Fairfax County Police Officers Retirement System

Actuarial Valuation Report
as of June 30, 2021

Produced by Cheiron
October 2021

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October 21, 2021

Board of Trustees
Fairfax County Police Officers Retirement System
12015 Lee Jackson Memorial Highway, Suite 350
Fairfax, Virginia 22033

**Re: *Fairfax County Police Officers Retirement System*
         *Actuarial Valuation as of June 30, 2021***

Dear Members of the Board:

At your request, we have conducted our annual actuarial valuation of the Fairfax County Police Officers Retirement System as of June 30, 2021. The results of the valuation are contained in this report. The purpose of this report is to present the annual actuarial valuation of the Fairfax County Police Officers Retirement System. This report is for the use of the Fairfax County Police Officers Retirement System Board of Trustees and its auditors in preparing financial reports in accordance with applicable law and accounting requirements.

Your attention is called to the Foreword in which we refer to the general approach employed in the preparation of this report. We also comment on the sources and reliability of both the data and the actuarial assumptions on which our findings are based. Those comments are the basis for our certification that this report is complete to the best of our knowledge and belief. The results of this report are only applicable to the County contribution for Fiscal Year 2023 and rely on future plan experience conforming to the underlying assumptions. To the extent that actual plan experience deviates from the underlying assumptions, the results would vary accordingly.

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 assumptions, changes in assumptions, and changes in plan provisions or applicable law.

In preparing our report, we relied on information (some oral and some written) supplied by the Retirement System. This information includes, but is not limited to, plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standards of Practice No. 23.

This report was prepared exclusively for the Fairfax County Police Officers Retirement System for the purpose described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other users.

Board of Trustees
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This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinions contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

Sincerely,
Cheiron

Fiona E. Liston, FSA, MAAA, EA
Principal Consulting Actuary

Coralie A. Taylor, FSA, MAAA, EA
Consulting Actuary

FOREWORD

Cheiron has performed the actuarial valuation of the Fairfax County Police Officers Retirement System as of June 30, 2021. The purpose of this report is to:

1) **Measure and disclose**, as of the valuation date, the financial condition of the System,

2) **Indicate trends** in the financial progress of the System,

3) **Determine the contribution rate** to be paid by the County for Fiscal Year 2023, and

4) **Provide specific information** and documentation required for the System's financial reporting.

An actuarial valuation establishes and analyzes system assets and liabilities on a consistent basis and traces the progress of both from one year to the next. It includes measurement of the system's investment performance, as well as an analysis of actuarial liability gains and losses.

Section I presents a summary containing our findings and disclosing important trends experienced by the System in recent years.

Section II presents risk factors to consider in the future outlook of the Plan.

Section III contains details on various asset measures, together with pertinent performance measurements.

Section IV shows similar information on the System's liabilities, measured for actuarial, accounting, and governmental reporting purposes.

Section V develops the County contribution rate, determined using actuarial techniques.

Section VI includes the required items to be included in the System's Annual Comprehensive Financial Report (ACFR).

The appendices to this report contain a summary of the System's membership at the valuation date, a summary of the major provisions of the System, and the actuarial methods and assumptions used in the valuations.

In preparing our report, we relied on information (some oral and some written) supplied by the System's staff. This information includes, but is not limited to, plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standards of Practice No. 23.

FOREWORD

The actuarial assumptions reflect our understanding of the likely future experience of the System, and the assumptions taken individually represent our best estimate for the future experience of the System. The results of this report are dependent upon future experience conforming to these assumptions. To the extent that future experience deviates from the actuarial assumptions, the true cost of the System could vary from our results.

SECTION I - BOARD SUMMARY

General Comments

The employer's annual contribution to this System is determined by using an amortization layer method. Under this funding approach, the employer's contribution rate consists of the normal cost rate plus expense rate plus layered amortization UAL bases. The UAL rates are summarized in Section V. The normal cost rate and actuarial accrued liability will be measured using the entry age funding method. The UAL is amortized over a series of fixed 15-year periods as a level percentage of payroll. Future gains and losses and changes in actuarial assumptions will be amortized in layers over separate 15-year periods.

The employer contribution rate for Fiscal Year (FY) 2023, as calculated under this method, remaining at 46.04% of payroll for FY 2022.

This valuation contains information reported in the June 30, 2021 Annual Comprehensive Financial Report (ACFR) of the System. Additional information regarding GASB Statement No. 67 can be found in a separate report.

Since the previous valuation, an experience study was performed to review the actuarial assumptions and methods. A description of the changes the Board has approved appears in Appendix B. The current results reflect these assumption changes which increase the liabilities by $56 million. As an offset to this liability impact, the smoothed value of assets includes an additional recognition of $38.7 million of the remaining balance of past investment gains. This additional recognition allows the calculated contribution rate to remain at its current level.

Trends

The System outperformed the investment assumption during the fiscal year ending in 2021, causing an actuarial gain on the asset side of the System. The actual return on a market value basis was 31.18%. On an actuarial value basis, the assets returned 11.29% compared with an assumed rate of return of 7.25%. The actuarial gain recognized for funding purposes was $62 million.

The measurement of liabilities produced a loss this year in the amount of $20 million. This loss was due to experience compared to our assumptions about salary increases, retirement behavior, COLA, and death, etc. Specific components of the loss include:

- The average salary increase was 4.7% for active participants who were in both the June 30, 2020 and June 30, 2021 valuations. This produced a loss of $6 million based on the actuarial assumption.

- The valuation assumed a 2.50% cost-of-living adjustment in 2020 for benefits in pay status. The actual CPI-based COLA was 2.60% last year, creating a liability loss of $1 million.

SECTION I - BOARD SUMMARY

- An annual component of liability loss is the delayed recognition of new hires throughout the year. This does not contribute to an increase in the System's unfunded liability because both the member and employer contribute from the date of hire. However, when we look only at the liability side, they are a component of the annual liability loss, and this year this contributed $1 million to that number.

- Finally, there was a $12 million liability loss component that is made up of various other causes such as members terminating, retiring, dying, or becoming disabled in a way contrary to the assumption, and on retirees and terminated vested members who were not in the 2018 data in that status in last year's valuation.

The combination of liability and investment experience, together with County plus member contributions over the last year, led to the System's funding ratio (actuarial value of assets over actuarial accrued liability) increasing from 83.1% at June 30, 2020 to 86.0% at June 30, 2021.

It is important to take a step back from the latest results and view them in the context of the System's recent history. On the next three pages, we present a series of charts that display key factors in the valuations over the last 15 years. After the historical review, we present a few projection graphs, showing the possible condition of the System over the next 15 years under various market return scenarios.

SECTION I - BOARD SUMMARY

Growth in Assets
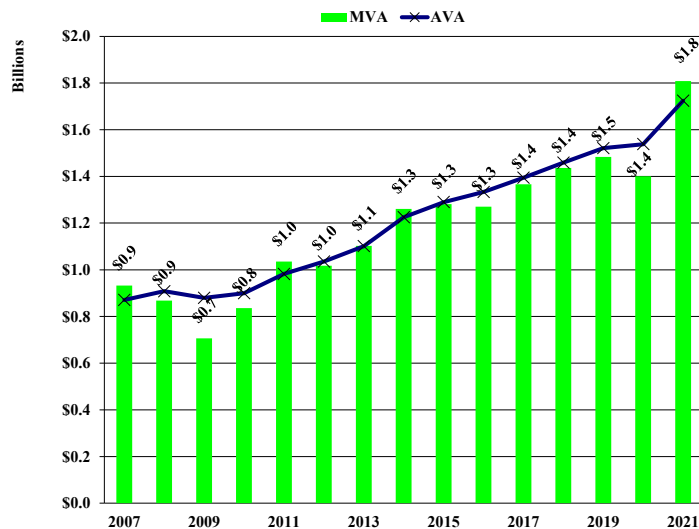
There was an increase in the market value of assets (MVA) (amount in billions shown above bars) over last year due to a return of 31.18%. The actuarial value of assets (AVA) increased due to the continued recognition only a portion of the asset gain this year, and has $84.4 million in unrecognized gains that will be phased in over the next few years.

Over the period July 1, 2007 to June 30, 2021, the System's assets returned approximately 6.30% per year measured at actuarial value, compared to the valuation assumption of per year.

Assets and Liabilities

The three colored bars represent the three different measures of liability mentioned in this report. The amount represented by the top of the pink bars, the present value of future benefits (PVFB), is the amount needed to provide all benefits for the current participants and their beneficiaries. If the System had assets equal to the PVFB, no contributions would, in theory, be needed for the current members. For funding purposes, the target amount is represented by the top of the gray bar. Through the 2013 valuation, we compare the actuarial value of assets to this measure of liability in developing the funded percent (black numbers). Starting in 2014, the comparison uses the market value of assets (red numbers). These are the percentages shown in the graph labels.
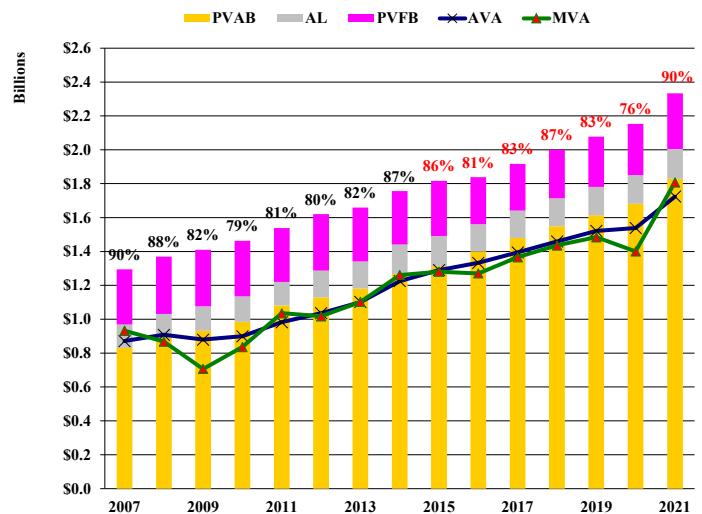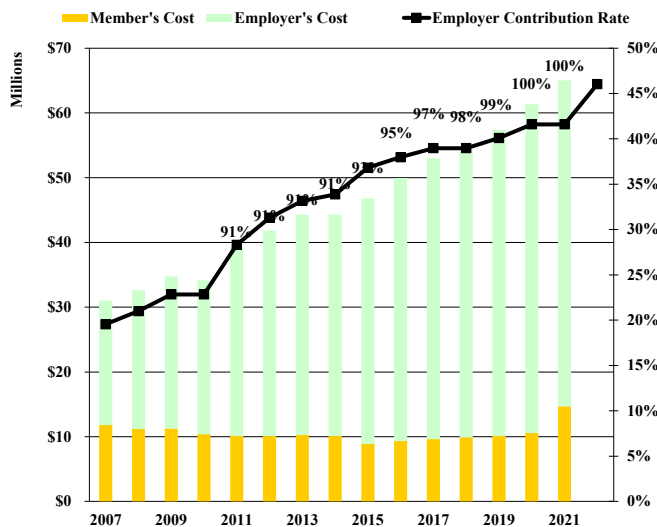
SECTION I - BOARD SUMMARY

Contribution Rates

The stacked bars in this graph show the contributions made by both the County and the members (left-hand scale). The black line shows the County contribution rate as a percent of payroll (right-hand scale).


The member contribution rate is set by the County Ordinance. The County contribution rate is set by the actuarial process, as constrained by the corridor method. Note there is a lag in the rate shown. For example, the 2021 value is the rate prepared by the 2019 valuation and implemented for the period June 30, 2020 to June 30, 2021. Starting with FY 2011, the County contribution has been based on a corridor floor greater than 90%. The data labels show the change in this metric.

Participant Trends

As with many systems in this country, there has been a steady growth in the number of retired members as the System has matured. The active-to-inactive ratio has decreased from 1.6 actives to each inactive in 2007 to 0.9 actives for each inactive today. While this would be an alarming trend in a pay-as-you-go system, the pool of invested assets has been established in anticipation of this development.

