 2021. Rates in future years are determined by the MP-2021 projection scale.

Proposed Disabled Post-Retirement Mortality Rates

Non-Public Safety (All Groups except Sheriff's Department)

Age	% Dying Next Year* Male	% Dying Next Year* Female	Age	% Dying Next Year* Male	% Dying Next Year* Female
50	1.5076%	1.3693%	86	10.8562%	9.6777%
51	1.6008%	1.4322%	87	11.7629%	10.5155%
52	1.7015%	1.5031%	88	12.7403%	11.3677%
53	1.8090%	1.5826%	89	13.9648%	12.2274%
54	1.9226%	1.6662%	90	15.3113%	13.1069%
55	2.0395%	1.7503%	91	16.6902%	14.0256%
56	2.1575%	1.8300%	92	18.0724%	14.9994%
57	2.2721%	1.9016%	93	19.4578%	16.0483%
58	2.3845%	1.9618%	94	20.8514%	17.1821%
59	2.4907%	2.0097%	95	22.2602%	18.4284%
60	2.5929%	2.0467%	96	23.8295%	19.8754%
61	2.6902%	2.0722%	97	25.4847%	21.4974%
62	2.7862%	2.0926%	98	27.2504%	23.2462%
63	2.8830%	2.1115%	99	29.1388%	25.1284%
64	2.9802%	2.1314%	100	31.1243%	27.1435%
65	3.0768%	2.1580%	101	33.1587%	29.2428%
66	3.1746%	2.1946%	102	35.1760%	31.3606%
67	3.2754%	2.2472%	103	37.1807%	33.4899%
68	3.3812%	2.3182%	104	39.1399%	35.5981%
69	3.4970%	2.4120%	105	41.0368%	37.6853%
70	3.6259%	2.5313%	106	42.8762%	39.7125%
71	3.7756%	2.6770%	107	44.6453%	41.6804%
72	3.9477%	2.8517%	108	46.3184%	43.5755%
73	4.1500%	3.0566%	109	47.9181%	45.3807%
74	4.3841%	3.2954%	110	49.2058%	47.0925%
75	4.6541%	3.5699%	111	49.3538%	48.7054%
76	4.9624%	3.8814%	112	49.5023%	49.6064%
77	5.3135%	4.2326%	113	49.6511%	49.7307%
78	5.7090%	4.6276%	114	49.8103%	49.8502%
79	6.1555%	5.0678%	115	49.9600%	49.9700%
80	6.6536%	5.5569%	116	49.9800%	49.9850%
81	7.2094%	6.0990%	117	49.9900%	49.9950%
82	7.8231%	6.6967%	118	50.0000%	50.0000%
83	8.4920%	7.3534%	119	50.0000%	50.0000%
84	9.2226%	8.0723%	120	100.0000%	100.0000%
85	10.0105%	8.8579%			

Applicable to calendar year 2021. Rates in future years are determined by the MP-2021 projection scale.

Proposed Disabled Post-Retirement Mortality Rates (Concluded)

Public Safety (Sheriff's Department)

Age	% Dying Next Year* Male	% Dying Next Year* Female	Age	% Dying Next Year* Male	% Dying Next Year* Female
50	0.3316%	0.2807%	86	9.5073%	7.2676%
51	0.3488%	0.3079%	87	10.6701%	8.1277%
52	0.3697%	0.3400%	88	11.9573%	9.0881%
53	0.3955%	0.3764%	89	13.3794%	10.1522%
54	0.4264%	0.4175%	90	14.9411%	11.3324%
55	0.4631%	0.4632%	91	16.5391%	12.5920%
56	0.5068%	0.5125%	92	18.1036%	13.9048%
57	0.5591%	0.5644%	93	19.6128%	15.2612%
58	0.6197%	0.6197%	94	21.0668%	16.6538%
59	0.6873%	0.6752%	95	22.4779%	18.1028%
60	0.7614%	0.7314%	96	24.0099%	19.6947%
61	0.8422%	0.7874%	97	25.6068%	21.3892%
62	0.9263%	0.8428%	98	27.3150%	23.1944%
63	1.0145%	0.8986%	99	29.1587%	25.1140%
64	1.1048%	0.9551%	100	31.1243%	27.1435%
65	1.1988%	1.0149%	101	33.1587%	29.2428%
66	1.2965%	1.0786%	102	35.1760%	31.3606%
67	1.4008%	1.1502%	103	37.1807%	33.4899%
68	1.5121%	1.2299%	104	39.1399%	35.5981%
69	1.6343%	1.3201%	105	41.0368%	37.6853%
70	1.7725%	1.4239%	106	42.8762%	39.7125%
71	1.9305%	1.5415%	107	44.6453%	41.6804%
72	2.1165%	1.6746%	108	46.3184%	43.5755%
73	2.3372%	1.8248%	109	47.9181%	45.3807%
74	2.5990%	1.9925%	110	49.2058%	47.0925%
75	2.9052%	2.1787%	111	49.3538%	48.7054%
76	3.2569%	2.3870%	112	49.5023%	49.6064%
77	3.6542%	2.6203%	113	49.6511%	49.7307%
78	4.0909%	2.9042%	114	49.8103%	49.8502%
79	4.5630%	3.2628%	115	49.9600%	49.9700%
80	5.0690%	3.6651%	116	49.9800%	49.9850%
81	5.6183%	4.1157%	117	49.9900%	49.9950%
82	6.2229%	4.6174%	118	50.0000%	50.0000%
83	6.8934%	5.1768%	119	50.0000%	50.0000%
84	7.6545%	5.8008%	120	100.0000%	100.0000%
85	8.5277%	6.4951%			

Applicable to calendar year 2021. Rates in future years are determined by the MP-2021 projection scale.