Anne Arundel County Fire Service Retirement Plan

Actuarial Valuation as of January 1, 2022 to Determine the County's Contribution for the Fiscal Year Ending June 30, 2023

Bolton

Submitted by:

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Bolton
Employee Benefits, Actuarial & Investment Consulting

May 3, 2022

Anne Budowski
Personnel Director
Anne Arundel County Government
2660 Riva Road
Annapolis, MD 21401

Re: Anne Arundel County Fire Service Retirement Plan Valuation

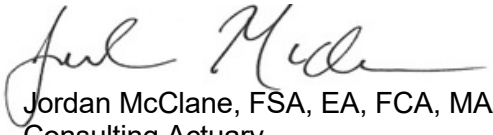
Dear Anne:

The following sets forth the actuarial valuation of the Anne Arundel County Fire Service Retirement Plan as of January 1, 2022. The actuarial valuation was performed at the request of Anne Arundel County (the County). Section I of the report provides a summary, Section II sets forth our Actuarial Certification, and Section III contains the development of the County's contribution for the 2023 fiscal year. Section IV provides discussion of risk metrics in accordance with ASOP 51, while Sections V through VIII contain a summary of the census and asset data, a ten-year projection of benefit payments, plan provisions, assumptions and actuarial methods. The appendices of the report provide information on plan funding as well as a glossary of many of the terms used in this report and a summary of major legislative changes.

We are available to answer any questions on the material in this report or to provide explanations or further details as appropriate.

Respectfully submitted,

Ann M Sturner, FSA, EA, FCA, MAAA
Senior Consulting Actuary



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Section I. Executive Summary

Background

Bolton has prepared the following report that sets forth the actuarial valuation of the Anne Arundel County Fire Service Retirement Plan as of January 1, 2022. This report provides the funded status of the plan as of January 1, 2022 as well as the Actuarially Determined Contribution (ADC) for the plan for the fiscal year ending June 30, 2023 (FY2023). Accounting results under Government Accounting Standards Board Statements 67 and 68 are provided in a separate report.

Actuarially Determined Contributions (ADC)

	FY2021	FY2022	FY2023
ADC	$22,142,771	$27,142,745	$28,574,641
Percent of Total Payroll	37.7%	42.8%	42.1%

The above amounts assume the County contribution will be made monthly throughout the fiscal year. Details of the determination of the County's contribution for FY2023 are shown in Section III of this report.

Key Demographic Elements

Funding Measures	1/1/2021	1/1/2022	Percent Change
Participants			
Active (Excluding DROP)	796	799	0.4%
Active DROP	74	87	17.6%
Retirees and Beneficiaries	645	661	2.5%
Total	1,515	1,547	2.1%

Funding Measures

Funding Measures	1/1/2021	1/1/2022	Percent Change
1. Actuarial Accrued Liability	$ 748,500,315	$ 799,890,892	6.9%
2. Actuarial Value of Assets	$ 605,126,804	$ 652,769,215	7.9%
3. Plan Funded Ratio (2. / 1.)	80.8%	81.6%	
4. Market Value of Assets	$ 609,695,729	$ 687,010,812	12.7%
5. Funded Ratio based on Market Value of Assets (4. / 1.)	81.5%	85.9%	

Changes in Contribution Rate

The following table shows the sources of changes in the County's contribution rate.

Description	Contribution Rate
January 1, 2021 Valuation	42.8%
Investment Performance	(1.3%)
Pay Increases	0.1%
New Entrants/Change in Normal Cost	(0.2%)
COLA	(0.5%)
Change in Expenses	(0.1%)
Discount Rate Change	0.0%
Other Assumption/Method Changes	0.0%
Demographics and Other Changes	1.3%
January 1, 2022 Valuation	42.1%

Experience Analysis

The following factors affected the County's contribution as a percentage of payroll:

- **Plan assets and investment performance** – the net return for the year ended December 31, 2021 after investment expenses was 13.7% on a market value basis and 8.9% on an actuarial value basis. Investment returns during CY2021 were about $40.6 million higher than assumed. A portion of this gain is reflected in the actuarial value of assets (AVA) in this valuation and the remaining portions will be reflected in future valuations. The AVA and return on AVA also reflect the continued recognition of net investment gains from prior valuations. As of January 1, 2022, there is a total of $34.2 million in net deferred investment gains that will be reflected in future valuations.
- **Cost of Living Adjustment** - Retiree COLAs (generally 1.183% for pre-2/1/1997 accruals and 1.6% for post-1/31/1997 accruals) effective July 1, 2021 were lower than the assumed annual increases (3.0% for pre-2/1/1997 accruals and 1.8% post-1/31/1997 accruals).
- **Payroll changes** - Pay for returning employees, excluding members in DROP, increased approximately 8.5% over the prior year; a larger increase than the 4.7% increase that was expected. Total participant payroll, including payroll for members in DROP, increased by 6.9% over the prior year resulting in a higher total payroll than anticipated by the 3.0% per year payroll growth assumption.

Risk Measures

The primary risk that a plan sponsor incurs from a defined benefit plan is the risk of substantial increases in annual contributions. Many variables can influence future results and the sensitivity of the ADC will vary from plan to plan. As part of the annual valuation, we monitor commonly used measures of the relative riskiness of a pension plan, relative to the plan sponsor and the employee group covered by the plan. A brief review of the risk metrics and a discussion of key risks are shown in Section IV. For 2022, the plan has a moderate dependency ratio of 56% and the magnitude of both assets and liabilities are high relative to payroll (multiples of 10.1 and 11.8, respectively). Additional detailed or focused assessment of risks is outside the scope of the actuarial valuation but can be conducted as a separate assignment.

Changes in Methods, Assumptions, and Plan Provisions

There were no changes in methods, assumptions or plan provisions.