The chart also shows the number of DROP participants. Neither County nor member contributions are made on their behalf, which leads to a slightly lower growth in effective covered payroll for this system.
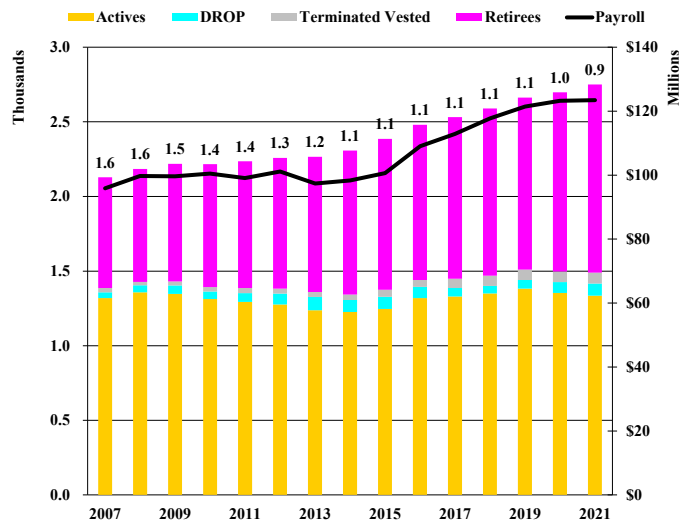
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SECTION I - BOARD SUMMARY

Cash Flow

The graph shows the annual cash flows into and out of the System. The graph shows the magnitude of the investment returns on the market value (green bars) compared to the contributions (yellow bars). The net cash flow (line) is comparing the contributions to benefits and expenses (red bar). Negative cash flow is expected for a mature system such as this one. The implications of a system with negative cash flow are that the impact of market fluctuations can be more severe. This is because, as assets are being depleted to pay benefits in down markets, less principal is available to be reinvested during periods of favorable returns.
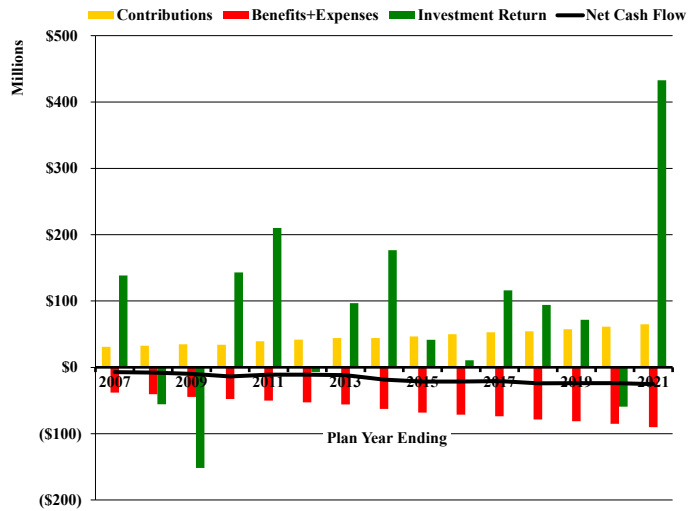
Future Outlook

Base-line Projections

The two graphs below show the expected progress of the System over the next 15 years, assuming the System's assets earn 6.75% on their *market value.*

Contributions are calculated using a full actuarial calculation. The County does not intend to reduce the contribution rate until the System is 100% funded. Once the System is 100% funded, the contribution rate will drop as returns keep the funding above 100%.

The graph entitled "Plan Funding" illustrates future County and member contribution rates.
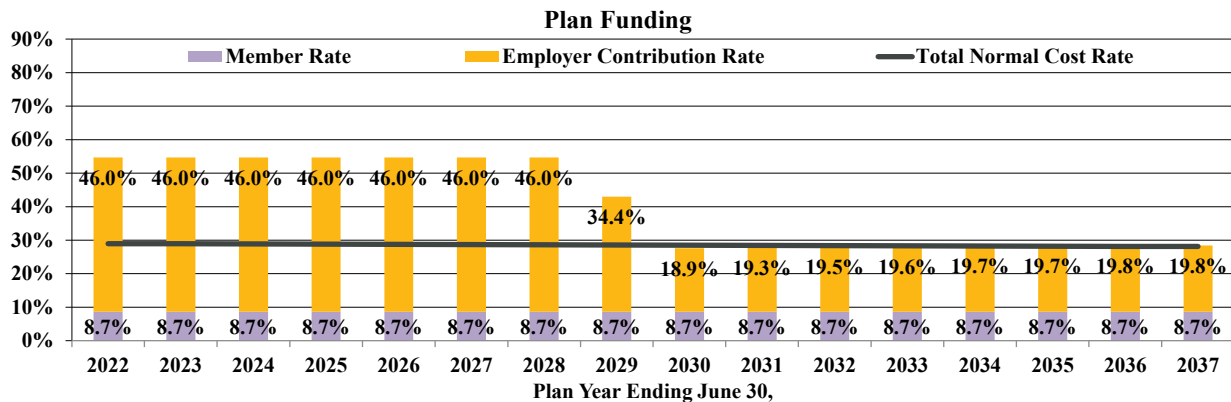
The "Assets and Liabilities" graph shows the projected funding status over the next 15 years. The funded ratio based on the actuarial value of assets gradually increases for the entire projection period ultimately reaching 100% funded as of 2029.
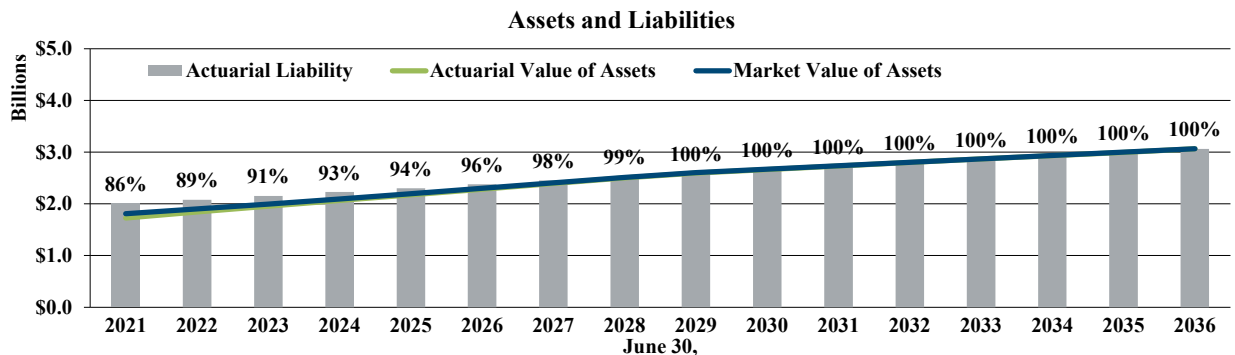
SECTION I - BOARD SUMMARY

The future funding status of this System will be influenced by the investment earnings. The prior projection assumed the System would earn 6.75% each and every year, which is extremely unlikely.

In the projections that follow, we show the risk to the System under volatile markets. The System has averaged a 9.31% return per year since 1980. In the following charts, we show results assuming returns over the next 15 years average 4.25%, 6.75%, and 9.25%. Different patterns of returns will produce different results from those shown here.

Table I-1			
Fiscal Year Ending June 30,	**Average 4.25%**	**Average 6.75%**	**Average 9.25%**
2022	6.92%	1.59%	(6.60)%
2023	6.30	6.42	3.79
2024	0.92	16.97	17.40
2025	2.23	29.26	31.81
2026	4.41	18.67	(9.73)
2027	(0.94)	4.86	9.72
2028	0.73	10.28	15.06
2029	16.84	3.55	(13.19)
2030	8.75	14.85	14.44
2031	8.50	(1.19)	14.08
2032	(2.86)	1.30	30.03
2033	(4.50)	(9.12)	24.17
2034	3.45	3.90	3.20
2035	6.52	(1.34)	6.62
2036	8.42	7.08	9.47
Average	**4.25%**	**6.75%**	**9.25%**

SECTION I - BOARD SUMMARY

Alternative Projection – with average return of 4.25% in the period

Under this scenario, the County contribution rate increases from 46% to about 61% of payroll. The System's funding drops to as low as 82% on an actuarial value basis, even with the ramping up of contributions.
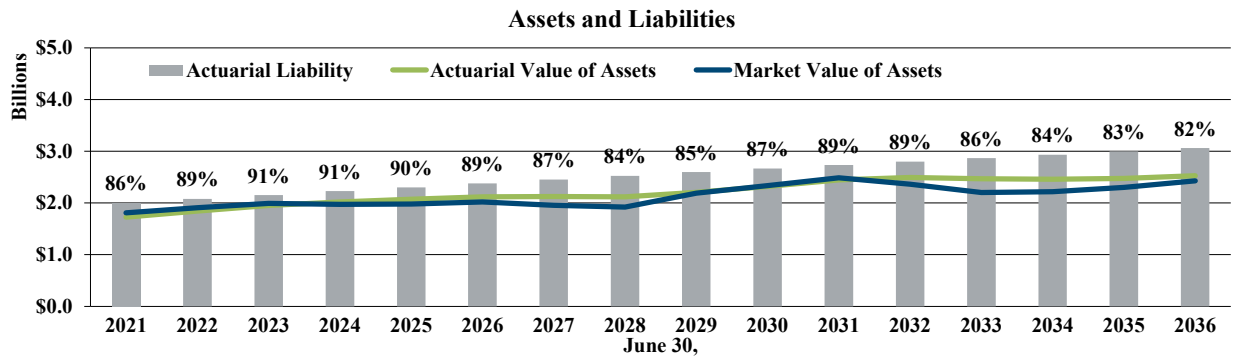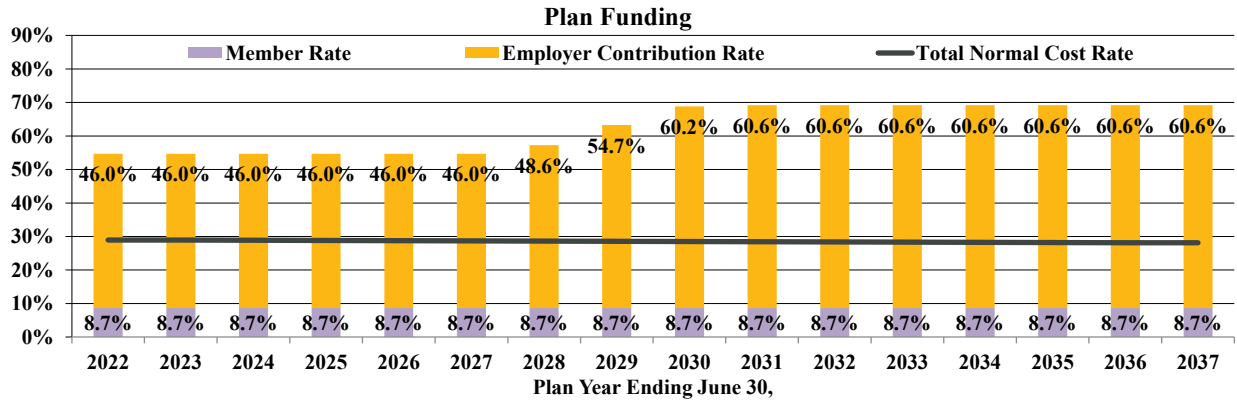
Plan Funding

