The Police and Fire Retirement System of the City of Detroit

Annual Actuarial Valuation of Component II

June 30, 2020

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June 8, 2021

Board of Trustees
The Police and Fire Retirement System
of the City of Detroit

Dear Board Members:

This **revised** report provides key results of the **Annual Actuarial Valuation** of the annuity and pension liabilities of the Police and Fire Retirement System of the City of Detroit – Component II benefits. The date of the valuation was **June 30, 2020. This report was revised from our report dated April 27, 2021 at the Board's request to show additional comparative results on page 3.**

The City of Detroit filed for bankruptcy on July 18, 2013. A final Plan of Adjustment ("POA") was confirmed on November 7, 2014 and the official exit from bankruptcy was on December 10, 2014. In connection with the POA, very significant changes were made to the benefits that the Police and Fire Retirement System provide and to the contributions that it will receive. In particular, the benefits provided by the Retirement System were divided into two separate plans, referred to as "Component I" and "Component II." The benefits provided in each component were effective July 1, 2014 and are described in detail in the Emergency Manager Order No. 44, dated December 8, 2014. In very general terms, Component I provide benefits for service rendered on and after July 1, 2014 and Component II provides benefits for service rendered prior to July 1, 2014.

The results provided herein relate solely to the **Component II** benefits. Component I benefits are the subject of a separate report. The purposes of the valuation are:

1. To measure the funding progress of Component II in accordance with the terms of the POA;
2. To provide illustrative actuarially determined contribution amounts for FY 2021;
3. To compare the illustrative actuarially determined contributions to the POA mandated contributions; and
4. To estimate the FY 2024 actuarially determined contributions (the first year the employer will be required to make actuarially determined contributions adopted by the Board and Investment Committee) under possible funding policies amounts. This report includes calculations based upon the Board approved funding policy shown in the appendix.

The results of the valuation are not applicable for other purposes. In particular, the information provided in this report is not suitable for financial reporting in connection with GASB Statement No. 67. Such information was provided in a separate report. Information regarding potential benefit restoration as allowed for in the POA will also be provided in a separate report at the Board's request.

The contribution amounts on page 4 include POA stipulated contributions plus two illustrative contribution amounts from alternate funding policies. Users of this report should be aware that contributions made at any of these amounts do not guarantee benefit security.

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as: plan experience differing from that anticipated by the economic and 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. Due to the limited scope of the actuary's assignment, the actuary did not perform an analysis of the potential range of such future measurements.

The valuation was based upon records maintained and furnished by the Retirement System staff concerning active members, retirees and beneficiaries, and financial accounts as of the valuation date. Data was checked for year-to-year consistency, but was not audited by the actuary. We are not responsible for the completeness or accuracy of the data. Certain data was not available in time to produce the results in this report and it was necessary for us to use approximations. Please see related discussion in the Comments section as well as the Data section of this report.

The assumptions used in the valuations concerning future experience are summarized in the Appendix of this report. Except for the assumed rate of investment return, the actuarial assumptions used for the valuation are set by the Board based upon discussion with the actuary and other parties. The assumed rate of investment return was set to 6.75% in the POA and is, therefore, a "prescribed assumption set by another party" as discussed in Actuarial Standard of Practice No. 4. We have reviewed the assumed rate of asset return based on the System's asset allocation and, in our professional judgment, believe it is reasonable for purposes of the measurement. In our judgement, all of the other actuarial assumptions used for the valuation are also reasonable for purposes of the measurement being taken.

This report does not reflect events occurring after the valuation date. In particular, it does not reflect the full impact of COVID-19 that is likely to affect economic and demographic experience during calendar year 2021 and possibly beyond.

This report was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation and has no material limitations or known weaknesses. We performed tests to ensure that the model reasonably represents that which is intended to be modeled. We are relying on the GRS actuaries and Internal Software, Training, and Processes Team who developed and maintain the model.

This report has been prepared by individuals who have substantial experience valuing public sector retirement systems. To the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board.

The individuals signing the report are independent of the plan sponsor.

David T. Kausch, Judith A. Kermans, and Jamal Adora are Members of the American Academy of Actuaries (MAAA), and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

This report does not evaluate the plan sponsor's ability or willingness to make contributions to the Retirement System. Given the funded level of this plan, plan sponsor contributions are critical if further benefit reductions are to be avoided. Please note that the employer contributions set forth in the POA are expected to lead to a decrease in the funded status through June 30, 2023 (as contemplated by the POA), even if all assumptions are met.

Respectfully submitted,

David T. Kausch, FSA, EA, FCA, MAAA, PhD

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VALUATION RESULTS

Valuation Results (Continued)

Executive Summary

($ in Millions)

Valuation Date	June 30, 2020	June 30, 2019
Contributions For Fiscal Year Ending	June 30, 2022	June 30, 2021
POA Mandated Employer Contributions	$ 18.3	$ 18.3
Membership		
Number of:		
Active Members	1,369	1,551
DROP Members	757	764
Retirees and Beneficiaries	7,960	8,102
Inactive, Nonretired Members	389	394
Total	10,475	10,811
Valuation Payroll	$ 71.8	$ 105.2
Assets		
Market Value (1)	$ 2,417.2	$ 2,670.8
Return on Market Value (net of administrative expenses)	1.20 %	3.54 %
Actuarial Information		
Actuarial Accrued Liability (2)	$ 3,725.3	$ 3,843.3
Unfunded Actuarial Accrued Liability: (2) - (1)	1,308.1	1,172.4
Funded Ratio: (1) / (2)	64.89 %	69.49 %
Risk Metrics		
Actuarial Accrued Liability Divided by Payroll	51.9	36.5
Market Value of Assets Divided by Payroll	33.6	25.4

Valuation Results (Continued)

Valuation Results

Actual POA Contributions

Required contributions to the Plan through FY 2023 are provided in the POA. The schedule below details our understanding of the remaining contributions required by the POA.

Fiscal Year	Contribution (Millions)
2021	$ 18.3
2022	18.3
2023	18.3

We have assumed that the contributions outlined above (as called for in the POA with adjustments) will not change. An estimate of the probability of those payments being made was outside the scope of this project, not required by Actuarial Standards, and not made.

Estimated 2024 Contributions

In order to help the Board assess the longer term implications of the funding requirements dictated in the POA, we have estimated the contribution that will be needed in 2024 when actuarially determined contributions will again be required according to the Plan.

We have recommended that the Board establish a funding policy for the contribution determinations on and after Fiscal Year 2024. The Board has accepted this recommendation and has approved the funding policy shown in the appendix in this report.