Sources of Information

The January 1, 2022 participant data and market value of assets were provided by or at the direction of Anne Arundel County. While we have reviewed this data for consistency and completeness, we have not audited this data.

Impact of COVID-19

Because the net impacts of COVID-19 on mortality, salary increases, and changes in turnover and retirement behavior are difficult to estimate at this time, we have not made any adjustments to the assumptions for the potential impact of the COVID-19 pandemic.

Section II. Actuarial Certification

This actuarial valuation sets forth our calculation of an estimate of the liabilities of the Anne Arundel County Fire Service Retirement Plan (the Plan), together with a comparison of these liabilities with the value of the plan assets, as submitted by Anne Arundel County Government (the County). This liability calculation and comparison with assets are applicable for the valuation date only. The future is uncertain, and the plan may become better funded or more poorly funded in the future. This valuation does not provide any guarantee that the plan will be able to provide the promised benefits in the future.

This report was prepared for the internal use of the County and its auditors in connection with our actuarial valuations of the pension plan. The purpose of this report is to provide the recommended employer contribution for the 2023 fiscal year. It is neither intended nor necessarily suitable for other purposes. Bolton is not responsible for the consequences of any other use or the reliance upon this report by any other party.

This report is based on plan provisions, census data, and asset data submitted by the County. We have relied on this information for purposes of preparing this report. We have not audited the census or asset data provided, however based on our review the data appears to be reasonable and consistent with previously provided information. Unless otherwise noted in our report, we believe the information provided is sufficiently complete and reliable for purposes of the results presented in this report. The accuracy of the results presented in this report is dependent upon the accuracy and completeness of the underlying information. The County is solely responsible for the validity and completeness of this information.

The County is responsible for selecting the plan's funding policy, actuarial valuation methods, asset valuation methods, and assumptions. The policies, methods and assumptions used in this valuation are those that have been so prescribed and are described in this report. The County is solely responsible for communicating to Bolton any changes required thereto.

The County is solely responsible for selecting the plan's investment policies, asset allocations and individual investments. Bolton's actuaries have not provided any investment advice to the County.

This is a deterministic valuation in that it is based on a single set of assumptions. This set of assumptions is one possible basis for our calculations. We may consider that some factors are not material to the valuation of the plan and may not provide a specific assumption for those factors. We may have used other assumptions in the past. We will likely consider changes in assumptions at a future date.

Different assumptions or scenarios within the range of possibilities may also be reasonable and results based on those assumptions would be different. As a result of the uncertainty inherent in a forward-looking projection over a very long period of time, no one projection is uniquely "correct" and many alternative projections of the future could also be regarded as reasonable. Two different actuaries could, quite reasonably, arrive at different results based on the same data and different views of the future.

The County could reasonably ask how the valuation would change if we used a different assumption set or if plan experience exhibited variations from our assumptions. This report does not contain such an analysis. That type of analysis would be a separate assignment.

In addition, decisions regarding benefit improvements, benefit changes, the trust's investment policy, and similar issues should not be based on this valuation. These issues are complex and other factors should be considered when making such decisions. Other factors might include the anticipated vitality of the local economy and future growth expectations, as well as other economic and financial factors.

The cost of this plan is determined by the benefits promised by the plan, the plan's participant population, the investment experience of the plan and many other factors. An actuarial valuation is a budgeting tool for the County. It does not affect the cost of the plan. Different funding methods provide for different timing of contributions to the plan. As the experience of the plan evolves, it is normal for the level of contributions to the plan to change. If a contribution is not made for a particular year, either by deliberate choice or because of an error in a calculation, that contribution can be made in later years. We are not responsible for the consequences of any decision by the County to make contributions at a future time rather than an earlier time. The County is responsible for funding the cost of the plan.

The report is conditioned on the assumption of an ongoing plan and is not meant to present the actuarial position of the plan in the case of plan termination. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan 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 plan's funded status), and changes in plan provisions or applicable law.

The valuation was completed using both proprietary and third-party models (including software and tools). We have tested these models to ensure they are used for their intended purposes, within their known limitations, and without any known material inconsistencies unless otherwise stated.

The calculations in this report have been computed in accordance with our understanding of generally accepted actuarial principles and practices and fairly reflect the actuarial position of the plan. The various actuarial assumptions and methods which have been used are, in our opinion, appropriate for the purposes of this report.

We make every effort to ensure that our calculations are accurately performed. We reserve the right to correct any potential errors by amending the results of this report or by including the corrections in a future valuation report.

The County should notify Bolton promptly after receipt of this report if the County disagrees with anything contained in the report or is aware of any information that would affect the results of the report that has not been communicated to Bolton or incorporated herein. The report will be deemed final and acceptable to the County unless the County promptly provides such notice to Bolton.

The undersigned credentialed actuaries meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. We are not aware of any direct or material indirect financial interest or relationship, including investments or other services, which could create a conflict of interest that would impair the objectivity of our work.

We are available to answer any questions on the material in this report to provide explanations or further details as appropriate.

BOLTON

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Senior Consulting Actuary

Jordan McClane, FSA, EA, FCA, MAAA
Consulting Actuary

Section III. Determination of Contributions

Derivation of Liabilities

Below is a summary of the actuarial accrued liability of the future benefits expected to be paid from the plan.