Assets and Liabilities

SECTION I - BOARD SUMMARY

<u>Alternative Projection – with average return of 6.75% in the period</u>

Under this scenario, in which the System is assumed to experience lower than expected returns for the first two years followed by higher-than-average returns in the next few years, the County contribution rate remains at 46% over the next few years as the asset losses are phased in and the funding ratio remains below 100%. After that time, the contribution drops dramatically as returns continue to push the funded percent over 132%. County contributions in this System can never drop below the member's contribution rate.
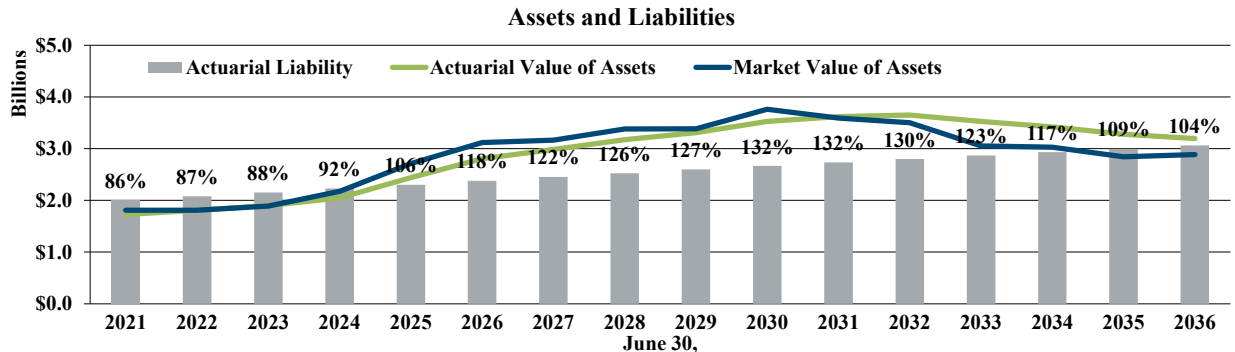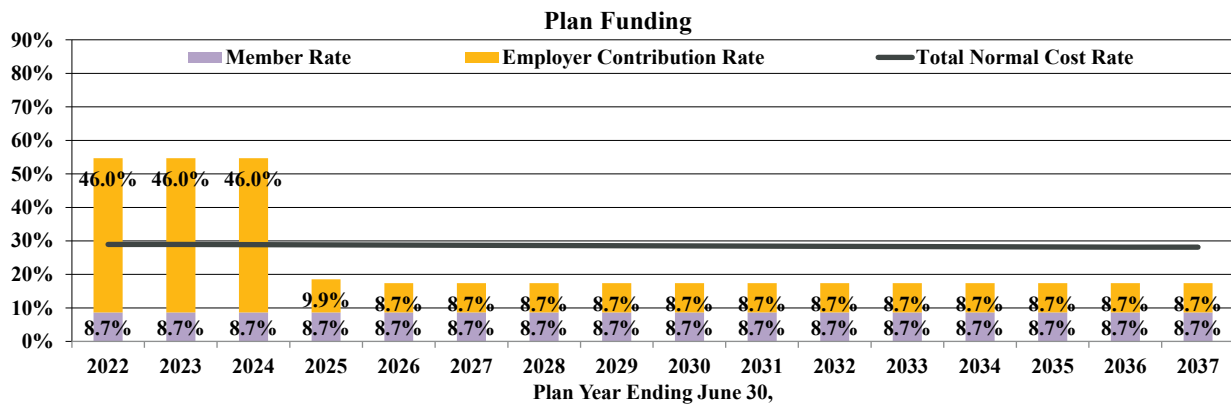
Plan Funding

Assets and Liabilities

SECTION I - BOARD SUMMARY

Alternative Projection – with average return of 9.25% in the period

Under this scenario, in which returns for the first two years are less than 6.75% but subsequent returns are much higher, the County contribution rate increases to 53.6% where it remains until the System reaches 100% funding on an actuarial value basis. By the end of the projection period, the County rate is down to the System's minimum of 8.65%, equal to the member contribution rate.
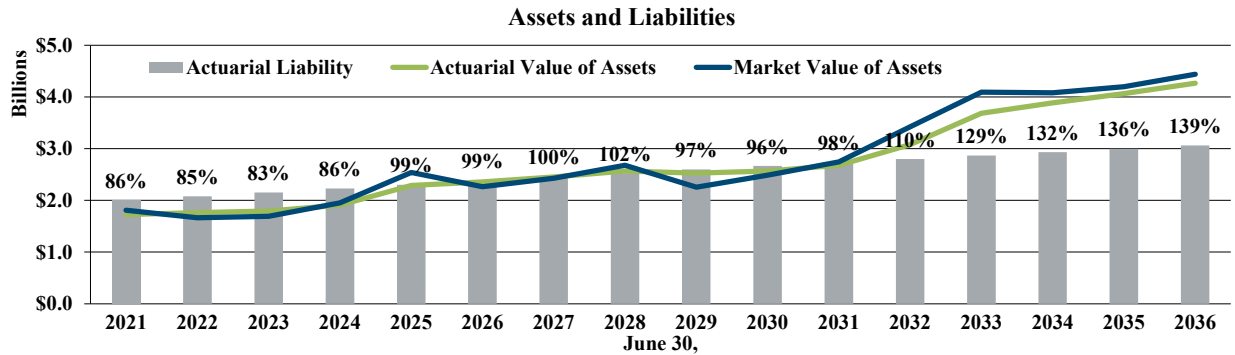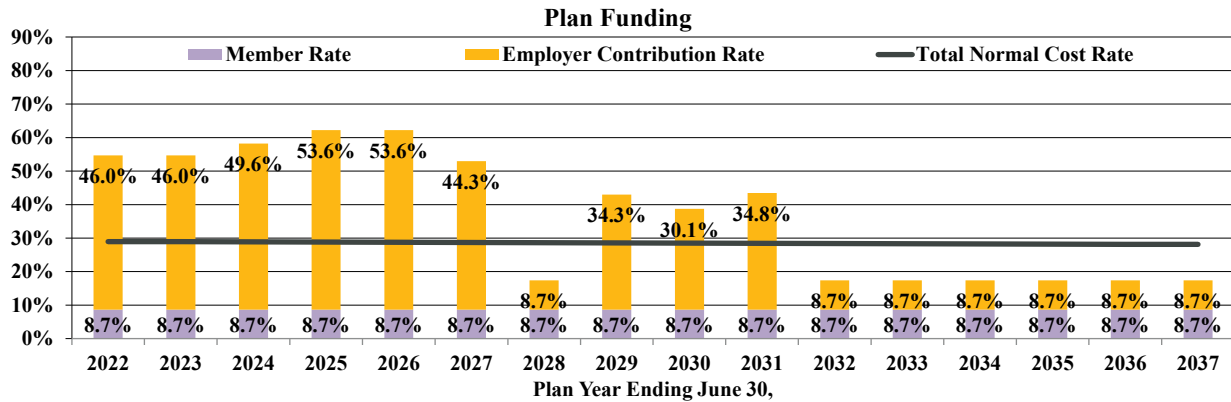
Plan Funding

Assets and Liabilities

SECTION I - BOARD SUMMARY

Table I-2 Summary of Prinicpal Plan Results			
Valuation as of:	**June 30, 2020**	**June 30, 2021**	**% Chg.**
Participant Counts			
Actives (excluding DROP)	1,353	1,335	(1.3)%
DROPs	74	82	10.8%
Terminated Vesteds	70	73	4.3%
In Pay Status	1,202	1,261	4.9%
Total	2,699	2,751	1.9%
Annual Salaries of Active Members	$ 123,249,682	$ 123,434,071	0.1%
Annual Retirement Allowances for Retired Members and Beneficiaries	$ 79,135,486	$ 85,220,341	7.7%
Assets and Liabilities			
Actuarial Liability (AL)	$ 1,851,586,671	$ 2,004,738,244	8.3%
Assets for Valuation Purposes (AVA)	1,538,146,337	1,723,799,319	12.1%
Unfunded Actuarial Liability	$ 313,440,334	$ 280,938,925	(10.4)%
Actuarial Value Funding Ratio (AVA / AL)	83.1%	86.0%	
Market Value Funding Ratio (MVA / AL)	75.6%	90.2%	
Present Value of Accrued Benefits	$ 1,681,227,206	$ 1,829,944,534	8.8%
Market Value of Assets	1,400,564,931	1,808,189,543	29.1%
Unfunded Accrued Liability (not less than $0)	$ 280,662,275	$ 21,754,991	(92.2)%
Accrued Benefit Funding Ratio	83.3%	98.8%	
Contributions as a Percentage of Payroll	**Fiscal Year 2022**	**Fiscal Year 2023**	
Employer Normal Cost	18.49%	20.16%	
UAL Amortization	27.15%	25.38%	
Administrative Expense	0.40%	0.50%	
County Rate	46.04%	46.04%	

SECTION II - IDENTIFICATION AND ASSESSMENT OF RISK

Actuarial valuations are based on a set of assumptions about future economic and demographic experience. These assumptions represent a reasonable estimate of future experience, but actual future experience will undoubtedly be different and may be significantly different. This section of the report is intended to identify the primary risks to the System, provide some background information about those risks, and provide an assessment of those risks.

Identification of Risks

The fundamental risk to a pension plan is that the contributions needed to pay the benefits become unaffordable. While we believe it is unlikely that the System by itself would become unaffordable, the contributions needed to support the System may differ significantly from expectations. While there are a number of factors that could lead to contribution amounts deviating from expectations, we believe the primary sources are:

- Investment risk,
- Interest rate risk,
- Longevity and other demographic risks,
- Contribution risk, and
- Assumption change risk.

Other risks that we have not identified may also turn out to be important.

SECTION II - IDENTIFICATION AND ASSESSMENT OF RISK

Investment Risk is the potential for investment returns to be different than expected. Lower investment returns than anticipated will increase the Unfunded Actuarial Liability necessitating higher contributions in the future unless there are other gains that offset these investment losses. The potential volatility of future investment returns is determined by the System's asset allocation, and the affordability of the investment risk is determined by the amount of assets invested relative to the size of the plan sponsor or other contribution base.
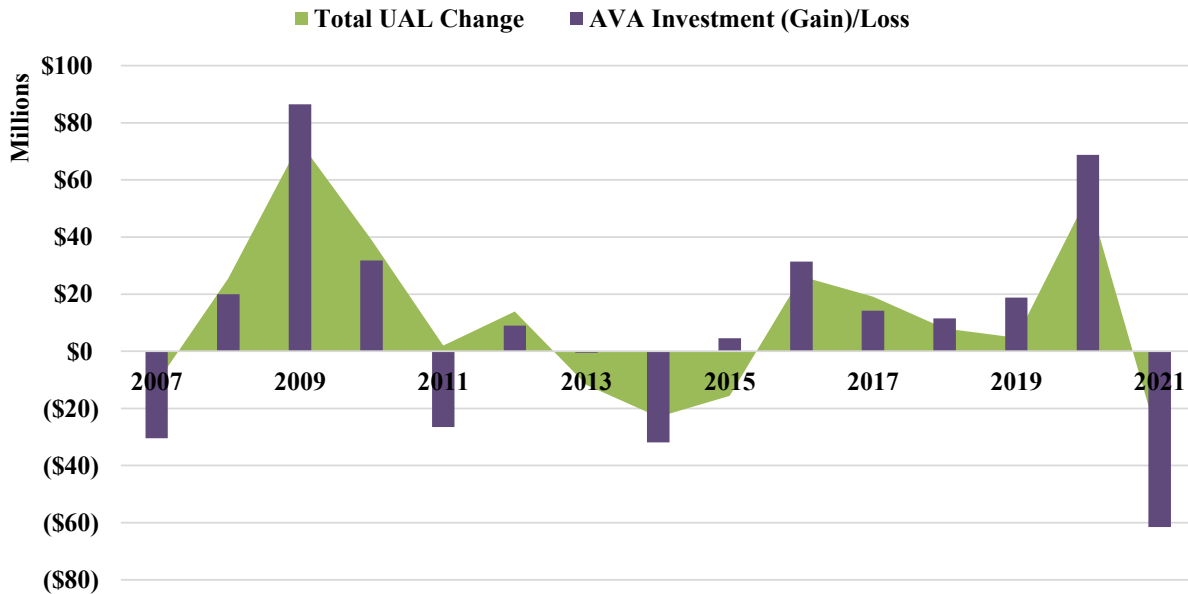
The graph above shows the impact of investment gains and losses on the smoothed Actuarial Value of Assets over the last 15 years compared to the System's total change in UAL.