The Estimated Employer Contribution for FY 2024 shown on the following page is based on a projection of results assuming only the POA contributions are made and all future experience between the valuation date and FY 2024 is as assumed. Actual experience will impact the final result (which will be based on the June 30, 2022 actuarial valuation) and could be materially different than shown.

Valuation Results (Continued)

($ millions)

	Market Value of Assets		Funding Policy Assets	
	POA Estimates	Board Adopted Funding Policy	POA Estimates	Board Adopted Funding Policy
Actuarial Accrued Liability	$ 3,725.3	$ 3,725.3	$ 3,725.3	$ 3,725.3
Assets	2,417.2	2,417.2	2,542.1	2,542.1
UAAL[1] as of June 30, 2020	$ 1,308.1	$ 1,308.1	$ 1,183.2	$ 1,183.2
Anticipated POA Contribution for FY 2021	18.3	18.3	18.3	18.3
Anticipated Expenses[2]	-	-	-	-
Interest at 6.75%	88.3	88.3	79.9	79.9
Projected UAAL[1] as of June 30, 2021	$ 1,378.1	$ 1,378.1	$ 1,244.8	$ 1,244.8
Anticipated POA Contributions for FY 2022	**18.3**	**18.3**	**18.3**	**18.3**
Estimated Employer Contributions for FY 2024[3]				
Amortization Period Beginning in FY 2024	30	20	30	20
Level Principal	**$ 154.5**		**$ 139.2**	
Level Dollar	**$ 120.4**	**$ 141.9**	**$ 108.5**	**$ 127.8**

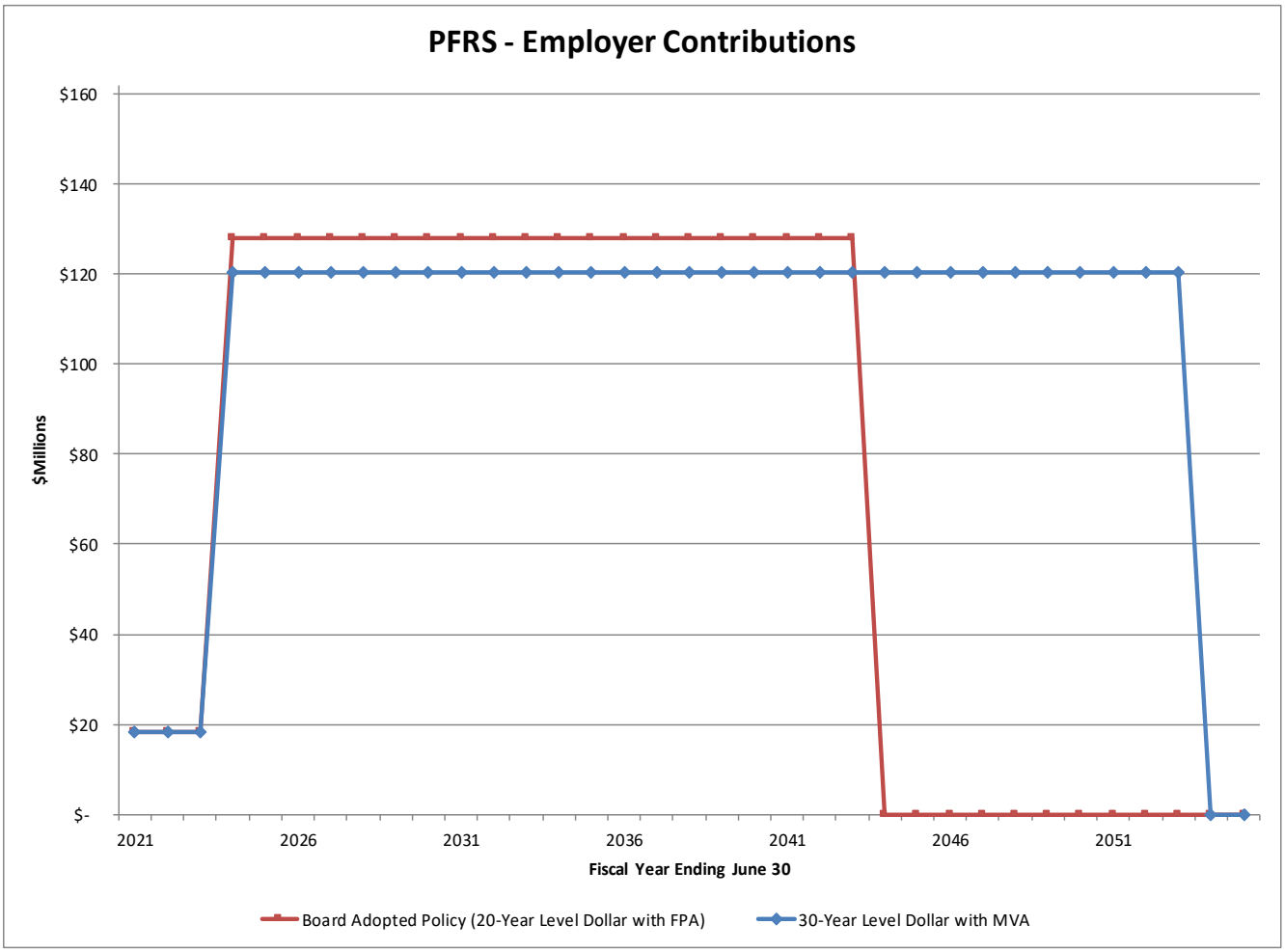
[1]Unfunded Actuarial Accrued Liability. Although the Board Approved Funding Policy uses the Funding Policy Assets (FPA) shown on page 57, estimates are also shown using the Market Value of Assets for comparative purposes.

[2]In accordance with the Plan Document, the mandated 6.75% rate of return is net of investment and administrative expenses. Contributions are assumed to be made at the end of the year.

[3]Total estimated employer contributions needed, including amounts paid by employer but funded from other sources as required by the POA.

The POA contributions will continue to result in a defunding of the plan between now and June 30, 2023, which was contemplated by the POA. In fact, the anticipated POA contribution for FY 2020 is about one fifth of the interest that will accrue on the UAAL and about 6% of the annual benefit payments.