Unfunded Liability		1/1/2021		1/1/2022
1.	Participants			
a.	Active (excluding DROP)	796		799
b.	Active DROP	74		87
c.	Retirees and Beneficiaries	645		661
d.	Total	1,515		1,547
2.	Active Payroll	$ 63,461,220	$	67,851,357
3.	Actuarial Accrued Liability			
a.	Active Participants	$ 322,203,277	$	349,777,299
b.	Retirees and Beneficiaries	426,297,038		450,113,593
c.	Total	$ 748,500,315	$	799,890,892
4.	Actuarial Asset Value	$ 605,126,804	$	652,769,215
5.	Unfunded Actuarial Liability (3.c. - 4.)	$ 143,373,511	$	147,121,677
6.	Funded Ratio (4. ÷ 3.c.)	80.8%		81.6%

Projection of Unfunded Liability

The projection of the unfunded actuarial liability from January 1, 2022 to July 1, 2022, the beginning of the fiscal year, is shown below.

1.	Unfunded Liability as of January 1, 2022	$ 147,121,677
2.	Expected County Contributions 1/1/2022 – 6/30/2022	$ 13,571,373
3.	Expected Employee Contributions 1/1/2022 – 6/30/2022	$ 2,111,100
4.	Expected Expenses 1/1/2022 – 6/30/2022	$ 249,500
5.	Total Normal Cost 1/1/2022 – 6/30/2022	$ 10,079,879
6.	Interest at 7.00%	$ 5,145,734
7.	Projected Unfunded Liability as of July 1, 2022 (1. – 2. – 3. + 4. + 5. + 6.)	$ 146,914,317

Development of County Contributions

The breakdown of the Actuarially Determined Contribution into normal cost, amortization payment, and expected administrative expenses is illustrated below.

Actuarially Determined Contribution		FY2023
1. County Normal Cost as of July 1	$	16,174,854
2. Amortization Amount as of July 1	$	10,942,864
3. Expected Expenses as of July 1	$	506,430
4. County's Contribution (1. + 2. + 3.)	$	27,624,148
5. County's Contribution Adjusted for Timing of Payment (4. x 1.07 ^ 0.5)	$	28,574,641
6. County's Contribution as a Percentage of Participant Payroll		42.1%

Schedule of Amortization Bases

Below is a schedule of the amortization bases as of July 1, 2022.

Description	Date Established	Remaining Years	Amount to be Amortized	Payment / (Credit)
Unfunded Accrued Liability	1/1/2004	12	$ 14,976,862	$ 1,525,794
Actuarial (Gain)/Loss	1/1/2005	13	$ (2,053,213)	$ (196,502)
Actuarial (Gain)/Loss	1/1/2006	14	$ 1,981,011	$ 179,144
Actuarial (Gain)/Loss	1/1/2007	15	$ (496,485)	$ (42,636)
Assumption Change	1/1/2008	16	$ (571,160)	$ (46,780)
Actuarial (Gain)/Loss	1/1/2008	16	$ 3,162,888	$ 259,051
Actuarial (Gain)/Loss	1/1/2009	17	$ 29,821,173	$ 2,338,350
Actuarial (Gain)/Loss	1/1/2010	18	$ (10,333,137)	$ (778,313)
Asset Method Change	1/1/2011	19	$ 25,261,654	$ 1,833,209
Actuarial (Gain)/Loss	1/1/2011	19	$ (24,093,536)	$ (1,748,440)
Actuarial (Gain)/Loss	1/1/2012	20	$ 22,374,584	$ 1,568,508
Assumption Change	1/1/2013	21	$ (2,600,422)	$ (176,520)
Actuarial (Gain)/Loss	1/1/2013	21	$ 27,424,041	$ 1,861,578
Assumption Change	1/1/2014	12	$ 5,877,279	$ 598,758
Actuarial (Gain)/Loss	1/1/2014	12	$ (10,353,254)	$ (1,054,756)
Actuarial (Gain)/Loss	1/1/2015	13	$ (2,933,953)	$ (280,792)
Actuarial (Gain)/Loss	1/1/2016	14	$ (5,910,264)	$ (534,468)
Actuarial (Gain)/Loss	1/1/2017	15	$ 2,327,802	$ 199,900
Actuarial (Gain)/Loss	1/1/2018	16	$ 300,254	$ 24,592
Actuarial (Gain)/Loss	1/1/2019	17	$ 13,533,175	$ 1,061,169
Assumption Change	1/1/2019	17	$ 4,395,941	$ 344,696
Method Change	7/1/2019	17	$ 976,255	$ 76,551
Actuarial (Gain)/Loss	7/1/2020	18	$ 530,645	$ 39,969
Assumption Change	7/1/2020	18	$ 10,383,061	$ 782,073
Actuarial (Gain)/Loss	7/1/2021	19	$ (2,029,142)	$ (147,252)
Assumption Change	7/1/2021	19	$ 42,174,072	$ 3,060,523
Actuarial (Gain)/Loss	7/1/2022	20	$ 2,788,186	$ 195,458
Totals			$ 146,914,317	$ 10,942,864

Bases are amortized as an equal percent of payroll each year with total payroll expected to increase 3.0% annually. The July 1, 2022 amortization payment of $10,942,864 is sufficient to cover the interest on the plan's unfunded liability.

Bases established prior to July 1, 2019 were reported as of the date of the valuation, resulting in a difference between the date established and the remaining years. This difference does not have a material effect on the funding of the plan.

Section IV. Risk Discussion

Risk Measures

Pension plans are complicated financial instruments designed to provide income security for plan participants as they move through their working lives and into retirement. As such they can be subject to many different forces that can put the plan in better or worse positions over time. The primary risk that a plan sponsor incurs from a defined benefit plan is the risk of substantial increases in annual contributions.

The "maturity" level of a plan can indicate the likely sensitivity the plan will have to different events whether positive or negative. Variations in the investment returns are a common source of these types of events or shocks. Other sources might be experience that differs from that assumed, assumption changes or plan changes.

Actuarial Standard of Practice No. 51 *Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions* requires actuaries to provide information so that users of the report can better understand the potential for future results to vary from the results presented in this report and identify risks on the plan's future financial condition. This standard does not require the assessment to be based on numerical calculations. In some cases, a more in-depth review of plan risk is warranted.