SECTION II - IDENTIFICATION AND ASSESSMENT OF RISK

Interest rate risk is the potential for interest rates to be different than expected. For public plans, short-term fluctuations in interest rates have little or no effect as the System's liability is usually measured based on the expected return on assets. Longer-term trends in interest rates, however, can have a powerful effect. The chart below shows the yield on a 10-year Treasury security compared to the System's assumed rate of return. The difference is a simple measure of the amount of investment risk taken. As interest rates have declined, plans faced a choice: maintain the same level of risk and reduce the expected rate of return, maintain the same expected rate of return, and take on more investment risk, or some combination of the two strategies.
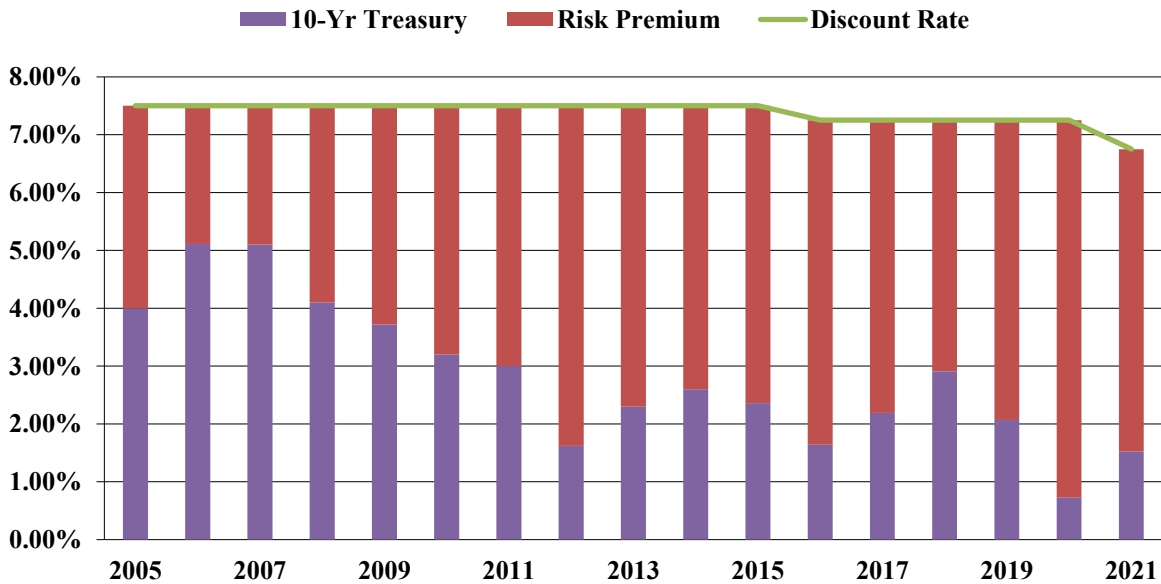
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SECTION II - IDENTIFICATION AND ASSESSMENT OF RISK

Longevity and other demographic risks are the potential for mortality or other demographic experience to be different than expected. Generally, longevity and other demographic risks emerge slowly over time and are often dwarfed by other changes, particularly those due to investment returns. The following graph shows the demographic gains and losses over the last 15 years compared to the total change in the UAL for each year.
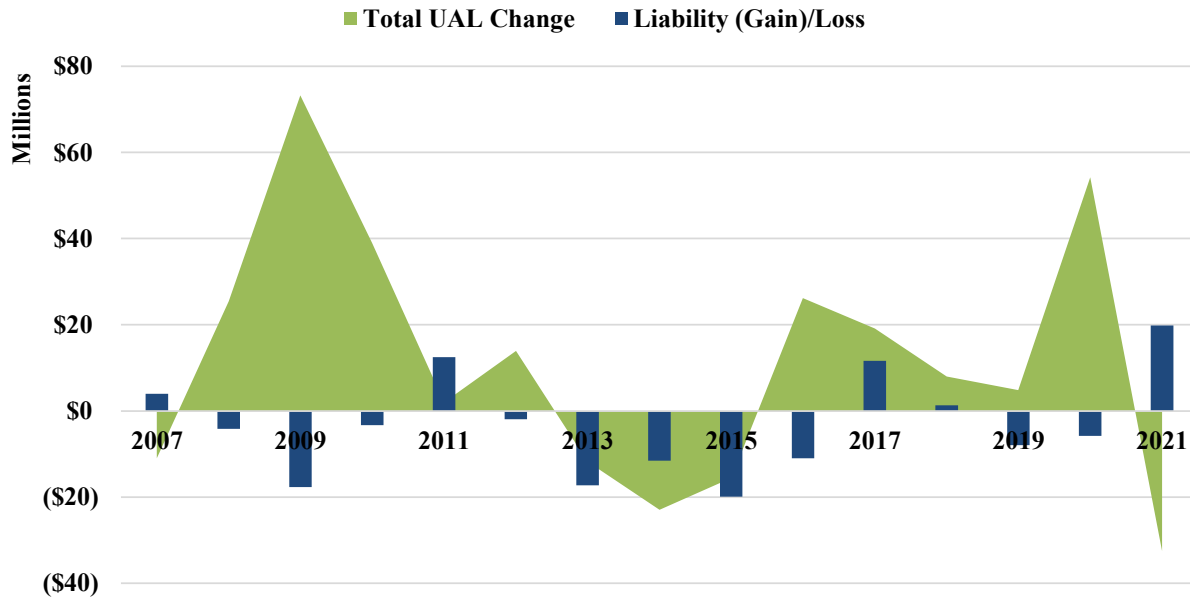
Contribution risk is the potential for actual future contributions to deviate from expected future contributions. There are different sources of contribution risk ranging from the sponsor choosing to not make contributions in accordance with the funding policy to material changes in the contribution base (e.g., covered employees, covered payroll, sponsor revenue) that affect the amount of contributions the System can collect. Historically, the System has made contributions in accordance with their funding policy.

SECTION II - IDENTIFICATION AND ASSESSMENT OF RISK

Assumption change risk is the potential for the environment to change such that future valuation assumptions are different than the current assumptions. Assumption change risk is an extension of the other risks identified, but rather than capturing the risk as it is experienced, it captures the cost of recognizing a change in environment when the current assumption is no longer reasonable.

Plan Maturity Measures

The future financial condition of a mature pension plan is more sensitive to each of the risks identified above than a less mature plan. Before assessing each of these risks, it is important to understand the maturity of this System compared to other plans and how the maturity has changed over time.

Plan maturity can be measured in a variety of ways, but they all get at one basic dynamic – the larger the system is compared to the contribution or revenue base that supports it, the more sensitive the system will be to risk. The measures below have been selected as the most important in understanding the primary risks identified for this System.

SECTION II - IDENTIFICATION AND ASSESSMENT OF RISK

Inactives per Active (Support Ratio)

One simple measure of plan maturity is the ratio of the number of inactive members (those receiving benefits or entitled to a deferred benefit) to the number of active members. The revenue base supporting the system is usually proportional to the number of active members, so a relatively high number of inactives compared to actives indicates a larger system relative to its revenue base as well.
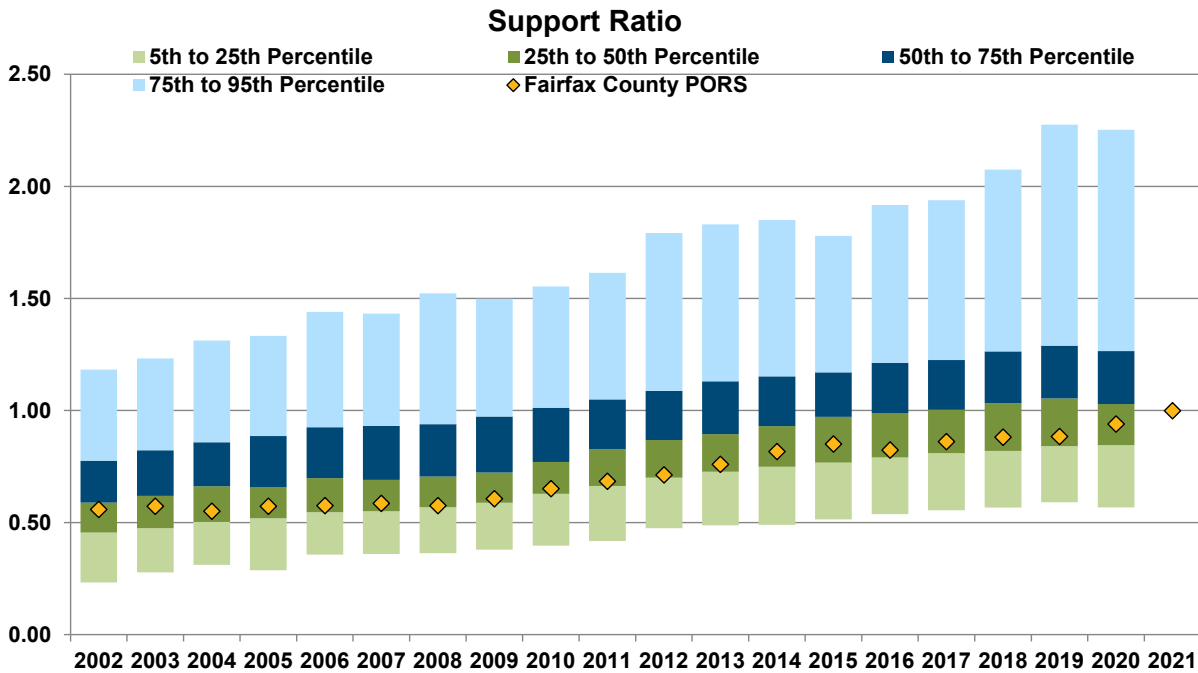
Survey Data from Public Plans Database as of 6/28/2021

The graph above shows the distribution from the 5th to 95th percentile of support ratios for the plans in the Public Plans Database. The gold diamonds show how the Retirement System compares to the other plans.

Whereas the support ratios for the plans as a whole have increased over the period as they mature, PORS's support ratio has increased over the period and has remained in the 25th to 50th percentile of the Public Plans Database during the entire period.

SECTION II - IDENTIFICATION AND ASSESSMENT OF RISK

Leverage Ratios

Leverage or volatility ratios measure the size of the plan compared to its revenue base more directly. An asset leverage ratio of 5.0, for example, means that if the System experiences a 10% loss on assets compared to the expected return, the loss would be equivalent to 50% of payroll.

The same investment loss for a system with an asset leverage ratio of 10.0 would be equivalent to 100% of payroll. As the System becomes better funded, the asset leverage ratio will increase, and if it was 100% funded, the leverage ratio would equal the Actuarial Liability (AL) leverage ratio.

Asset Leverage Ratio

Survey Data from Public Plans Database as of 6/28/2021
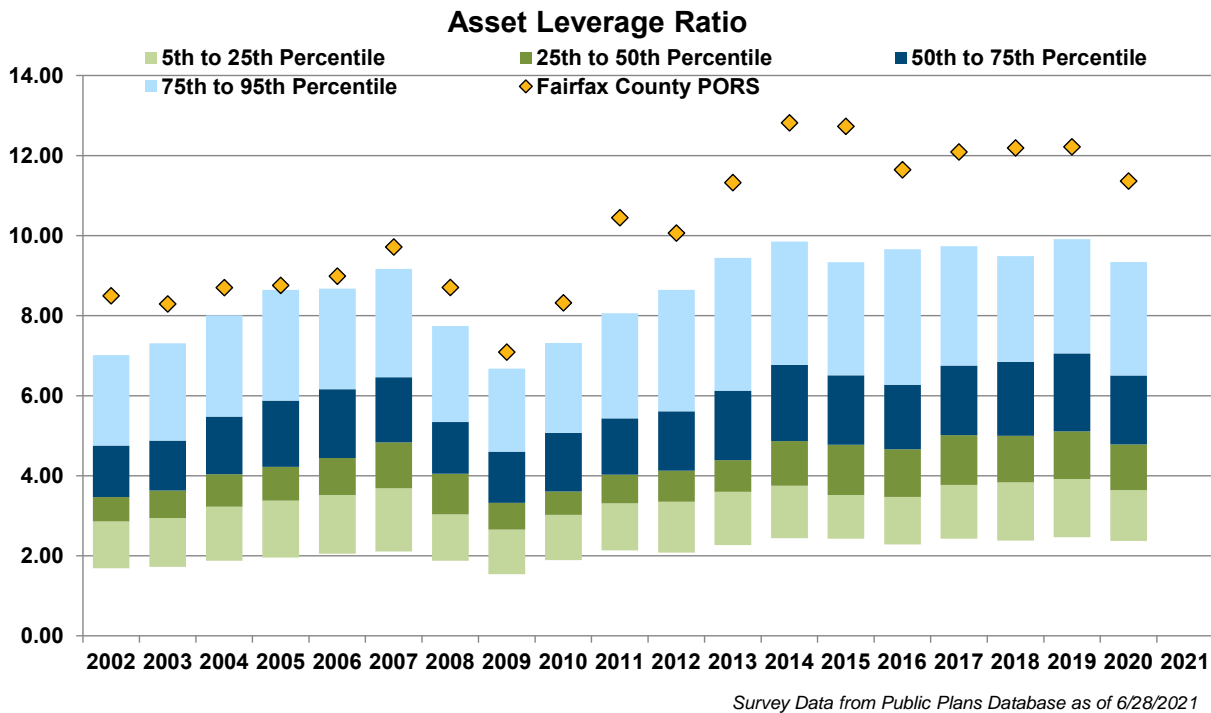
The chart above shows the distribution from the 5th to 95th percentile of asset leverage ratios for the plans in the Public Plans Database. The gold diamonds show how the System compares.