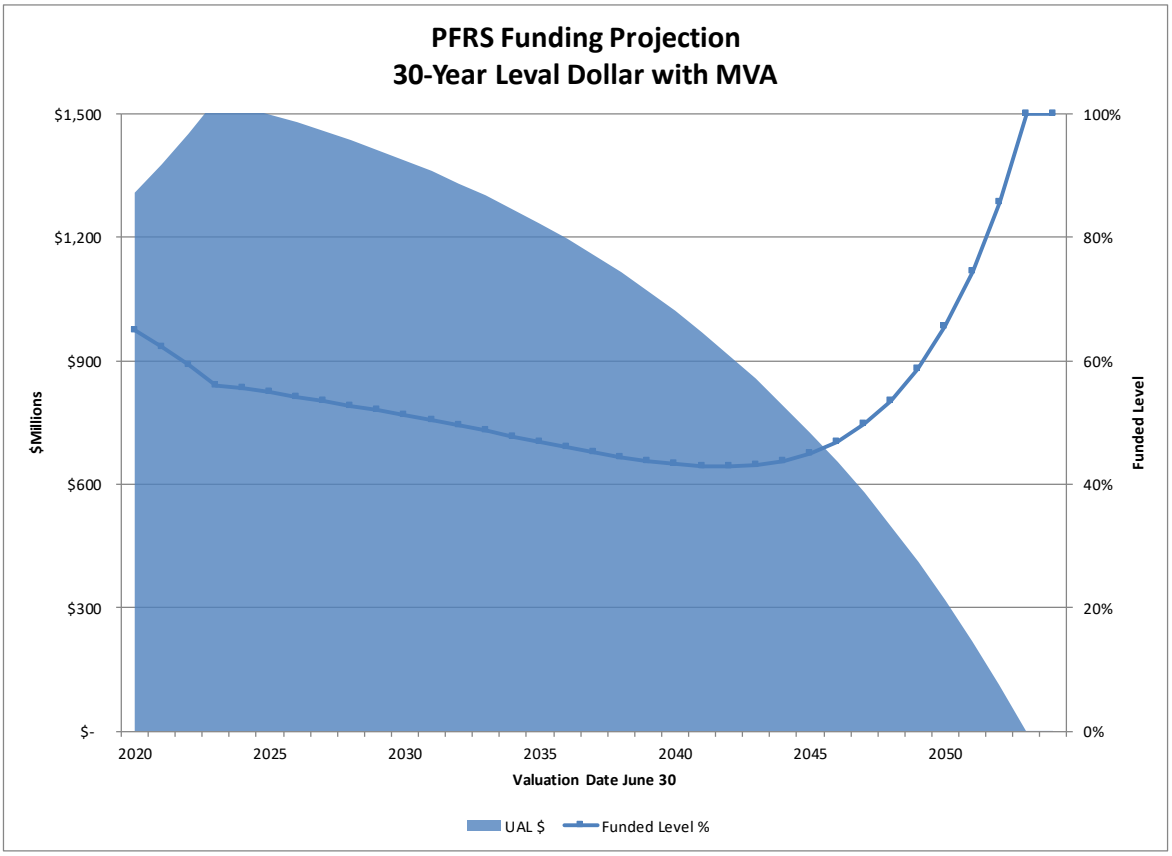
Valuation Results (Continued)

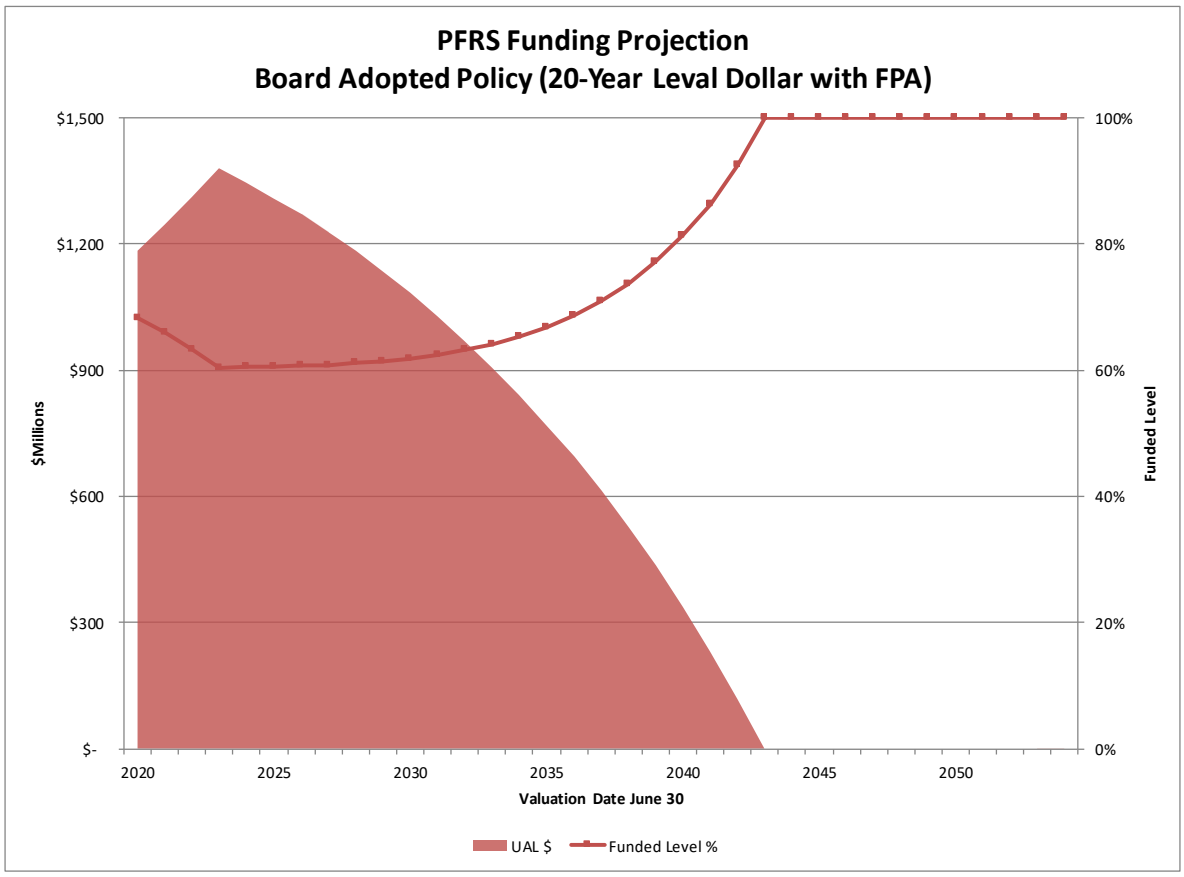


Notes:

- All actuarial assumptions are assumed to be met exactly each year in the projection (i.e., no future gains or losses). For the two scenarios shown, the rate of return on funding policy assets and rate of return on market value of assets are assumed to be 6.75%. Since the funding policy assets are higher than the market value of assets as of June 30, 2020, there are deferred losses in the smoothing method. This means that earning 6.75% on the market value of assets would result in rates of return below 6.75% on the funding policy assets. The 6.75% scenario on the funding policy assets implicitly assumes rates of return above 6.75% on the market value to make up for deferred losses.
- POA contributions are assumed through June 30, 2023.
- The Board approved policy contributions are based on the funding policy assets. Since the market value of assets is lower than the funding policy assets, a 20-year amortization based on the market value of assets would be higher.