Examples of risk common to most public plans include the following (generally listed from greatest to least risk):

- Investment risk: The potential that investment returns will be different than expected. The Trustees are well aware of this risk. This valuation reflects the smoothing of asset returns, which reduces the risk of wide year-by-year contribution changes due to investment return fluctuations but does not ultimately reduce the risk inherent in a defined benefit plan.
- Contribution risk: Most commonly this is associated with the potential that actual future contributions are not made in accordance with the plan's actuarially based funding policy. When this occurs, it can create negative long-term problems.
- Longevity and other demographic risks: The potential that mortality or other demographic experience will be different than expected.
- Asset/liability mismatch risk: The potential that changes in asset values are not matched by changes in the value of liabilities.
- Cash flow risks: The potential that contributions coming into the plan will not cover benefit payments. While common in well-funded plans, this still requires the use of interest, dividends or principal to cover benefit payments. When assets need to be sold (or more cash held) it can be an issue. Poorly funded plans with DROP lump sum payments can magnify the issue.

One item left off this list is "interest rate risk" (i.e., the potential that interest rates will be different than expected). This risk is common in corporate ERISA plans where funding is based on bond rates. Interest rates on bonds are still an important consideration when setting an expected return assumption and can change over time.

There are several plan maturity measures that can be significant to understanding the risks associated with the plan. The following table shows four commonly used measures of the relative riskiness of a pension plan, relative to the plan sponsor and the employee group covered by the plan and how they have changed over time.

Risk Measure	1/1/2019	1/1/2020	1/1/2021	1/1/2022	Conservative Measures*
Inactive Liability as a Percent of Total Liability	61%	58%	57%	56%	<50%
Assets to Payroll	9.3	9.8	9.6	10.1	<5
Liabilities to Payroll	11.7	11.5	11.8	11.8	<5
Benefit Payments to Contributions	1.7	1.4	1.4	1.2	<3

The Assets to Payroll ratio, also called the Asset Volatility Ratio (AVR) is equal to the market value of assets (MVA) divided by payroll. A higher AVR implies that the plan is exposed to greater contribution volatility. The current AVR of 10.1 indicates that a:

- 1% asset gain/loss can be related to about 10.1% of the annual payroll.
- The County's contribution changes by about 0.7% of payroll for each 1.0% gain or loss on the market assets (the plan currently amortizes asset gains/losses over a period of 20 years).

The Liabilities to Payroll ratio also call the Liability Volatility Ratio (LVR) is equal to the Actuarial Accrued Liability (AAL) divided by payroll. A higher LVR implies that the plan is exposed to greater contribution volatility due to changes in liability measurements. The current LVR of 11.8 indicates that a:

- 1% liability gain/loss can be related to about 11.8% of the annual payroll.
- The County's contribution changes by about 0.8% of payroll for each 1.0% gain or loss on the AAL (the plan currently amortizes liability gains/losses over a period of 20 years).

As the plan approaches a 100% funded level, the AVR will converge to the LVR.

The use of payroll in these risk measures is an easily available substitute for the employer's revenue and often reflects the employer's ability to afford the plan. Each of these measures are a measure of plan maturity. The common evolution of a pension plan is to become more mature over time. Mature plans present more risk to plan sponsors because changes to the liability or assets will result in large changes in the unfunded liability as compared to the overall size of the employer as measured by payroll. As a result, the change in the metrics over time can be as important as the nominal size of the metric itself.

Additional Review

In some instances, more detailed quantitative assessment of risks is warranted either by the above maturity metrics, part of a periodic self-assessment of risks, or due to changes in investment allocations and capital market assumptions. The following are examples of tests that could be performed:

- Scenario Test—A process for assessing the impact of one possible event, or several simultaneously or sequentially occurring possible events, on a plan's financial condition. A scenario test could show, for example, the effect of a layoff or reduction in workforce, or early retirement program.

- Sensitivity Test—A process for assessing the impact of a change in an actuarial assumption on an actuarial measurement. A sensitivity analysis could demonstrate, for example, the impact of a decrease in the valuation discount rate or a change in future life expectancies.

- Stochastic Modeling—A process for generating numerous potential outcomes by allowing for random variations in one or more inputs over time for the purpose of assessing the distribution of those outcomes. This type of analysis could show, for example, a range of potential future contribution levels and the likelihood of contributions increasing to a certain level.

- Stress Test—A process for assessing the impact of adverse changes in one or relatively few factors affecting a plan's financial condition. A stress test could show, for example, the impact of a single year or period of several years with significant investment losses.

Section V. Assets

Reconciliation of Assets

Below is a reconciliation of assets (unaudited) from January 1, 2020 through December 31, 2021.

		CY2020		CY2021
1. Beginning of Year Assets	$	574,028,152	$	607,384,572
2. Receipts				
a. Employer Contributions	$	20,232,633	$	24,226,092
b. Employee Contributions		3,913,699		4,176,628
c. Investment Income & Dividends		10,072,190		13,045,039
d. Realized and Unrealized Gain/(Loss)		32,581,032		65,401,903
e. Stock Loan Income		31,049		50,069
f. Other		2,776,841		7,146,555
g. Total Receipts	$	69,607,444	$	114,046,286
3. Deductions				
a. Benefit Payments	$	32,663,118	$	34,048,772
b. Administrative Expenses		486,076		512,562
c. Investment Expenses		3,101,830		2,613,120
d. Total Disbursements	$	36,251,024	$	37,174,454
4. Net Increase (2.g. – 3.d.)	$	33,356,420	$	76,871,832
5. Preliminary Ending Value (1. + 4.)	$	607,384,572	$	684,256,404
6. Contribution Receivable	$	2,311,157	$	2,754,408
7. End of Year Assets	$	609,695,729	$	687,010,812
8. Rate of Return Net of Investment Fees (2I / [A + B – I] Method)		7.4%		13.7%