The System's asset leverage ratio has historically been in the 75th to 95th percentile compared to other plans but has been above the 95th percentile since 2002. This increase in the asset leverage ratio will continue as the System approaches 100% funded.

SECTION II - IDENTIFICATION AND ASSESSMENT OF RISK

The actuarial liability leverage ratio of 5.0 means that if the System experiences a 10% loss on liability compared to the expected liability, the liability loss would be equivalent to 50% of payroll.

Liability Leverage Ratio

Survey Data from Public Plans Database as of 6/28/2021
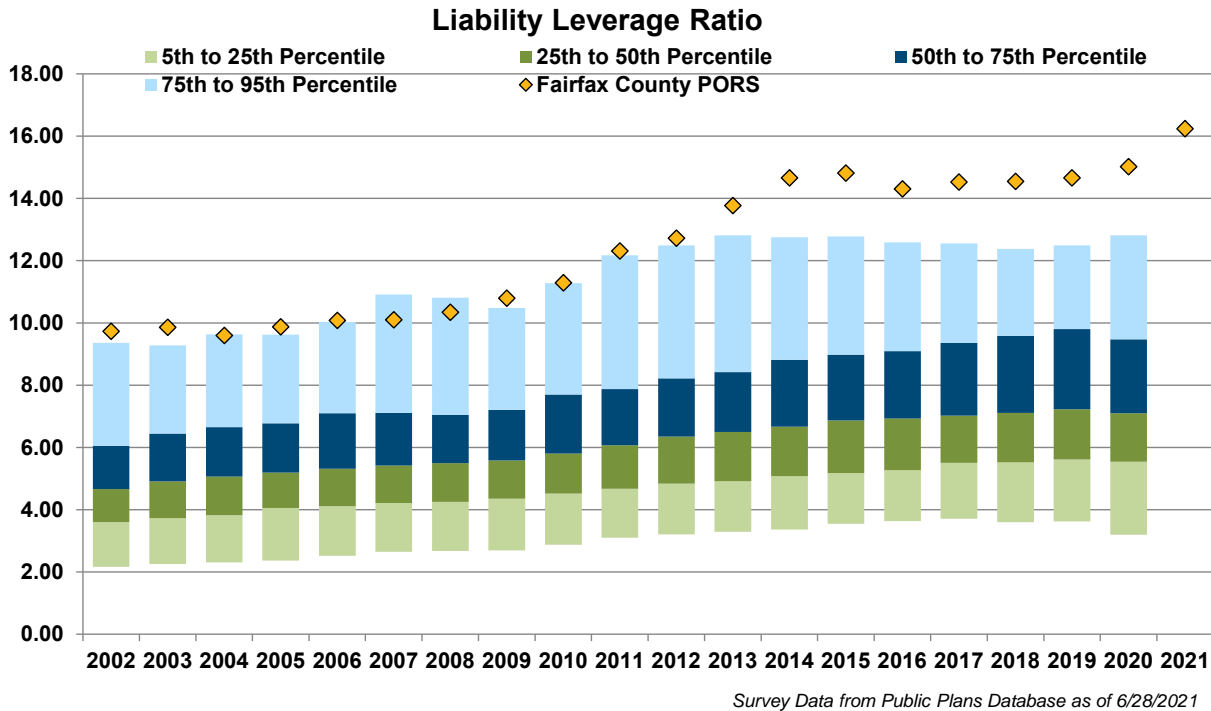
The chart above shows the distribution from the 5th to 95th percentile of Actuarial Liability leverage ratios for the plans in the Public Plans Database. The gold diamonds show how the System compares.

The System's Actuarial Liability leverage ratio has historically been above the 75th to 95th percentile compared to other plans. But as the System matures and more of the liability is due to inactive members, this ratio has been above the 95th percentile since 2011. The ratio has been over 9.5 over the period with the ratio currently around 16.0 in 2021.

SECTION III - ASSETS

Pension system assets play a key role in the financial operation of the System and in the decisions the Trustees may make with respect to future deployment of those assets. The level of assets, the allocation of assets among asset classes, and the methodology used to measure assets will likely impact benefit levels, County contributions, and the ultimate security of participants' benefits.

In this section, we present detailed information on the System's assets including:

- **Disclosure** of the System's assets at June 30, 2020 and June 30, 2021,
- Statement of the **changes** in market values during the year,
- Development of the **actuarial value of assets**,
- An assessment of **investment performance**, and
- A projection of the System's expected **cash flows** for the next 10 years.

Disclosure

The market value of assets represents "snap-shot or cash-out" values, which provide the principal basis for measuring financial performance from one year to the next. Market values, however, can fluctuate widely with corresponding swings in the marketplace. As a result, market values are usually not suitable for long-range planning.

The actuarial values are market values that have been smoothed; they are used for evaluating the System's ongoing liability to meet its obligations.

Current methods employed by this System set the actuarial value equal to the expected value plus 33⅓% of the difference between the expected value of assets and the actual market value, where the expected value is equal to the prior year's actuarial value, rolled forward with actual contributions, benefit payments, and administrative expenses plus interest imputed at the prior year investment return assumption of 7.25%.

SECTION III - ASSETS

Table III-1 Statement of Assets at Market Value		
	June 30, 2020	**June 30, 2021**
Assets		
Equity in County's Pooled Cash, Contributions Receivable and Other Assets	$ 4,838,462	$ 5,826,843
Accrued Interest and Dividends Receivable	1,786,334	2,621,930
Receivable from Sale of Investments	1,226,503	3,607,754
Capital Assets	9,586	8,661
US Government Obligations	42,370,768	78,964,276
Asset-Backed Securities	49,328,398	43,380,369
Other Bonds and Notes	52,465,848	82,378,203
Common and Preferred Stock	159,427,191	203,880,266
Pooled and Mutual Funds	1,004,249,792	1,328,431,453
Short-Term Investments	85,450,882	65,667,361
Cash Collateral Received Under Securities Lending Agreements	13,069,006	13,523,487
Natural Resources	4,986,688	4,425,275
Total Assets	$ 1,419,209,458	$ 1,832,715,878
Liabilities		
Payable for Collateral Received Under Securities Lending Agreements	$ 13,069,006	$ 13,523,487
Payable for Purchase of Investments	1,833,463	6,362,722
Accounts Payable and Accrued Expenses	3,742,058	4,640,126
Total Liabilities	$ 18,644,527	$ 24,526,335
Net Assets Available for Benefits	**$ 1,400,564,931**	**$ 1,808,189,543**

SECTION III - ASSETS

Table III-2 Changes in Market Values		
Value of Assets – June 30, 2020		$ 1,400,564,931
Additions		
Contributions:		
County Contributions	$ 50,348,130	
Employee Contributions	14,687,984	
Total Contributions		$ 65,036,114
Investment Income:		
Net Appreciation (Depreciation) in		
Fair Value of Investments	$ 439,194,912	
Interest	9,861,961	
Dividends	3,421,776	
Total Investment Income	$ 452,478,649	
Investment Activity Expenses:		
Management Fees	$ (18,946,038)	
Custodian Fees	(94,888)	
Consulting Expense	(99,749)	
Allocated Administrative Expenses	(571,144)	
Total Investment Activity Expenses	$ (19,711,819)	
From Securities Lending Activities:		
Securities Lending Income	$ 103,641	
Securities Lending Expenses		
Borrowers Rebates	0	
Management Fees	(35,989)	
Net Income from Securities Lending		
Activities	$ 67,652	
Net Investment Income		$ 432,834,482
Total Additions		$ 497,870,596
Deductions		
Annuity Benefits	$ (81,576,691)	
Disability Benefits	(1,423,764)	
Survivor Benefits	(5,691,474)	
Refunds and Other Expenses	(888,427)	
Administrative Expenses	(665,628)	
Total Deductions		$ (90,245,984)
Total		
Net Increase (Decrease)		$ 407,624,612
Value of Assets – June 30, 2021		**$ 1,808,189,543**

SECTION III - ASSETS

Actuarial Value of Assets

The actuarial value of assets represents a "smoothed" value developed by the actuary to reduce or eliminate erratic results which could develop from short-term fluctuations in the market value of assets. For this System, the actuarial value has been calculated by adding 33⅓% of the difference between market value and expected value to the expected value. The actuarial value of assets in this July 1, 2021 also recognizes an additional amount of past deferred gains in order to offset the increase in liability caused by changes in assumptions. The following table illustrates the calculation of the actuarial value of assets for the June 30, 2021 valuation.

Table III-3 Development of Actuarial Value of Assets as of June 30, 2021	
1. Actuarial Value of Assets at June 30, 2020	**$ 1,538,146,337**
2. Amount in (1) with Interest to June 30, 2021	1,649,661,946
3. County and Member Contributions for the Plan Year Ended June 30, 2021	65,036,114
4. Interest on Contributions Assuming Received Uniformly Throughout the Year to June 30, 2021	2,316,311
5. Disbursements from Trust Except Investment Expenses, July 1, 2020 Through June 30, 2021	(90,246,315)
6. Interest on Disbursements Assuming Payments Made Uniformly Throughout the Year to June 30, 2021	(3,214,191)
7. Expected Value of Assets at June 30, 2021 = (2) + (3) + (4) + (5) + (6)	1,623,553,865
8. Market Value of Assets at June 30, 2021	1,808,189,046
9. Excess of (8) Over (7)	$ 184,635,181
10. Additional Recognition of Past Deferred Gains	$ 38,700,000
11. Actuarial Value of Assets at June 30, 2021 = (7) + 33-1/3% of (9) + (10)	**$ 1,723,798,925**

SECTION III - ASSETS

Investment Performance

The market value of assets (MVA) returned 31.18% during 2021, which is less than the assumed 7.25% return. A return of 11.29% on the actuarial value of assets (AVA) is primarily the result of the asset smoothing method being utilized for the calculation of the actuarial value of assets. Since only 33⅓% of the gain or loss from the performance of the System is recognized in a given year, in periods of very good performance, the AVA can lag significantly behind the MVA. In a period of negative returns, the AVA does not decline as rapidly as the MVA.

Table III-4 Annual Rates of Return				
Year Ending June 30,	**Market Value**	**Actuarial Value**	**Total Return Standard & Poor's 500 Index**	**Barclays Global Aggregate Index[1]**
1997	21.4%	15.1%	34.7%	8.2%
1998	17.3%	8.1%	30.2%	10.5%
1999	8.1%	15.9%	22.8%	3.1%
2000	7.7%	12.7%	7.2%	4.6%
2001	(3.1)%	7.0%	(14.8)%	11.2%
2002	(5.1)%	3.0%	(18.0)%	8.6%
2003	4.1%	3.3%	0.3%	10.4%
2004	15.5%	7.0%	19.1%	0.3%
2005	9.1%	7.7%	6.3%	6.8%
2006	9.5%	8.3%	8.6%	(0.8)%
2007	17.4%	11.4%	20.6%	6.1%
2008	(6.0)%	5.2%	(13.1)%	7.1%
2009	(17.6)%	(2.1)%	(26.2)%	5.5%
2010	20.5%	3.9%	14.4%	9.5%
2011	25.3%	10.5%	30.8%	3.9%
2012	(0.7)%	6.6%	5.4%	7.5%
2013	9.6%	7.6%	20.6%	(0.1)%
2014	16.2%	10.3%	24.6%	4.4%
2015	3.3%	7.1%	7.4%	1.8%
2016	0.9%	3.5%	4.0%	6.0%
2017	9.2%	6.2%	17.9%	(0.3)%
2018	7.0%	6.4%	14.4%	(0.4)%
2019	5.0%	6.0%	10.4%	7.9%
2020	(4.0)%	2.7%	7.5%	8.7%
2021	31.2%	13.8%	40.8%	(0.3)%

[1] Figures shown prior to 1987 are Salomon Brothers Long Term Bond Index.

SECTION III - ASSETS

Expected benefit payments are projected for the closed group valued at June 30, 2021. Projecting any further than 10 years using a closed group would not yield reliable predictions due to the omission of new hires.