Valuation Results (Continued)





Valuation Results (Continued)

We understand that the Investment Committee has not yet approved a funding policy and is still researching elements related to the funding policy. As such, we are continuing to show the estimated FY 2024 contributions based on the sample funding policies that we have included in past valuation reports.

In the chart below, the first policy funds the UAAL over the expected remaining active service life of this group. The second policy is similar to the Board's pre-bankruptcy policy, but with accelerated principle payments of the UAAL to prevent insolvency prior to the end of the funding period. The illustrations are intended to show that there are a broad range of possible funding policies, but are not intended to provide specific recommendation or a minimum or maximum level of contributions.

Funding Policy 1 is based on amortizing the UAAL over the average remaining service life of active members (4 years) using level dollar amortization.

Funding Policy 2 is based on amortizing the UAAL with level principal payments over a 30-year period plus interest. This method is also known as level principal declining interest amortization.

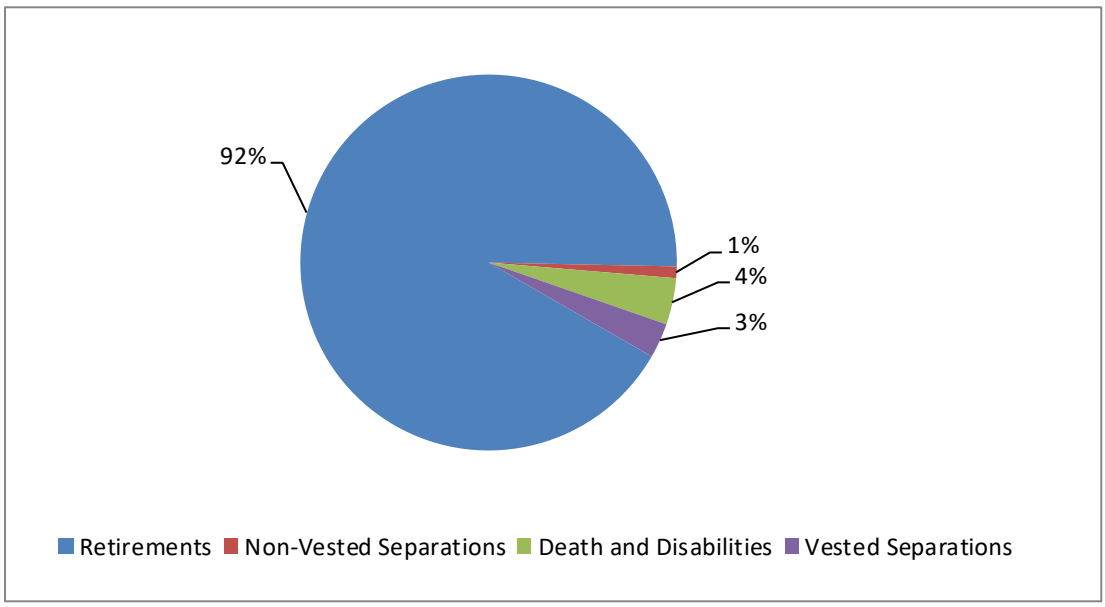
Illustrative Contribution Shortfall	($ millions)
(1) Illustrative Contribution for FY 2022 (Funding Policy 1)	$ 404.5
(2) Illustrative Contribution for FY 2022 (Funding Policy 2)	139.0
(3) POA Contribution for FY 2022	18.3
Fiscal Year 2022 Shortfall - Funding Policy 1: (1) - (3)	$ 386.2
Fiscal Year 2022 Shortfall - Funding Policy 2: (2) - (3)	$ 120.7

We understand the Employer has set aside some money to contribute to the Pension Plans in the future. Since the portion of the fund this Plan will receive has not been determined, we have not taken those assets into account in our calculations. We commend the Employer for taking proactive steps to manage the estimated increase in funding requirements beginning in FY 2024. In the meantime, we recommend continued consideration of increasing contributions actually deposited into the trust.

Valuation Results (Concluded)

Present Value	June 30, 2020	June 30, 2019
Accrued Pension Liabilities		
Retirees and beneficiaries	$3,023,739,174	$3,055,699,278
Inactive members future deferred pensions	53,105,662	61,658,034
Active members	504,197,443	577,882,824
Total accrued pension liabilities	3,581,042,279	3,695,240,136
Pension fund balances	2,272,972,647	2,522,817,278
Unfunded accrued pension liabilities	$1,308,069,632	$1,172,422,858
Accrued Annuity Liabilities		
Retirees and beneficiaries		
Future annuities	$ 3,524,584	$ 3,730,401
Reserve for outstanding refunds & contingencies	26,894,729	26,819,139
Total	$ 30,419,313	$ 30,549,540
Members annuities & future refunds	113,856,180	117,476,538
Total accrued annuity liabilities	144,275,493	148,026,078
Annuity fund balances	144,275,493	148,026,078
Unfunded accrued annuity liabilities	$ 0	$ 0
System Totals		
Actuarial accrued liabilities	$3,725,317,772	$3,843,266,214
Accrued assets	2,417,248,140	2,670,843,356
Unfunded actuarial accrued liabilities	$1,308,069,632	$1,172,422,858