Determination of Investment Gain/(Loss) for Assets

Market Value of Assets	
As of January 1, 2021	$ 609,695,729

Item (1)	Amount (2)	Weight for Timing (3)	Weighted Amount (2) x (3)
Contributions	$ 28,845,971	50%	$ 14,422,986
Benefits Paid	(34,048,772)	50%	(17,024,386)
Expenses	(512,562)	50%	(256,281)
Total			(2,857,682)
Market Value plus Total Weighted Amount			606,838,048
Assumed Rate of Return for the Year			7.00%
Expected Return			$ 42,478,663

Actual Return	
1. Market Value as of January 1, 2021	$ 609,695,729
2. Contributions	28,845,971
3. Benefits and Administrative Expenses Paid	(34,561,334)
4. Market Value as of January 1, 2022	687,010,812
5. Actual Return [(4) - (1) - (2) - (3)]	$ 83,030,446
6. Calculation Base (1) + 50% x [(2) + (3)]	606,838,048
7. Market Value Return as a Percentage [(5) / (6)]	13.7%

Investment Gain/(Loss)	
Actual Return minus Expected Return	$ 40,551,783

Development of Actuarial Value of Assets

The actuarial asset value as of January 1, 2022 is determined by spreading the asset gain or loss for each year over a five-year period. The asset gain or loss is the amount by which the actual asset return differs from the expected asset return.

Market Value of Assets		
As of January 1, 2022	$	687,010,812

Plan Year End (1)	Investment Gain/(Loss) (2)	Percent Recognized (3)	Percent Deferred (4)	Deferred Gain/(Loss) (2) x (4)
12/31/2021	$ 40,551,783	20%	80%	$ 32,441,426
12/31/2020	(225,786)	40%	60%	(135,472)
12/31/2019	37,753,770	60%	40%	15,101,508
12/31/2018	(65,829,327)	80%	20%	(13,165,865)
Total Deferred				$ 34,241,597

Preliminary Actuarial Value of Assets		
As of January 1, 2022 (Market Value of Assets less Total Deferred Gain/(Loss))	$	652,769,215

Final Actuarial Value of Assets		
Minimum actuarial value of assets (50% of MVA)		343,505,406
Maximum actuarial value of assets (150% of MVA)		1,030,516,218
As a Percentage of Market Value		95.0%
Actuarial Value of Assets as of January 1, 2022	$	652,769,215

Return on Actuarial Value of Assets		
1. Actuarial Value as of January 1, 2021	$	605,126,804
2. Contributions		28,845,971
3. Benefits and Administrative Expenses Paid		(34,561,334)
4. Actuarial Value as of January 1, 2022		652,769,215
5. Actuarial Return [(4) - (1) - (2) - (3)]		53,357,774
6. Calculation Base (1) + 50% × [(2) + (3)]		602,269,123
7. Actuarial Return as a Percentage [(5) / (6)]		8.9%

Benefit Payment Projection

The following table shows the estimated benefit payments from January 1, 2022 through December 31, 2031 based on existing members of the plan.

Calendar Year	Benefits
2022	$50,268,000
2023	45,102,000
2024	49,424,000
2025	52,212,000
2026	50,130,000
2027	51,762,000
2028	54,605,000
2029	58,623,000
2030	62,499,000
2031	65,116,000

Section VI. Participant Information

Participant Summary

The following table summarizes the counts, ages and benefit information for plan participants used in this valuation.

	1/1/2021	1/1/2022
1. Actives, including DROP members		
a. Number	870	886
b. Average Age	39.1	39.2
c. Average Service	12.3	12.5
d. Average Salary	$ 72,933	$ 76,582
2. Service Retirements and Beneficiaries		
a. Number	645	661
b. Average Age	64.2	64.6
c. Total Annual Benefits	$ 30,405,868	$ 31,796,585

Active Age/Service Distribution Including Compensation

Shown below is the distribution of active participants, excluding those currently enrolled in DROP, based on age and service. The compensation shown is the average rate of pay as of January 1, 2022.

	Years of Service as of 01/01/2022										
Age	Under 1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & Up	Total
Under 25	27	26	6	0	0	0	0	0	0	0	59
	46,945	51,274	55,755	0	0	0	0	0	0	0	49,749
25 - 29	10	51	49	0	0	0	0	0	0	0	110
	46,945	51,904	60,669	0	0	0	0	0	0	0	55,358
30 - 34	11	44	96	20	5	0	0	0	0	0	176
	46,945	52,928	61,315	78,637	88,487	0	0	0	0	0	61,060
35 - 39	2	15	55	33	54	0	0	0	0	0	159
	46,945	53,161	62,033	79,909	91,421	0	0	0	0	0	74,697
40 - 44	2	4	15	31	64	13	0	0	0	0	129
	46,945	52,579	63,732	79,201	93,341	111,835	0	0	0	0	86,381
45 - 49	0	0	8	10	38	18	6	0	0	0	80
	0	0	59,190	77,726	90,237	106,207	107,134	0	0	0	90,429
50 - 54	0	0	7	3	22	7	17	0	0	0	56
	0	0	61,919	77,152	89,811	106,180	117,523	0	0	0	96,105
55 - 59	0	0	2	1	9	5	5	2	0	0	24
	0	0	61,308	80,945	89,819	103,921	104,641	125,982	0	0	96,113
60 - 64	0	1	0	0	2	1	0	1	0	0	5
	0	50,289	0	0	89,745	111,919	0	94,766	0	0	87,293
65 - 69	0	0	0	0	1	0	0	0	0	0	1
	0	0	0	0	86,711	0	0	0	0	0	86,711
70 & Up	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
Totals	52	141	238	98	195	44	28	3	0	0	799
	46,945	52,249	61,306	79,129	91,448	107,736	112,996	115,577	0	0	72,888

Averages	
Age	37.5
Service	10.7

Participant Reconciliation

Shown below is the reconciliation of participants between the prior and current valuation date.