Expected employer contributions are projected based on the current County contribution rate of 46.04% for FY 2022 continuing to FY 2028 and then continuing to calculate a rate with 15 year amortization layers thereafter. This projection assumes no further liability gains or losses, continued reflection of untapped investment gains in the future, a 2.25% annual increase in the total covered payroll and models the anticipated impact of new hires coming in with altered plan provisions.

Table III-5		
Projection of System's Benefit Payments and Employer Contributions		
Year Beginning July 1,	**Expected Benefit Payments**	**Expected County Contributions**
2021	$ 94,802,000	$ 56,829,000
2022	101,521,000	58,108,000
2023	106,417,000	59,416,000
2024	110,239,000	60,753,000
2025	115,834,000	62,120,000
2026	123,089,000	63,517,000
2027	130,387,000	64,946,000
2028	137,012,000	66,408,000
2029	144,107,000	48,457,000
2030	151,527,000	51,466,000

SECTION IV - LIABILITIES

In this section, we present detailed information on System liabilities including:

- **Disclosure** of System liabilities at June 30, 2020 and June 30, 2021,
- Statement of **changes** in these liabilities during the year, and
- A **projection** of future liabilities.

Disclosure

Several types of liabilities are calculated and presented in this report. Each type is distinguished by the people ultimately using the figures and the purpose for which they are using them.

- **Present Value of Benefits:** Used for analyzing the financial outlook of the System, this represents the amount of money needed today to fund all future benefits of the System, assuming participants continue to accrue benefits and all assumptions are met.

- **Actuarial Liability:** Used for funding calculations and GASB disclosures, this liability is calculated taking the present value of benefits above and subtracting the present value of future member contributions and future employer normal costs under an acceptable actuarial funding method. This method is referred to as the **Entry Age Normal** funding method.

- **Present Value of Accrued Liabilities:** Used for communicating the current level of liabilities, this liability represents the total amount of money needed today to fully fund the current accrued obligations of the System, assuming no future accruals of benefits and that all assumptions are met, including the 6.75% investment return. These liabilities are also used to assess whether the System can meet its current benefit commitments.

None of the liability figures disclosed in this report is meant to be a measure of the System's settlement liability.

The following table discloses each of these liabilities for the current and prior valuations. With respect to each disclosure, a subtraction of the appropriate value of the System's assets yields, for each respective type, a **net surplus** or an **unfunded liability**.

SECTION IV - LIABILITIES

Table IV-1 Liabilities/Net (Surplus)/Unfunded				
		June 30, 2020		**June 30, 2021**
Present Value of Future Benefits				
Active Participant Benefits (excluding DROP)	$	972,929,454	$	1,033,448,810
DROP Participant Benefits		109,723,998		128,998,097
Retiree Benefits		1,058,646,066		1,157,845,191
Terminated Vested and Inactive Members		11,985,227		13,111,652
Present Value of Benefits (PVB)	$	2,153,284,745	$	2,333,403,750
Market Value of Assets (MVA)	$	1,400,564,931	$	1,808,189,543
Future Employee Contributions		95,232,760		97,669,524
Future County Contributions		657,487,054		427,544,683
Total Resources	$	2,153,284,745	$	2,333,403,750
Actuarial Accrued Liability				
Present Value of Benefits (PVB)	$	2,153,284,745	$	2,333,403,750
Present Value of Future Normal Costs (PVFNC)				
County Portion		206,465,314		230,995,982
Employee Portion		95,232,760		97,669,524
Actuarial Liability	$	1,851,586,671	$	2,004,738,244
(AL = PVB - PVFNC)				
Actuarial Value of Assets (AVA)		1,538,146,337		1,723,799,319
Net (Surplus)/Unfunded (AL – AVA)	$	313,440,334	$	280,938,925
Present Value of Accrued Benefits				
Present Value of Benefits (PVB)	$	2,153,284,745	$	2,333,403,750
Present Value of Future Benefit Accruals (PVFBA)		472,057,539		503,459,216
Present Value of Accrued Benefits	$	1,681,227,206	$	1,829,944,534
(PVAB = PVB – PVFBA)				
Market Value of Assets (MVA)	$	1,400,564,931	$	1,808,189,543
Net Unfunded, not less than $0 (PVAB – MVA)	$	280,662,275	$	21,754,991

SECTION IV - LIABILITIES

Changes in Liabilities

Each of the liabilities disclosed in the prior table are expected to change at each valuation. The components of that change, depending upon which liability is analyzed, can include:

- New hires since the last valuation
- Benefits accrued since the last valuation
- Plan amendments increasing benefits
- Passage of time which adds interest to the prior liability
- Benefits paid to retirees since the last valuation
- Participants retiring, terminating, or dying at rates different than expected
- A change in actuarial or investment assumptions
- A change in the actuarial funding method

Unfunded liabilities will change because of all of the above and due to changes in System assets resulting from the following:

- County contributions less than the full actuarial contribution
- Investment earnings different than expected
- A change in the method used to measure System assets

In each valuation, we report on those elements of change that are of particular significance, potentially affecting the long-term financial outlook of the System. Below we present key changes in liabilities since the last valuation.

Table IV-2			
	Present Value of Benefits	Actuarial Liability	Present Value of Accrued Benefits
Liabilities June 30, 2020	$ 2,153,284,745	$ 1,851,586,671	$ 1,681,227,206
Liabilities June 30, 2021	2,333,403,750	2,004,738,244	1,829,944,534
Liability Increase (Decrease)	$ 180,119,005	$ 153,151,573	$ 148,717,328
Change Due to:			
Plan Amendment	$ 0	$ 0	$ 0
Actuarial (Gain)/Loss	*Not Calculated*	19,812,468	*Not Calculated*
Method and Assumption Changes	83,980,276	55,913,508	48,525,909
Benefits Accumulated and Other Sources	96,138,729	77,425,597	100,191,419

SECTION V - CONTRIBUTIONS

In the process of evaluating the financial condition of any pension system, the actuary analyzes the assets and liabilities to determine what level (if any) of contributions is needed to properly maintain the funding status of the System. Typically, the actuarial process will use a funding technique that will result in a pattern of contributions that is both stable and predictable.

For this System, the funding method employed is the **Entry Age Actuarial Cost Method**. Under this method, there are three components to the total contribution: the **normal cost rate**, the **unfunded actuarial liability rate** (UAL rate), and the **administrative expense rate**. The normal cost rate is determined in the following steps. First, an individual normal cost rate is determined by taking the value, as of entry age into the System, of each member's projected future benefits. This value is then divided by the value, also at entry age, of the member's expected future salary. Second, the normal cost rate is multiplied by current salary and added together to obtain the total rate. Finally, the total normal cost rate is reduced by the average member contribution rate to produce the County's normal cost rate.

Development of County Contribution Rate

The employer's total contribution rate is equal to the normal cost rate plus rate changes due to amendments passed or assumption changes adopted since July 1, 2001 plus a 15-year amortization of the UAL that existed on June 30, 2018 other than that which existed from prior amendment and assumption change bases. In the future, additional amortization bases will be created each year. Finally, the rate includes an expense rate. Please see Table V-2 for details.

This section contains a comparison of the County contribution rates for FY 2022 and 2023 in Table V-1. Tables V-2 and V-3 show the calculations of the FY 2022 and 2023 rates using a closed 15-year layered amortization approach.

SECTION V - CONTRIBUTIONS

The table below presents and compares the budgeted rate for the System for this valuation and the prior one.

The UAL rate is the level percent of member payroll which, when applied to each year's payroll, will be sufficient to amortize the various layers of unfunded actuarial liability over their respective 15-year periods.

Table V-1 Actuarially Determined Rate (for Corridor Contribution)		
Valuation Date	**June 30, 2020**	**June 30, 2021**
Fiscal Year	**2022**	**2023**
Normal Cost Rate	18.49%	20.16%
UAL Rate	27.15%	25.38%
Expense Rate	0.40%	0.50%
Total County Rate	46.04%	46.04%

SECTION V - CONTRIBUTIONS

Table V-2 Development of UAL Amortization Layer	June 30, 2020 (for FY 2022)	June 30, 2021 (for FY 2023)
1. Present Value of Future Benefits		
a. Active Employees	$ 972,929,454	$ 1,033,448,810
b. DROP	109,723,998	128,998,097
c. Retired Members	1,058,646,066	1,157,845,191
d. Vested Terminated and Inactive Members	11,985,227	13,111,652
e. Total Present Value	$ 2,153,284,745	$ 2,333,403,750
2. Present Value of Future Normal Costs		
a. County Portion	$ 206,465,314	$ 230,995,982
b. Employee Portion	95,232,760	97,669,524
c. Total Present Value	$ 301,698,074	$ 328,665,506
3. Actuarial Liability (1) – (2)	$ 1,851,586,671	$ 2,004,738,244
4. Actuarial Value of Assets	$ 1,538,146,337	$ 1,723,799,319
5. Unfunded Accrued Liability (UAL)	$ 313,440,334	$ 280,938,925
6. Oustanding Prior Bases (see Table V-4)	249,479,292	307,177,871
7. New Base at July 1, 2021//2022	63,961,042	(26,238,946)
8. Expected County Contribution FY 2021//2022 (County Rate x Expected Payroll)	51,271,868	56,829,046
9. Employer Normal Cost Payments	(22,788,866)	(24,884,309)
10. Expense Payments (using 0.40%/0.50% assumption)	(492,999)	(617,170)
11. Net Contribution to apply to UAL	27,990,003	31,327,567
12. Amortization of prior bases (from Table V-3)	27,640,815	34,341,359
13. Excess UAL Payment (11 - 12)	$ 349,188	$ (3,013,792)
14. Remaining New Base One Year Later (7 - 13, with interest)	$ 68,236,593	$ (24,896,228)
15. 14-year Amortization Factor	10.3847	10.3966
16. New UAL Amortization Layer (14 / 15)	$ 6,570,899	$ (2,394,659)
17. Next Year Amortization of Bases (from Table V-3)	27,816,847	34,425,492
18. Total UAL Payments (16 + 17)	$ 34,387,746	$ 32,030,833
19. Estimated Payroll	$ 126,639,048	$ 126,211,338
20. UAL as a % of Payroll	27.15%	25.38%

SECTION V - CONTRIBUTIONS

			June 30, 2021	FY 2022	June 30, 2022		FY 2023
			Table V-3				
			Schedule of Amortization Bases				
Type of Base		Date Established	Outstanding Amount	Amortization Payment	Outstanding Amount[1]	Amortization Years	Amortization Payment
1.	Ad-hoc COLA	7/1/2005	$ 564,022	$ 582,747	$ -	1	$ -
2.	Remove 30 year service cap on benefits	7/1/2006	87,736	90,649	-	1	-
3.	Ad-hoc COLA	7/1/2007	1,227,160	647,600	640,894	2	662,171
4.	Assumption Changes	7/1/2007	2,997,111	673,784	2,503,263	5	688,944
5.	Assumption Changes	7/1/2008	11,450,244	1,711,048	10,455,283	8	1,749,547
6.	Assumption Changes	7/1/2010	8,521,449	1,060,596	8,000,840	10	1,084,459
7.	Unfunded Base	7/1/2018	199,443,909	21,523,325	190,668,497	12	22,007,600
8.	New UAL Layer 2019	7/1/2019	14,649,647	1,488,233	14,100,857	13	1,521,718
9.	New UAL Layer 2020	7/1/2020	68,236,593	6,563,377	66,061,289	14	6,711,053
	Total		**$ 307,177,871**	**$ 34,341,359**	**$ 292,430,923**		**$ 34,425,492**

[1] Outstanding amount includes a full year of interest on prior year balance and half year on the amortization payment

SECTION VI - ACCOUNTING STATEMENT INFORMATION

ASC Topic 960 of the Financial Accounting Standards Board (FASB) describes certain disclosures regarding a plan's funded status.

The FASB ASC Topic 960 disclosures provide a quasi "snap-shot" view of how the System's assets compare to its liabilities if contributions stopped and accrued benefit claims had to be satisfied. However, due to potential legal requirements and the possibility that alternative interest rates would have to be used to determine the liabilities, these values may not be a good indication of the amount of money it would take to buy the benefits for all members if the System were to terminate.

FASB ASC Topic 960 specifies that a comparison of the present value of accrued (accumulated) benefits with the market value of the assets as of the valuation date must be provided. The relevant amounts as of June 30, 2020 and June 30, 2021 are exhibited in Table VI-1, which also includes a reconciliation of liabilities determined as of the prior valuation, June 30, 2020 to the liabilities as of June 30, 2021.