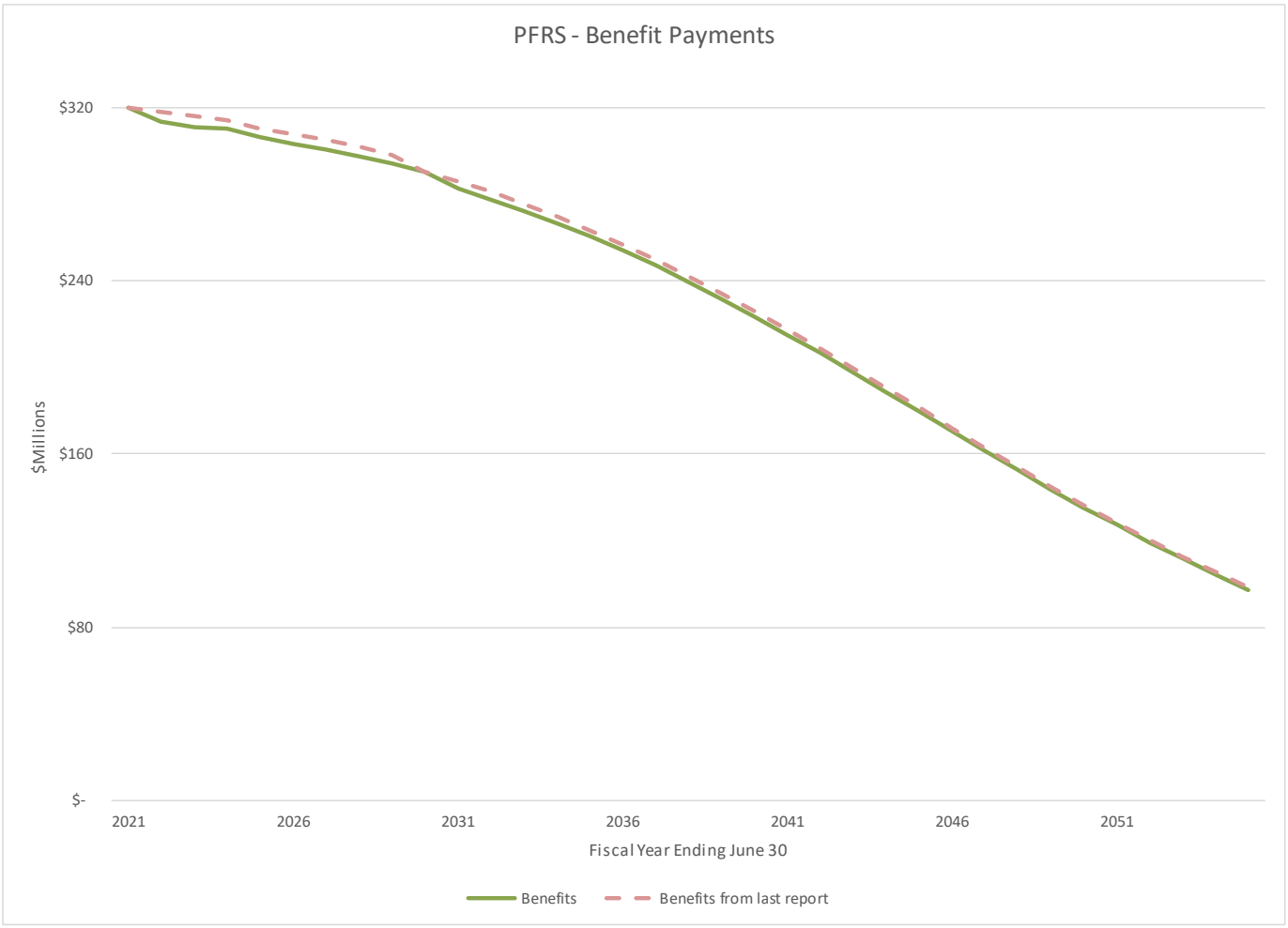
Expected Terminations from Active Employment for Current Active Members



The chart above shows the expected future development of the present population in simplified terms. The Retirement System presently covers 1,369 active members (excluding 757 members currently in the DROP). Eventually, 15 members are expected to terminate covered employment prior to retirement and forfeit eligibility for an employer provided benefit. 1,301 members are expected to receive monthly retirement benefits either by retiring directly from active service (including DROP), or by retiring from vested deferred status. 53 members are expected to become eligible for death-in-service or disability benefits.

Expected Benefit Payments

Shown below is a graph of projected benefit payments remaining in the Retirement System.



The graph above shows the projection of future expected benefit payments (solid green line) derived from the June 30, 2020 actuarial valuation data and contrasts that with the corresponding projection from the June 30, 2019 valuation data (red dashed line). Since the assumptions are the same in the two projections, the graph shows the impact that the pandemic has had on the future expected benefit projection, which is lower in the earlier years and nearly unchanged in the later years. In addition, the remaining ARF balances are assumed to be paid out over a rolling 10-year period resulting in a shift of those 10-year payments visible in the graph between last year and this.

Comments, Recommendations and Conclusion

Experience

Experience was less favorable than assumed during the year ending June 30, 2020. The main sources of the losses were investment experience. These losses were partially offset by demographic experience gains such as mortality (more retiree deaths then assumed), retirement (fewer retirements than assumed) and terminations (more terminations than assumed). The chart below shows the estimated total experience loss and the portion of the gain/loss due to investments.

Development of Actuarial Gain/(Loss)
($ millions)

	$ Millions
(1) UAAL[1] as of June 30, 2019	$ 1,172.4
(2) POA Contribution FY 2020	18.3
(3) Interest at 6.75%	79.1
(4) Benefit Changes	-
(5) Projected UAAL[1] as of June 30, 2020 (1) - (2) + (3) + (4)	$ 1,233.3
(6) Actual UAAL[1] as of June 30, 2020	1,308.1
Gain or Loss: (5) - (6)	$ (74.8)
Gain or Loss from Investments	(139.8)
Gain or Loss from Excess Interest Transfers (Inc. FY 2019)	0.4
Gain or Loss from Liabilities	64.6

[1]*Unfunded Actuarial Accrued Liability.*

Type of Risk Area	Gain or Loss in Period[1]	
	Totals ($ in millions)	Percent of Beginning of Year Liabilities[2]
Terminated Vested Data Audit	$ 6.7	0.2 %
Other Data Improvements[3]	13.7	0.4 %
Excess Interest Transfers (Inc. FY 2019)	0.4	0.0 %
Risks Related to Assumptions		
Economic Risk Areas:		
Investment Return	(139.8)	(3.6)%
Demographic Risk Areas:		
Full and Reduced Service Retirements	1.9	0.0 %
Death Benefits	(0.3)	0.0 %
Disability Benefits	(2.7)	(0.1)%
Other Terminations	16.0	0.4 %
Post-Retirement Mortality (Inc. DROP)	29.3	0.8 %
Total Gain or Loss During Period	(74.8)	(1.9)%

[1]*Results are approximate due to limitations in data.*
[2]*Beginning of year accrued liabilities is equal to $3,843.3 million.*
[3]*Net of adjustments to modeling as a result of data changes.*

Comments, Recommendations and Conclusion

Experience (Continued)

A summary of Actual (A) to Expected (E) activity is shown in the table below).

	Actives													
	Number Added		Terminations During Year											
Year	During		Normal		Disability		Died-in-		Withdrawal				Retiree	
Ended	Year		Retirement		Retirement		Service		Vested	Other	Total		Deaths[1]	
June 30	A	E	A	E	A	E	A	E	A	A	A	E	A	E
2019	5	0	157	363	18	12	0	1	23	8	31	18	281	247
2020	**8**	**0**	**121**	**391**	**8**	**10**	**0**	**1**	**45**	**16**	**61**	**13**	**405**	**247**

[1]*Includes DROP*

Member Experience Additional Comments

- Retirements were less than one-third the number expected.
- Vested Terminations were nearly three times the number expected.
- Post Retirement mortality was more than one and one-half times the number expected.