	Active Participants	DROP	Inactive Participants With Deferred Benefits	Inactive Participants Receiving Benefits	Total
Participants in Last Valuation	796	74	0	645	1,515
Retired	(8)	(6)	0	14	0
Disabled	(7)	0	0	7	0
Vested Termination	0	0	0	0	0
Nonvested Termination/ Lump Sum Paid	(17)	0	0	0	(17)
Deceased/Payment Expired	0	0	0	(12)	(12)
Beneficiary	0	0	0	7	7
New QDRO	0	0	0	0	0
Transfer In From:					
Fire Plan	0	0	0	0	0
Employee Plan	1	0	0	0	1
Detention Plan	0	0	0	0	0
Transfer Out To:					
Fire Plan	0	0	0	0	0
Employee Plan	0	0	0	0	0
Detention Plan	0	0	0	0	0
Rehired	0	0	0	0	0
New Participants	52	0	0	0	52
Entered DROP	(18)	18	0	0	0
Adjustments	0	1	0	0	1
Participants in This Valuation	799	87	0	661	1,547

Section VII. Summary of Plan Provisions

Plan Year
January 1 – December 31.

Normal Retirement Date or Unreduced Early Retirement Date
20 years of service or age 50 with 5 years of service.

Normal Form of Benefit
For single participants, monthly life annuity with payments guaranteed for 5 years.

For married participants, unreduced 100% Joint & Survivor Annuity with payments guaranteed for 5 years.

Post Retirement Cost of Living Increases

For benefits accrued as of 1/31/1997
Retiree benefits are adjusted each year. The revised benefit amount is the lesser of:

- Base benefit multiplied by ratio of current 12 month average CPI to 12 month average CPI at retirement.
- Prior year benefit increased by 4%.

For benefits accrued after 1/31/1997
Retiree benefits are adjusted each year. The revised benefit amount is the lesser of:

- Prior year benefit multiplied by 60% of the increase in the current March CPI from March CPI for prior year, or
- Prior year benefit increased by 2.5%.

Employee Contibutions
7.25% of compensation for all employees.

Compensation
Regular annual rate of pay, exclusive of extra compensation of any kind such as overtime pay, bonuses, and commissions.

Final Earnings
The average of the highest 3 years of annual basic pay.

Benefit Formula
2 ½% of final earnings for each year of service up to 20 years plus 2% of final earnings for each year of service after 20 years (maximum 70% plus 2% times unused disability credit and pre-employment military service credit).

Termination Prior to Retirement
Return of employee contributions with 3% interest.

Disability Benefit

Must be totally and permanently disabled (except as the result of activities specified in the County code) regardless of length of service.

Line of Duty Disability

The greater of the accrued benefit or 66 2/3% of final earnings, payable immediately, unreduced.

Non-Line of Duty Disability

The greater of the accrued benefit or 20% of final earnings, payable immediately, unreduced.

Pre-Retirement Spouse's Benefit

Line of Duty Death Benefit

Greater of accrued benefit or 66 2/3% of final earnings.

Non-Line of Duty Death Benefit

Accrued benefit.

Other Pre-Retirement Death Benefit

Return of employee contributions with 3% interest, plus, if the member has one or more years of credited service, a lump sum equal to 50% of final earnings.

DROP

Allows accumulation of pension after 20 years of County service. DROP period must be between three and six years (with the sixth year requiring approval for certain job classifications). Interest shall be credited to the DROP account on a monthly basis at an interest rate of 0.34745%, which provides an effective annual interest rate of 4.25%.

Changes Since Prior Valuation

None.

Section VIII. Actuarial Methods and Assumptions

Funding Method

Projected Unit Credit Actuarial Cost Method. The contribution equals the sum of the normal cost and the amount necessary to amortize the unfunded actuarial liabilities according to the amortization policy.

Amortization Policy

The unfunded actuarial accrued liability (UAAL) is amortized as a level percentage of payroll as follows:

- Gains and losses over 20 years
- Assumption changes over 20 years
- Post-2018 plan improvements over the average expected future working period
- Early retirement incentives over 5 years or less
- Surplus, when reached, over 30 years (open)

Different amortization periods were utilized prior to 1/1/2014.

Amortization payments increase 3.0% per year.

Asset Method

Asset smoothing method which spreads the investment gains or losses in excess of the assumed return over a five-year period. The Actuarial Value of Assets can be no less than 50% of market value of assets and no more than 150% of market value of assets.

Discount Rate and Investment Rate of Return

7.00% compounded annually, net of investment expenses. This assumption is based on the plan's investment policy and the long-term expectation of each investment class, based upon the recommendations of the plan's investment advisor.

Inflation

3.0%, compounded annually.

Post-retirement COLA Increases

Benefits accrued before Bill 88-96 are assumed to increase by 3.0% of the current benefit each year from retirement.

Benefits accrued after Bill 88-96 are assumed to increase by 1.8% of the current benefit each year from retirement.

Salary Increases

The following graded schedule is used:

Age	Service <20	20 - 26	27+
20	7.5%	3.5%	6.5%
25	7.0%	3.0%	6.0%
30	6.5%	2.5%	5.5%
35	6.0%	2.0%	5.0%
40	5.5%	1.5%	4.5%
45	5.0%	1.0%	4.0%

Mortality

Healthy

RP-2014 Blue Collar Mortality Table for males and females with the 2006 base rates projected generationally from 2006 using scale MP-2018. Projections from 2006 to the valuation date represent current mortality and projections beyond the valuation date represent future mortality improvement.