Table VI-2 is a history of gains and losses in Accrued Liability, and Table VI-3 is the Schedule of Funded Liabilities by Type, which shows the portion of Accrued Liability covered by Assets. See our report dated October 21, 2021 for the required disclosures under GASB Statement No. 67.

SECTION VI - ACCOUNTING STATEMENT INFORMATION

Table VI-1 Accounting Statement Information		June 30, 2020	June 30, 2021
A. **FASB ASC Topic 960 Basis**			
1. Present Value of Benefits Accrued and Vested to Date			
	a. Members Currently Receiving Payments	$ 1,058,646,066	$ 1,157,845,191
	b. Vested Terminated and Inactive Members	11,985,227	13,111,652
	c. DROP	109,723,998	128,998,097
	d. Active Members	487,481,431	518,446,430
	e. Total PVVB	$ 1,667,836,722	$ 1,818,401,370
2. Present Value of Non-Vested Accrued Benefits for Active Members		13,390,484	11,543,164
3. Total Present Value of Accrued Benefits		$ 1,681,227,206	$ 1,829,944,534
4. Assets at Market Value		1,400,564,931	1,808,189,543
5. Unfunded Present Value of Accrued Benefits, But Not Less Than Zero		$ 280,662,275	$ 21,754,991
6. Ratio of Assets to Value of Benefits (4) / (3)		83.3%	98.8%
B. **Statement of Changes in Present Value of Accrued Benefits**			
Actuarial Present Value of Accrued Benefits as of June 30, 2020			$ 1,681,227,206
Increase (Decrease) During Year Attributable to:			
Passage of Time			$ 122,159,813
Benefit Paid – FY 2021			(89,580,356)
Assumption Changes			48,525,909
Plan Amendment			0
Benefits Accrued, Other Gains/Losses			67,611,962
Net Increase (Decrease)			$ 148,717,328
Actuarial Present Value of Accrued Benefits as of June 30, 2021			$ 1,829,944,534

SECTION VI - ACCOUNTING STATEMENT INFORMATION

Table VI-2
Analysis of Financial Experience
Gains and Losses in Accrued Liability During Years Ended June 30
Resulting from Differences Between Assumed Experience and Actual Experience

Type of Activity	2016	2017	2018	2019	2020	2021
	Gain (or Loss) for Year ending June 30,					
Investment Income	$ (31,414,324)	$ (14,213,085)	$ (11,506,421)	$ (18,786,193)	$ (68,790,703)	$ 61,545,112
Combined Liability Experience	10,963,818	(11,638,382)	(1,315,247)	7,959,490	5,784,618	(19,812,468)
Gain (or Loss) During Year from Financial Experience	$ (20,450,506)	$ (25,851,467)	$ (12,821,668)	$ (10,826,703)	$ (63,006,085)	$ 41,732,644
Non-Recurring Items	(9,895,400)	0	0	0	0	(17,213,508)
Composite Gain (or Loss) During Year	$ (30,345,906)	$ (25,851,467)	$ (12,821,668)	$ (10,826,703)	$ (63,006,085)	$ 24,519,136

Table VI-3
Schedule of Funded Liabilities by Type
Aggregate Accrued Liabilities For

Valuation Date June 30,	(1) Active Member Contributions	(2) Retirees Vested Terms, Beneficiaries & DROP	(3) Active Members (Employer Financed Portion)	Reported Assets*	Portion of Accrued Liabilities by Reported Assets (1)	(2)	(3)
2016	$ 110,961,165	$ 995,104,603	$ 454,451,944	$ 1,333,218,360	100%	100%	50%
2017	114,966,811	1,022,229,636	503,472,954	1,394,270,429	100%	100%	51%
2018	116,981,031	1,067,481,291	528,832,329	1,458,935,865	100%	100%	52%
2019	118,210,189	1,119,414,518	542,791,614	1,521,246,708	100%	100%	52%
2020	116,462,622	1,180,355,291	554,768,758	1,538,146,337	100%	100%	44%
2021	116,591,173	1,299,954,940	588,192,131	1,723,799,319	100%	100%	52%

*Reported assets are the actuarial value of assets in this demonstration.

APPENDIX A - MEMBERSHIP INFORMATION

The data for this valuation was provided electronically by the Fairfax County Retirement System staff. Cheiron did not perform a formal audit on the data. However, we did perform checks of the data for reasonableness and consistency in accordance with Actuarial Standards of Practice No. 23 – Data Quality. The data was collected as of December 31, 2020.

Data reported in this Appendix is as of the December 31, 2020 data collection date. Covered payroll and benefits in pay status reported elsewhere in this report have been adjusted to approximate the June 30, 2021 values.

For inactive participants given with a Joint and Survivor form of benefit and no continuation percentage provided, a survivor percentage of 100% is assumed.

APPENDIX A - MEMBERSHIP INFORMATION

Summary of Membership Data as of December 31, 2020

Active Members *			
	Count	**Annual Salary Rates**	**Average Annual Salary**
Employed Prior to July 1, 1981	1	$ 174,066	$ 174,066
Employed on or After July 1, 1981	791	78,492,410	99,232
Employed on or After January 1, 2013	442	34,068,551	77,078
Employed on or After January 1, 2020	101	5,421,049	53,674
Total	1,335	$ 118,156,077	$ 88,506
Average Age	38.4		
Average Service	12.6		

* Excludes DROP Participants

Inactive Members and DROP Participants			
	Count	**Total Annual Benefit**	**Average Monthly Benefit**
Service Retirement	1,054	$ 76,220,033	$ 6,026
Service–Connected Disability	25	1,327,909	4,426
Ordinary Disability	8	213,747	2,227
Beneficiaries	174	5,295,297	2,536
Total/Average in Payment Status	1,261	$ 83,056,985	$ 5,489
DROP	82	$ 6,733,842	$ 6,843
Vested Former Members	73	$ 1,468,986	$ 1,677

APPENDIX A - MEMBERSHIP INFORMATION

	Active	DROP	Terminated Vested	Retired	Service-Connected Disability	Ordinary Disability	Widow	Beneficiary	Child	Total
Data Reconciliation from June 30, 2020 to June 30, 2021										
Participant count as of June 30, 2020	**1,353**	**74**	**70**	**1,011**	**27**	**7**	**117**	**29**	**11**	**2,699**
New Hires / Re-hires	88		(1)							87
Terminated Vested	(7)		7							0
DROP	(40)	40								0
Retired	(28)	(31)	(2)	61						0
Deceased with beneficiary				(11)	(1)		15	3	3	9
Deceased without beneficiary		(1)		(7)	(1)		(3)	(1)		(13)
Benefits Expired										0
Ordinary Disability	(1)					1				0
Service-Connected Disability										0
Return of Contributions	(30)		(1)							(31)
Corrections										-
Change	(18)	8	3	43	(2)	1	12	2	3	52
Participant count as of June 30, 2021	**1,335**	**82**	**73**	**1,054**	**25**	**8**	**129**	**31**	**14**	**2,751**

APPENDIX A - MEMBERSHIP INFORMATION

Distribution of Active Participants - - Total

COUNTS BY AGE/SERVICE

Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 & Up	Total
Under 25	41	42	0	0	0	0	0	0	83
25 to 29	23	142	64	3	0	0	0	0	232
30 to 34	11	54	107	41	3	0	0	0	216
35 to 39	3	15	37	76	71	6	0	0	208
40 to 44	1	5	15	32	100	72	6	0	231
45 to 49	2	1	7	14	51	123	17	0	215
50 to 54	2	1	3	6	28	40	28	3	111
55 to 59	0	1	1	3	10	6	5	5	31
60 to 64	0	0	1	2	2	0	1	1	7
65 & up	0	0	0	0	0	1	0	0	1
Total	83	261	235	177	265	248	57	9	1,335

TOTAL SALARY BY AGE/SERVICE

Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 & Up	Total
Under 25	$ 2,089,249	$ 2,662,506	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 4,751,755
25 to 29	1,221,487	10,020,302	5,335,874	198,911	0	0	0	0	16,776,574
30 to 34	573,256	3,954,802	9,079,973	3,570,342	283,002	0	0	0	17,461,375
35 to 39	184,998	1,047,518	3,216,265	6,859,614	6,987,742	604,137	0	0	18,900,274
40 to 44	59,979	372,067	1,224,035	2,868,756	9,630,513	7,612,714	854,926	0	22,622,990
45 to 49	118,201	81,076	601,353	1,236,674	4,858,807	13,154,794	1,980,897	0	22,031,802
50 to 54	91,611	87,838	268,825	557,243	2,713,230	4,133,631	3,102,856	540,691	11,495,925
55 to 59	0	82,331	88,897	258,708	946,520	596,641	565,203	688,432	3,226,732
60 to 64	0	0	88,454	174,214	200,583	0	151,164	174,066	788,481
65 & up	0	0	0	0	0	100,169	0	0	100,169
Total	$ 4,338,781	$ 18,308,440	$ 19,903,676	$ 15,724,462	$ 25,620,397	$ 26,202,086	$ 6,655,046	$ 1,403,189	$ 118,156,077

APPENDIX B - ACTUARIAL ASSUMPTIONS AND METHODS

A. Long-Term Assumptions Used to Determine System Costs and Liabilities

1. **Demographic Assumptions**

   a. **Healthy Mortality**

Annual Deaths Per 10,000 Members Mortality Projected to 2021		
Age	Male	Female
50	26	18
55	37	32
60	65	55
65	105	83
70	162	130
75	285	219
80	522	380
85	963	657
90	1,604	1,142
95	2,347	1,839
100	3,217	2,853

The PubS-2010 Healthy Annuitant Head-Count Weighted Mortality Table for males and females, respectively, projected using the MP-2020 model, with an ultimate rate of 0.85% for ages 20-80 grading down to an ultimate rate of 0% for ages 114-120 and convergence to the ultimate rate in the year 2027. The valuation uses fully generational projection of mortality improvements. Sample rates shown are those projected through the valuation date.

20% of pre-retirement deaths are assumed to be service connected.

APPENDIX B - ACTUARIAL ASSUMPTIONS AND METHODS

b. Beneficiary/Survivor Mortality

Annual Deaths Per 10,000 Members Mortality Projected to 2021		
Age	Male	Female
20	4	2
25	4	2
30	6	3
35	9	4
40	10	5
45	12	6
50	47	37
55	62	41
60	84	49
65	114	66
70	170	104
75	281	182
80	493	333
85	876	621
90	1,497	1,172
95	2,288	1,913
100	3,217	2,853

The PubG-2010 Healthy Annuitant Head-Count Weighted Mortality Table for males and females, respectively, projected using the MP-2020 model, with an ultimate rate of 0.85% for ages 20-80 grading down to an ultimate rate of 0% for ages 114-120 and convergence to the ultimate rate in the year 2027. The valuation uses fully generational projection of mortality improvements. Sample rates shown are those projected through 2021.

APPENDIX B - ACTUARIAL ASSUMPTIONS AND METHODS

c. **Active Separation From Service Due to Death**

Annual Deaths Per 10,000 Members Mortality Projected to 2021		
Age	Male	Female
20	5	2
25	5	2
30	7	4
35	8	5
40	9	6
45	10	7

The PubS-2010 Employee Head-Count Weighted Mortality Table for males and females, respectively, projected using the MP-2020 model, with an ultimate rate of 0.85% for ages 20-80 grading down to an ultimate rate of 0% for ages 114-120 and convergence to the ultimate rate in the year 2027. The valuation uses fully generational projection of mortality improvements. Sample rates shown are those projected through the valuation date.

d. **Disabled Mortality**

Annual Deaths Per 10,000 Members Mortality Projected to 2021		
Age	Male	Female
45	33	22
50	43	30
55	63	56
60	98	92
65	143	120
70	207	169
75	329	292
80	553	499

The PubS-2010 Disabled Head-Count Weighted Annuitant Mortality Table for males and females, respectively, projected using the MP-2020 model, with an ultimate rate of 0.85% for ages 20-80 grading down to an ultimate rate of 0% for ages 114-120 and convergence to the ultimate rate in the year 2027. The valuation uses fully generational projection of mortality improvements. Sample rates shown are projected through the valuation date.