The year ending June 30, 2020 was unique due to the Covid-19 pandemic as well as the City's response. The pandemic, by itself, appears to have increased retiree mortality. However, the liability gain related to the increase in mortality was less than the number counts would imply. This suggests that the pandemic had a bigger impact on the older, lower liability population of the plan. This valuation is only six months into the pandemic and we expect higher mortality for at least the next six months following the valuation date. Given all the uncertainty regarding this experience, we have not attempted to account for this potential liability risk in this valuation. While we do not have the cause of death in the census data, it is likely that a significant portion of those who died during the year in excess of expectations were as a result of COVID-19. We honor those who have died during the pandemic.

Comments, Recommendations and Conclusion

Terminated Vested Data Audit

As a result of an improvement of the Terminated Vested member data, we were informed that 31 members reported in the 2019 data were actually deceased as of June 30, 2019. The change this year is included in the source of gains/losses on page 10. This improved data has been recognized in this valuation, resulting in a gain of approximately $6.7 million.

Year-to-Year Reconciliation of Projected June 30, 2024 Contributions

The estimated FY 2024 contributions are very sensitive to changes in year-to-year experience. The chart below reconciles our estimate from the June 30, 2019 valuation to our estimate from this valuation (June 30, 2020). For purposes of this reconciliation, amortized periods are 30 years.

	$ Millions		
	30-Year Level Principal - MVA	30-Year Level Dollar - MVA	Board Policy (20-Year Level Dollar - FPA)
Est. FY 2024 Employer Contribution from 6/30/2019 Valuation	$ 145.4	$ 113.3	
Gain or Loss from Investments	17.1	13.4	
Gain or Loss from Excess Interest Transfers (Inc. FY 2019)	-	-	
Other Experience	(7.9)	(6.2)	
Est. FY 2024 Employer Contribution from 6/30/2020 Valuation	$ 154.5	$ 120.4	$ 127.8

Annuity Reserve Fund (ARF)

The ARF, as reported, was $27 million higher than the related accrued liabilities for Retirees and Beneficiaries. If the Board chooses to transfer some or all of the $27 million from the ARF to the Pension Accumulation Fund (PAF) within Component II, the transfer would reduce the UAAL. As discussed in the 2019 valuation report, the Annuity Reserve Fund does not appear to have been credited with any interest during the year (asset details provided were not sufficient to definitively determine).

Annuity Savings Fund (ASF) Interest Credits

The ASF fund is credited with the lesser of 5.25% interest and the total fund earnings. We understand that any earning in excess of 5.25% (that otherwise would have been credited to the ASF fund if not for the 5.25% cap) will be transferred to Component I assets, to the extent needed, for funding of transition liability. For purposes of calculating future refunds of member contributions, the ASF was assumed to earn 5.25% interest in all future years. Furthermore, since the fund earned less than 5.25% for both FY 2019 and FY 2020, we do not expect that there will be transfers of excess ASF interest in either FY 2021 or FY 2022. No additional liabilities were included in this report to account for anticipated excess earnings expected to occur as a result of return on assets. We have previously discussed the potential for additional liability with the Plan's auditors, who have indicated that the excess earnings transfer should not be included as a liability in the GASB Statements Nos. 67 and 68 reports until it actually occurs.

In FY 2020, approximately $1.6 million was transferred from Component II (Legacy) to Component I (Hybrid) due to excess interest earned in FY 2018. This is the second year of such a transfer. The amount was approximately $0.4 million less than we had estimated in the June 30, 2019 valuation.

Comments, Recommendations and Conclusion

We understand that the System has adopted a procedure for computing the ASF interest credits lagging the actual experience of the assets. We have not reviewed or audited this procedure. If the Retirement System can provide the methodology for determining the transfer, we may be able to more accurately reflect it in advance.

Comments, Recommendations and Conclusion

Estimated Excess Interest Transfers

Fiscal Year Transfer is Expected (A)	ASF Balance BOY (B)	Assumed ASF Payment (C)	ASF Balance EOY (D)	FY 2 Years Prior to Transfer Year (E)	Estimated Return (F)	Investment Return Excess Percent (G) = (F) - 5.25%	ASF Return Excess (H) = (G) x (B)	Estimated Component I Funded Transition Cost Status (I)	Resulting Percent Transfer (J)	Assets to be Transferred Out (BOY) (K) = (H) x (J)
2021	$ 113,856,180	$ 14,547,455	$ 104,909,188	2019	3.54%	0.00%	$ -	>100%	50%	$ -
2022	104,909,188	14,547,455	95,492,480	2020	1.20%	0.00%	-	>100%	50%	-

We understand this calculation will be performed by staff and may be different than shown above. The estimates above are used to approximate the effect on UAAL.

Section G-2(f) of the Combined PFRS Plan is shown below:

In any Plan Year during the period beginning on or after July 1, 2014 and ending June 30, 2023 in which the annual rate of return credited to the accounts of Members investing in the Annuity Savings Fund as provided in paragraph (a) is less than the actual rate of return net of expenses of the Retirement System's invested assets for the second Plan Year immediately preceding the Plan Year in which the annual rate of return is credited ("ASF Return Excess"), an amount equal to the value of the ASF Return Excess shall be transferred to the Pension Accumulation Fund maintained under Component I of the Combined Plan and shall be used to fund the Transition Cost relating to Component I. The Transition Cost is a measure of the liability that Component I of the Retirement System has at its inception; due to the fact that at its inception, Members in Component I of the Retirement System receive vesting and eligibility credit under Component I for service that was earned prior to July 1, 2014 and is otherwise credited to Members under Component II of the Retirement System, as such Transition Cost is calculated by the Plan Actuary. In the event there is an ASF Return Excess for a Plan Year following the Plan Year in which such transfers have fully funded the Transition Costs relating to Component I, fifty percent (50%) of such ASF Return Excess shall be transferred to the Pension Accumulation Fund maintained under Component II and the remaining fifty percent (50%) of such ASF Return Excess shall be transferred to Component I and credited to the Rate Stabilization Fund maintained under Component I. "Transition Cost" shall be determined by the Plan Actuary.

Comments, Recommendations and Conclusion

Option Factors

The Board adopted new option factors for the Plan. We have not been provided with a specific effective date for the new factors. However, we understand the intent is to implement the new factors with the new data system. For the sake of simplicity, we have assumed the new factors apply to all retirements after the valuation date.

Actuarial Assumptions

The Retirement System routinely has five-year experience studies in accordance with the City ordinance. The Board has chosen to schedule the next experience study to begin subsequent to the June 30, 2020 valuation.