Disabled

RP-2014 Blue Collar Mortality Table for males and females set forward five years with the 2006 base rates then projected generationally from 2006 using scale MP-2018. Projections from 2006 to the valuation date represent current mortality and projections beyond the valuation date represent future mortality improvement.

100% of pre-retirement deaths are assumed to be non-duty related.

Retirement

Active Members Not Participating in DROP on the Valuation Date

Retirement (reflecting DROP exit) rates are as follows:

Age	Service <20	20	21 - 23	24	25 - 29	30 - 33	34+
38 - 49	N/A	5%	5%	25%	30%	40%	100%
50	20%	10%	10%	15%	25%	40%	100%
51 - 53	7%	12%	7%	25%	20%	40%	100%
54	7%	12%	7%	25%	20%	40%	100%
55 - 58	15%	15%	10%	20%	25%	40%	100%
59 - 61	23%	23%	23%	28%	33%	40%	100%
62+	100%	100%	100%	100%	100%	100%	100%

Members Participating in DROP on the Valuation Date

Members are assumed to exit DROP upon the later of (1) four years from their DROP entry date and (2) the valuation date.

DROP Election Rate

90% of eligible participants are assumed to elect to enter DROP.

Disability

Sample rates are:

Age	Rate
30	0.2203%
35	0.3259%
40	0.6725%
45	1.1245%
50	1.6548%
55	0.0000%

75% of disablements are assumed to be duty-related.

Termination of Employment

Sample rates are:

Age	Rate
20	7.33%
25	5.68%
30	3.44%
35	1.77%
40	1.35%
45	0.97%
50	0.00%

Marriage

80% of employees and 70% of current retired and disabled members are assumed married. Males are assumed to be four years older than their spouses.

Disability Leave

Service credit for benefit formula purposes is increased by 1.75% to account for disability leave which is converted to service credit at retirement.

Military Service

Active liabilities (which depend on credited service) are loaded by 3.25% to account for future crediting of military service.

Transferred Service

Transferred service is included in the calculation of a participant's benefit starting at the time the service is originally transferred to the County.

CIGNA Benefit

Our calculations and the data exhibits reflect that some benefits have already been purchased.

Administrative Expenses

A load for estimated administrative expenses is included in the Actuarially Determined Contribution. The load is equal to the average of actual expenses for the two years preceding the valuation date, rounded to the nearest thousand.

Rationale for Assumptions

The following assumptions are deemed to have a significant effect on the calculations and were selected by the County based on the most recent Experience Study dated December 18, 2018.

- Inflation
- Pay increases
- Payroll growth
- Mortality
- Retirement
- Disability
- Termination of employment
- Marriage

The discount rate/investment rate of return is reviewed at least once annually following the same procedures as outlined in the Experience Study.

Anything not specifically noted is deemed to be not significant.

The various actuarial assumptions and methods which have been used are, in our opinion, appropriate for the purposes of this report.

Changes Since Prior Valuation

None.

Appendix 1

Summary of Funding Progress

Valuation Date	(1) Actuarial Value of Assets	(2) Actuarial Accrued Liability	(3) Percentage Funded (1) / (2)	(4) Unfunded Actuarial Accrued Liability (2) - (1)	(5) Annual Covered Payroll	(6) Unfunded Actuarial Accrued Liability as a Percentage of Covered Payroll (4) / (5)
1/1/2012	$426,196,539	$486,095,747	87.7%	$59,899,207	$45,673,006	131.1%
1/1/2013	$426,659,036	$510,470,652	83.6%	$83,811,615	$43,361,686	193.3%
1/1/2014	$462,235,880	$542,077,933	85.3%	$79,842,053	$44,950,885	177.6%
1/1/2015	$490,533,983	$567,754,744	86.4%	$77,220,761	$48,549,950	159.1%
1/1/2016	$503,389,792	$574,775,821	87.6%	$71,386,029	$49,181,953	145.1%
1/1/2017	$516,044,681	$590,268,772	87.4%	$74,224,091	$50,412,257	147.2%
1/1/2018	$534,987,850	$609,789,729	87.7%	$74,801,879	$51,766,876	144.5%
1/1/2019	$546,237,671	$639,462,284	85.4%	$93,224,613	$54,769,258	170.2%
1/1/2020	$568,443,867	$672,356,792	84.5%	$103,912,925	$58,710,040	177.0%
1/1/2021	$605,126,804	$748,500,315	80.8%	$143,373,511	$63,461,220	225.9%
1/1/2022	$652,769,215	$799,890,892	81.6%	$147,121,677	$67,851,357	216.8%

Analysis of the dollar amounts of net assets available for benefits, actuarial accrued liability, and unfunded actuarial accrued liability in isolation can be misleading. Expressing the net assets available for benefits as a percentage of the actuarial accrued liability provides one indication of funding status on a going-concern basis. Analysis of this percentage over time indicates whether the plan is becoming financially stronger or weaker. Generally, the greater this percentage, the stronger the plan. Trends in unfunded actuarial accrued liability and annual covered payroll are both affected by inflation. Expressing the unfunded actuarial accrued liability as a percentage of annual covered payroll approximately adjusts for the effects of inflation and aids analysis of Anne Arundel County's progress made in accumulating sufficient assets to pay benefits when due. Generally, the smaller this percentage, the stronger the plan.

Appendix 2 – Glossary

Actuarial Accrued Liability (AAL)
The difference between the Present Value of Future Benefits and the Present Value of Future Normal Costs or the portion of the present value of future benefits allocated to service before the valuation date in accordance with the actuarial cost method. Represents the present value of benefits expected to be paid from the plan in the future allocated to service prior to the date of the measurement.