APPENDIX B - ACTUARIAL ASSUMPTIONS AND METHODS

e. **Termination of Employment (Prior to Normal Retirement Eligibility)**

Annual Terminations Per 1,000 Members	
Years of Service	**Terminations**
0	96
1	68
2	42
3	32
4	29
5	23
6	18
7	18
8	15
9	19
10	10
11	8
12	8
13	10
14	6
15	7
16	3
17	7
18	3
19	3
20	2
21	2
22	1
23	1
24	1
25 or more	0

It is assumed that members who terminated before normal or early retirement age elect to receive a refund of contributions instead of vested benefits.

APPENDIX B - ACTUARIAL ASSUMPTIONS AND METHODS

f. Disability

Annual Disabilities Per 10,000 Members*	
Age	**Male and Female**
20	3
25	4
30	5
35	7
40	10
45	17
50	28
55	40
60	40

* 80% of disabilities are assumed to be service connected. Of these, 100% are assumed to receive Workers' Compensation benefits.

g. Retirement/DROP

Years of Service	Retirement/DROP*
5-23	5%
24	10
25	40
26	35
27	30
28	35
29	40
30	35
31	40
32	25
33	50
34	30
35+	100

* 70% of those who leave under this decrement are assumed to DROP, with the other 30% taking immediate retirement.

APPENDIX B - ACTUARIAL ASSUMPTIONS AND METHODS

h. Merit/Seniority Salary Increase (in addition to General Wage Increases)

Years of Service*	Merit/Seniority Increase
0	6.50%
5	3.00
10	1.00
15	2.00
20	2.50
25	1.00
30+	1.00

i. Family Composition

For purposes of valuing the pre-retirement death benefit, an assumption concerning how many employees are married is needed. The assumption used in this valuation is that 80% of active employees are married at death and that the female spouse is five years younger than the male spouse. In addition, each married employee is assumed to have two children, 22 and 24 years younger than the employee.

j. Sick Leave Credit

Unused sick leave balances as reported for each active member are used as of the valuation date. Future sick leave accruals are assumed to accrue at 100% of each participant's annual average but are capped at 124 hours per year.

2. Economic Assumptions

a. Rate of Investment Return: 6.75%
b. Rate of General Wage Increase: 2.25%
c. Rate of Increase in Cost of Living: 2.10% *
d. Rate of Increase in Total Payroll (for Amortization): 2.25%
e. Administrative Expenses as a Percentage of Payroll: 0.50%

* Benefit increases are limited to 4% per year.

3. Rationale for Assumptions

The actuarial assumptions were adopted by the Board of Trustees upon the recommendation of the actuary, based on an experience study performed in 2021. The results of this study were presented in a report dated October 2021 and are incorporated into this report by reference.

APPENDIX B - ACTUARIAL ASSUMPTIONS AND METHODS

4. **Changes Since Last Valuation**

All of the assumptions were reviewed as part of the experience study performed in early 2021. The assumptions that were changed since the last valuation include healthy and disabled mortality rates, termination, disability, retirement and DROP rates, salary increases, sick leave credit, investment return (decreased by 0.50%), general wage increase (decreased by 0.50%), cost-of-living adjustments, total payroll increase, and administrative expenses as a percentage of payroll.

B. Actuarial Methods

1. **Funding Method**

The Entry Age Normal Cost method is used to determine costs. Under this method, the employer contribution has three components: the normal cost, the payment toward the unfunded actuarial liability, and the expense rate.

The normal cost is a level percent of pay cost, which, along with the member contributions, will pay for projected benefits at retirement for each plan participant.

The actuarial liability is that portion of the present value of projected benefits that will not be paid by future employer normal costs or member contributions. The difference between this liability and funds accumulated as of the same date is referred to as the unfunded actuarial liability.

The expense rate is added to cover the System's administrative expenses.

The employer's total contribution rate is equal to the normal cost rate plus rate changes due to amendments passed or assumption changes adopted since July 1, 2001 plus a 15-year level percent of pay amortization of the UAL that existed on June 30, 2018 other than prior unamortized amendment and assumption change bases. In the future, additional amortization bases will be created each year. Finally, the rate includes an expense rate.

2. **Actuarial Value of Assets**

For purposes of determining the County contribution to the System, we use an actuarial value of assets. The asset adjustment method dampens the volatility in asset values that could occur because of fluctuations in market conditions. Use of an asset smoothing method is consistent with the long-term nature of the actuarial valuation process.

In determining the actuarial value of assets, we calculate an expected actuarial value based on cash flow for the year and imputed returns at the actuarial assumption. This expected value is compared to the market value and one-third of the difference is added to the preliminary actuarial value to arrive at the final actuarial value.

APPENDIX B - ACTUARIAL ASSUMPTIONS AND METHODS

In 2021, there was an additional recognition of $38.7 million of the remaining balance of past investment gains.

3. Valuation Timing

All participant data is collected as of the December 31 prior to the valuation date. Initial valuation runs are performed as of December 31, and the resulting liabilities are then adjusted for six months to the June 30 valuation date. The adjustment takes into account the actual July 1 cost-of-living increase and any other changes that are known to have occurred in that six-month period.

4. Changes Since Last Valuation

There was an additional recognition of $38.7 million of the past investment gains.

5. Rationale for Change in Asset Smoothing Method

This one-time adjustment to the asset smoothing method was made to recognize both the fact that market returns on investments were extraordinarily high this year and the desire to make changes to the actuarial assumptions while maintaining a level contribution rate. The County has established a policy of not allowing the contribution rate to go down until the System has paid off its unfunded actuarial liability. Absent recognizing these additional gains that rate would have increased with this valuation report and not recognizes the anticipated reductions that would occur in future valuations as the remaining investment gains flow through the asset smoothing method.

6. Statement of Disclosures Regarding Models Used

Cheiron utilizes and relies on the actuarial software program known as ProVal for the intended purpose of calculating liabilities and projected benefit payments. ProVal is a produce of Winklevoss Technologies.

The projected expected results of future valuations in this report were developed using P-scan, our proprietary tool for the intended purpose of developing projections.

As part of the review process for this actuarial valuation, we have performed a number of tests to verify that the results are reasonable and appropriate. We are not aware of any material inconsistencies, unreasonable output resulting from the aggregation of assumptions, material limitations or known weaknesses that would affect this report.

APPENDIX C - SUMMARY OF PLAN PROVISIONS

1. **Membership**

The plan covers Police Officers who are not covered by the Fairfax County Employees' Retirement System, the Uniformed Retirement System, or the VRS. In addition, former Park Police Officers who elected, effective January 22, 1983, to transfer to this System from the Uniformed Retirement System are eligible for membership.

Members hired prior to January 1, 2013 joined Plan A, those hired on or after January 1, 2013 and prior to July 1, 2019 joined Plan B. Members hired on or after July 1, 2019 will join Plan C.

2. **Member Contributions**

8.65% of compensation. Starting on January 1, 1984, the contributions are made through an "employer pick-up" arrangement, which results in deferral of taxes on the contributions.

Interest is credited at the rate of 5% per year.

3. **Credited Service**

All service as a member, including the period a member is on service-connected disability retirement plus certain purchased prior service for re-employed officers, is credited. In addition, credit is allowed at the rate of one month for 172 hours of accrued unused sick leave. For those hired on or after January 1, 2013, the amount of unused sick leave that may be used is capped at 2,080 hours.

4. **Average Final Compensation**

Compensation includes salary including pick-up contributions, roll call, and holiday pay. Average final compensation is the average over the high 36 consecutive months (or shorter period of total service) including the period covered by unused sick leave.

5. **Normal Retirement**

Eligibility

For members employed before July 1, 1981, age 55 or completion of 20 years of service. For members employed after July 1, 1981, age 55 or completion of 25 years of service.

Benefit

Plan A and B Benefits: 2.8% of average final compensation for each year of service. The benefit is then increased by 3%.

Plan C Benefits: 2.8% of average final compensation for each year of service.

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APPENDIX C - SUMMARY OF PLAN PROVISIONS

6. **Early Retirement**

   Eligibility

   20 years of service (does not apply if hired before July 1, 1981)

   Benefit

   Plan A and B: Normal retirement benefit calculated using average final compensation and service at early retirement, actuarially reduced. The resulting benefit is then increased by 3%.

   Plan C: Normal retirement benefit calculated using average final compensation and service at early retirement, actuarially reduced.

7. **DROP (Deferred Retirement Option Program)**

   Eligibility

   All members are eligible for DROP participation upon attaining eligibility for normal service retirement. Members can only participate in DROP once, and their election is irrevocable.

   Benefit

   The benefit scheduled to begin at normal retirement will be credited to a separate DROP account within the Retirement System, accumulating with interest while the member continues to work for a period of 36 months. Upon completion of the three-year period, DROP participation ends, and participants must terminate employment. At that time, the participant will receive payment of the accumulated DROP benefits and begin receiving his or her monthly retirement benefit (in the same amount as determined at commencement of DROP participation, plus annual cost-of-living increases).

   The DROP account will be credited with interest at an annual rate of 5%, compounded monthly.

   Death or Disability during DROP

   Non-Service-Connected: The effective date of the death or disability will be treated as the end of the DROP participation.

   Service-Connected Disability: The member may elect either (1) to receive the service-connected disability benefits to which he or she would otherwise be entitled (forfeiture of DROP balance) or (2) the normal retirement benefit plus the DROP account balance.

   Service-Connected Death: The beneficiary will receive payment of the accumulated DROP benefits and the regular service-connected benefit.

8. **Service-Connected Disability**

    Eligibility

    No age or service requirement

    Benefit

    For total disability, 66-2/3% of compensation as of the date of disability less 100% of Virginia Workers' Compensation benefit, payable to 25 years of service at which time the benefit converts to 60% of the current compensation for the position from which the member retired.

9. **Ordinary Disability**

    Eligibility

    No age or service requirement

    Benefit

    Plan A and B: If not eligible for normal or early retirement benefit, greater of (i) 10% of average final compensation or (ii) amount determined under normal retirement benefit formula, based on average final compensation and credited service as of disability date. The resulting benefit is then increased by 3%.

    Plan C: If not eligible for normal or early retirement benefit, greater of (i) 10% of average final compensation or (ii) amount determined under normal retirement benefit formula, based on average final compensation and credited service as of disability date.

10. **Service-Connected Death**

    Eligibility

    No age or service requirement

    Benefit

    Plan A and B: Spouse may elect a benefit of 66-2/3% of member's current salary in lieu of ordinary death benefit. The resulting benefit is then increased by 3%.

    Plan C: Spouse may elect a benefit of 66-2/3% of member's current salary in lieu of ordinary death benefit.

APPENDIX C - SUMMARY OF PLAN PROVISIONS

11. Ordinary Death

<u>Eligibility</u>

No age or service requirement (covers death while active or after normal, early, or service-connected disability benefits)

<u>Benefit</u>

Surviving spouse receives $1,000 per month payable for the life of the spouse but ceasing upon remarriage. Surviving children under 18, or under age 23 if full-time students, receive $400 per month. The maximum combination of benefits is $2,000 per month. This benefit will be increased by cost-of-living adjustments in the future. The monthly benefits for the year beginning July 1, 2021 are $2,460.37, $984.14, and $4,920.76, respectively.

12. Vesting

<u>Eligibility</u>

Five years of service

<u>Benefit</u>

Normal retirement benefit based on average final compensation and service at date of termination. Benefit is payable in full at age 55 or actuarially reduced and payable at early retirement age.

A member may withdraw his contributions at termination, in which case no deferred vested benefit is payable.

13. Withdrawal

<u>Eligibility</u>

Not eligible for other benefits

<u>Benefit</u>

Member contribution account balance

APPENDIX C - SUMMARY OF PLAN PROVISIONS

14. Form of Payment

The normal form of payment is a life annuity with a guarantee that at least the amount of member contributions will be paid to the retiree or beneficiaries.

A member who is entitled to a normal or early retirement benefit may elect an actuarially equivalent Joint and Survivor pop-up benefit.

15. Cost-of-Living Adjustment

Each July 1, benefits are increased by the lesser of 4% or the increase in the cost-of-living index. The increase is prorated for those who have not been retired for a full year.

Cost-of-living adjustments do not apply to deferred vested benefits prior to benefit commencement. Service connected disability benefits, commencing prior to July 1, 1981, are increased by the salary index used in the actuarial valuation instead of by the cost-of-living index.

In addition to automatic adjustments, benefits may be further increased on an ad hoc basis, if actuarial experience has been favorable.

16. Changes Since Last Valuation

None