Restoration

This valuation assumes no future restoration of Component II benefits. Calculations related to restoration will be provided in a separate report at the Board's request. Any future restoration will be reflected beginning in the next valuation after being granted.

Future Results

While FY 2021 investment performance is not yet available (since the fiscal year is not over), the S&P 500 and the Dow Jones Industrial Average have so far both returned substantially more than 6.75%, so far, this fiscal year. If the Retirement System's experience is similar and that experience is not overshadowed by a reverse in the last quarter of the fiscal year, then there might be upward pressure on the funded status and downward pressure on the estimated FY 2024 contribution from investment experience during FY 2021. However, the defunding of the Retirement System through the POA mandated contribution levels will continue to put downward pressure on the funded status (the POA mandated contribution levels have already been considered in the FY 2024 contribution estimates).

Census Data and Approximations

Data was reported separately for Component I and Component II. Additional time was needed to reconcile these two data sets. Processing time for the valuation could be shortened if data for future valuations is reconciled before being provided to GRS. We would be happy to work with the Retirement System staff to help them provide the information that is needed for the valuation. After we issued our annual data letter (in which we questioned the reported frozen AFC amounts for the Legacy plan), we were informed that the amounts reported on the file were incorrect. We worked with the Executive Director to develop a process that would enable us to complete the 2020 valuation. We acknowledge his help with appreciation. That process was to file match the Legacy actives reported on the 2020 data file to the Legacy actives reported on the 2018 data file for purposes of using the Frozen AFC reported on the 2018 file for this valuation. All other active member data used in this valuation was taken from the 2020 data files. Additional information about the data approximations and assumptions may be found on page 36.

Comments, Recommendations and Conclusion (Concluded)

Disability Retirees

The Police and Fire Retirement System Combined Plan provides disability benefits for both Component I and Component II. Our understanding of the Component II freeze as it relates to duty disability benefits was that the only benefit payable from Component II would be the frozen accrued benefit, payable at the time of conversion to normal retirement (for members becoming disabled after 6/30/2014) and that any benefits payable during the period of disability would be paid from Component I. Data reported for this valuation is not consistent with that understanding. However, assets reported for this valuation appear to be consistent with this interpretation. We have valued the pre-conversion duty disability benefit in a manner consistent with the data (paid out of Component II). We understand that the System is in the process of moving to a new data system and expect this issue to be corrected once the new data system is in place.

For future retirees, duty disability retirement benefits prior to age 65 are assumed to be paid from Component I.

For current duty disability retirees that became disabled after June 30, 2014, we have estimated the amount that will be paid by Component II upon conversion.

New Data System

We understand that the Retirement System is in the process of moving to a new data system and that future valuation data will be provided from that system beginning with the 2021 or 2022 valuation. We also understand that data may have gone through additional cleaning/auditing as it has been entered into the new system. We anticipate that data will be more precise for valuation purposes once the new system is providing that data. Please note that changes in data may impact future valuation results and generate gains or losses.

Recommendation

We recommend that every potential action be taken to generate contributions to the Retirement System above those provided in the POA. Benefit payments to retirees in the Plan were approximately $300 million compared to FY 2020 contributions of $18 million.

Prior Recommendation

The Board has approved a funding policy for FY 2024 and beyond.

Conclusion

It is likely that the funded status will decline and the unfunded actuarial accrued liability will increase between now and FY 2024. The funded status is projected to decline to approximately 56% as of June 30, 2024, if all assumptions are met. Events occurring after the valuation date have not been included in this valuation.

Risks Associated with Measuring the Accrued Liability and Actuarially Determined Contribution

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

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 due to changing conditions; 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 scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

1. **Investment Risk** – actual investment returns may differ from the expected returns;
2. **Asset/Liability Mismatch** – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. **Contribution Risk** – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. **Salary and Payroll Risk** – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. **Longevity Risk** – members may live longer or shorter than expected and receive pensions for a period of time other than assumed; and
6. **Other Demographic Risks** – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example, if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise, if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

Risks Associated with Measuring the Accrued Liability and Actuarially Determined Contribution

Plan Risk Measures

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk.

In our discussions with the Board and Investment Committee, we illustrated various investment return scenarios as part of the funding policy analysis. This type of analysis may also be considered a quantitative risk assessment. We recommend that the Board consider similar periodic analysis as appropriate under the Risk Controls of the newly approved funding policy.

The Board approved funding policy call for illustrating the table of risk measures shown below. Please see the funding policy in the appendix for additional information. In the table below, the acronyms are as follows: FPA = Funding Policy Assets; MVA = Market Value of Assets; AAL = Actuarial Accrued liability; UAAL = Unfunded Actuarial Accrued Liability).

	2020	2019
(i) Classic measures		
– Funded ratio		
MVA	64.9%	69.5%
FPA	68.2%	71.0%
– UAAL amortization period	20	
– Portfolio rate of return		
MVA	1.20%	3.54%
FPA	3.76%	5.68%
– Geometric average portfolio rate of return		
5-year		
MVA	2.36%	3.54%
FPA	4.72%	5.68%
10-year		
MVA	2.36%	3.54%
FPA	4.72%	5.68%
– Standard deviation of return		
5-year		
MVA	1.17%	0.00%
FPA	0.96%	0.00%
10-year		
MVA	1.17%	0.00%
FPA	0.96%	0.00%
(ii) Duration of the Actuarial Accrued Liability	9.4	9.5
(iii) Total UAAL / Covered Payroll[1]		
MVA	8.5	7.8
FPA	7.7	7.4
(iv) Total Assets / Covered Payroll[1]		
MVA	15.8	17.8
FPA	16.6	18.2
(v) Total AAL / Covered Payroll[1]	24.3	25.6
(vi) Non-Investment Cash flow / Beginning of year MVA	-10.6%	-10.2%
(vii) MVA / Benefit Payments	8.0	8.6
(viii) Solvency Liability ($ millions)[2]	$ 6,061.3	$ 5,748.1

[1]Payroll for this purpose is Component I payroll of $153.0 million for 2020 and $150.0 million for 2019.

[2]See discussion on next page.

Risks Associated with Measuring the Accrued Liability and Actuarially Determined Contribution

Solvency Liability

Funded Ratio - POA

		Defined Benefit	Annuity Funds	Total
A	Actuarial Accrued Liability	$ 3,581,042,279	$ 144,275,493	$ 3,725,317,772
B	Market Value of Assets	$ 2,272,972,647	$ 144,275,493	$ 2,417,248,140
C	Unfunded Actuarial Accrued Liability (A - B)	$ 1,308,069,632	$ -	$ 1,308,069,632
D	Funded Ratio (B/A)	63.5%	100.0%	64.9%
E	Prior Years Funded Ratio	68.3%	100.0%	69.5%

The POA Funded Ratio is an expected return-based measurement of the pension obligations. It is based upon the POA mandated 6.75% interest rate assumption (assumption prescribed by another party). It determines an amount that will be sufficient to provide benefits if the portfolio earns the expected 6.75% return on assets and all other assumptions are met. This measure is appropriate for assessing the need for or amount of future contributions if all assumptions are met. This measure is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligation, in other words, of transferring the obligation to a third party in a market value type transaction.