Actuarial Assumptions
Estimates of future plan experience such as investment return, expected lifetimes and the likelihood of receiving a pension from the pension plan. Demographic, or "people" assumptions include rates of mortality, retirement and separation. Economic, or "money" assumptions, include expected investment return, inflation and salary increases.

Actuarial Cost Method
A procedure for allocating the Present Value of Future Benefits into the Present Value of Future Normal Costs and the Actuarial Accrued Liability. Also known as the "funding method".

Actuarial Value of Assets (AVA)
The value of the assets as of a given date, used by the actuary for valuation purposes. The AVA may be the market or fair value of plan assets or a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the actuarially determined contribution (ADC).

Actuarially Determined Contribution (ADC)
The employer's periodic determined contribution to a pension plan, calculated in accordance with the assumptions and methods used by the plan actuary.

Amortization Method
A procedure for payment of the Unfunded Actuarial Accrued Liability (UAAL) by means of periodic contributions of interest and principal. The components of the amortization payment for the UAAL includes the amortization period length, amortization payment increase (level dollar or level percentage of pay), and amortization type (closed or open).

Experience Gain/Loss
A measure of the difference between actuarial experience and experience anticipated by a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used.

Funded Ratio
The actuarial value of assets expressed as a percentage of the plan's actuarial accrued liability.

Market Value of Assets (MVA)
The value of the assets as of a given date held in the trust available to pay for benefits of the pension plan.

Normal Cost

That portion of the Present Value of Future Benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method.

Present Value of Future Benefits (PVFB)

The present value of amounts which are expected to be paid at various future times to active members, retired members, beneficiaries receiving benefits, and inactive, non-retired members entitled to either a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.

Present Value of Future Normal Cost (PVFNC)

The portion of the Present Value of Future Benefits (PVFB) allocated to future service.

Unfunded Actuarial Accrued Liabilities (UAAL)

The difference between the Actuarial Accrued Liability (AAL) and the Actuarial Value of Assets (AVA).

Appendix 3 – Summary of Major Legislative Changes

County Council Bill No. 48-89
Effective 9/13/1989.

The previously combined Police and Fire plan was separated into distinct plans for each group.

The reduction for retirement prior to age 50 was changed to 0.2% per month from 0.3% per month.

County Council Bill No. 34-92
Effective 6/1/1992 through 8/31/1992.

Participants over age 50 or with at least 20 years of service could elect to retire with an additional pension equal to 1/12 of 2.5% of final earnings for the first 20 years of service, plus 1/12 of 2% of final earnings for each additional year of service. The additional amount could be taken as a pension increase, a lump sum, or as a temporary supplement to age 62. Appropriate actuarial adjustments apply.

State House Bill No. 687
Effective 7/1/1990.

County employees were given the opportunity to apply for credit under the County's plan for previous service with the State of Maryland (or a political subdivision of the State).

County Council Bill 88-96
Effective 12/4/1996.

The previous method of calculating cost of living increases will only apply to benefits accrued as of 1/31/1997. The cost of living increase for future benefits is a compound increase equal to 60% of the annual change in the CPI, not to exceed 2.5%. Employees hired, or rehired, on or after 12/4/1996 will be Tier Two employees and will have different benefits than current employees.

Recodification
Effective 2/25/2002.

Allows a benefit based on disability leave service and pre-plan military service to be paid over the 70% cap. Normal Retirement was changed to the earlier of 20 years of service or age 50 with 5 years of service. Elimination of Tier 2 benefits implemented a Deferred Retirement Option Program (DROP), a voluntary program that provides an alternative way to earn and receive retirement benefits.

County Council Bill 74-09
Effective 12/11/2009.

For non-represented members, FY2010 annual pay shall be determined by increasing FY2009 annual pay by an assumed 3% for determining the final average basic pay. For represented members, FY2010 annual pay shall be determined by increasing FY2009 annual pay by an assumed 5% for determining the final average basic pay.

County Council Bill 6-10
Effective 4/18/2010.

Provides for a disability benefit for those participants who are totally and permanently disabled as a result of qualified military service.

County Council Bill 41-10
Effective 7/1/2010.

Reduced the DROP interest rate from 8% to 4.25%. Increased the contribution rate for all but Battalion Chief, Division Chief, Deputy Chief and Fire Chief to 7.25%.

County Council Bill No. 98-12
Effective 5/13/2013.

Changed the definition of “final average basic pay” from highest 3 out of the last 5 years basic pays to highest 3 of all basic pays.

County Council Bill No. 30-12
Effective 2/1/2013.

All participants shall contribute 7.25% of his or her annual basic pay in each calendar year or portion of a calendar year while an active participant is in the plan.

County Council Bill No. 66-18
Effective 7/1/2016.

Except for Battalion Chiefs, allows for interest to be credited to a DROP member’s account in the sixth year of DROP participation, for members entering their sixth year in DROP after July 1, 2018.

County Council Bill No. 55-20
Effective 11/09/2020.

The legislation permits Battalion Chiefs to now earn interest in the 6th year of DROP for Members entering the 6th year of DROP after July 1, 2020.

County Council Bill No. 70-20
Effective 11/22/2020.

Each of the pension plans provide pension benefits for an employee who is or becomes totally and permanently disabled and meets certain criteria. To be eligible for a disability pension, the plan requires that the disability prevent the participant from performing the duties of the participant’s regular duties. The purpose of the bill is to eliminate the participant’s ability to perform any other assignment within their Department as a disqualifying factor for a service connected disability.

County Council Bill No. 79-21

Effective 12/04/2021.

This bill allows Battalion Chiefs to extend their DROP participation period to the sixth year without approval of the Fire Chief.