Funded Ratio - Solvency

		Defined Benefit	Annuity Funds	Total
A	Actuarial Accrued Liability	$ 5,917,072,862	$ 144,275,493	$ 6,061,348,355
B	Market Value of Assets	$ 2,272,972,647	$ 144,275,493	$ 2,417,248,140
C	Unfunded Actuarial Accrued Liability (A - B)	$ 3,644,100,215	$ -	$ 3,644,100,215
D	Funded Ratio (B/A)	38.4%	100.0%	39.9%

The Solvency Liability is a market-based measurement of the pension obligations. It represents the amount the plan would need to invest in low risk securities to provide the benefits with greater certainty. For this purpose, the solvency liability is computed at 2.45% as of June 30, 2020, based on the long-term municipal bond rate ("20-Year Municipal GO AA Index" rate from the Fidelity Index as of June 30, 2020). No adjustment has been made for the credit quality of the plan sponsor. This measure may not be appropriate for assessing the need for or amount of future contributions. This measure may not be appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligation.

The difference between the two measures (POA and Solvency) is one illustration of the savings the sponsor anticipates by taking on the risk in a diversified portfolio.

Risks Associated with Measuring the Accrued Liability and Actuarially Determined Contribution

Funded Ratio

The funded ratio is the most widely known measure of a plan's financial strength, but the trend in the funded ratio is much more important than the absolute ratio. The funded ratio should trend to 100%. As it approaches 100%, it is important to re-evaluate the level of investment risk in the portfolio and potentially to re-evaluate the assumed rate of return.

Rate of Return, Geometric Average, and Standard Deviation

Investment return is probably the largest single risk that most systems face. The year-by-year return and the geometric average give an indicator of the realism of the System's assumed return.

Duration of the Actuarial Accrued Liability

The duration of the actuarial accrued liability may be used to approximate the sensitivity to a 1% change in the assumed rate of return. For example, a duration of 10 indicates that the liability would increase approximately 10% if the assumed rate of return were lowered 1%.

Ratio of Unfunded Actuarial Accrued Liability to Payroll

The ratio of unfunded liability to payroll gives an indication of the plan's sensitivity to differences between assumed and actual experience related to the employer contributions. A value above approximately 300% or 400% may indicate high volatility relative to small gains and losses.

Ratio Assets to Payroll

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 2.0 times the payroll, a return on assets 5% different than assumed would equal 10% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

Ratio of Actuarial Accrued Liability to Payroll

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of the liability itself. For example, if the actuarial accrued liability is 2.5 times the payroll, a change in liability 2% other than assumed would equal 5% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

Risks Associated with Measuring the Accrued Liability and Actuarially Determined Contribution

Ratio of Non-Investment Cash Flow to Market Value of Assets

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

Additional Risk Assessment

Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, and stress tests. We can provide additional risk assessments at the Board's request.

Valuation Results – Comparative Statement ($ millions)

June 30	Active Payroll		Actuarial Accrued Liabilities			Unfunded / Active Pays	Employer Contributions % of Pays
	Total	Average	Computed Total	Valuation Assets	Unfunded		
2001	253.3	45,353	3,463.2	3,900.0	(436.8)	-	27.22%
2002[1]	248.7	46,203	3,632.0	3,635.1	(3.1)	-	23.39%
2003	248.7	47,305	3,721.6	3,205.5	516.1	2.1	43.89%
2004	258.7	51,126	3,857.5	3,074.5	783.0	3.0	54.36%
2005[3]	250.5	52,197	3,780.4	3,757.9	22.5	0.1	25.98%
2006[3]	228.1	52,908	3,809.0	3,980.3	(171.3)	-	25.09%
2007[2, 3]	230.2	54,647	3,896.8	4,307.2	(410.4)	-	26.71%
2008[1]	232.8	57,090	4,071.1	4,316.3	(245.2)	-	26.27%
2009	231.8	57,418	4,221.3	3,945.2	276.1	1.2	35.22%
2010[1, 2]	228.8	57,322	3,767.4	3,853.3	(85.9)	-	23.02%
2011	220.5	57,773	3,808.6	3,804.8	3.8	0.0	23.14%
2012[1]	205.8	57,374	3,822.7	3,675.5	147.2	0.7	30.59%
2013[2]	186.7	57,163	3,890.1	3,545.5	344.6	1.8	44.93%
2014[2]	132.6	50,831	4,007.3	3,276.2	731.1	5.5	
2015	132.7	55,626	4,053.4	3,194.8	858.6	6.5	
2016	126.9	57,535	4,001.7	2,950.5	1,051.3	8.3	
2017	116.3	60,757	3,967.9	2,922.1	1,045.8	9.0	
2018[2]	111.4	63,589	3,907.4	2,866.3	1,041.1	9.3	
2019[2]	105.2	67,849	3,843.3	2,670.8	1,172.4	11.1	
2020	71.8	52,478	3,725.3	2,417.2	1,308.1	18.2	

[1]After changes in actuarial assumptions and/or methods.
[2]After Plan Amendments.
[3]2005 and 2006 assets were revised following the June 30, 2006 valuation. 2007 assets were revised after the June 30, 2007 valuation.

Schedule of Funding Progress

Actuarial Valuation Date	Actuarial Value of Assets (a)	Schedule of Funding Progress: Actuarial Accrued Liability (AAL) -- Entry Age (b)	Schedule of Funding Progress: Unfunded AAL (UAAL) (b - a)	Schedule of Funding Progress: Funded Ratio (a / b)	Covered Payroll (c)	UAAL as a % of Covered Payroll ((b - a) / c)
2001	$3,900,020,703	$3,463,248,393	$(436,772,310)	112.6%	$253,297,027	-
2002[1]	3,635,106,581	3,631,971,448	(3,135,133)	100.1%	248,663,133	-
2003	3,205,516,657	3,721,593,210	516,076,553	86.1%	248,681,461	207.5 %
2004	3,074,516,589	3,857,493,282	782,976,693	79.7%	258,699,581	302.7 %
2005[3, 5]	3,757,884,417	3,780,447,414	22,562,997	99.4%	250,491,872	9.0 %
2006[3]	3,980,254,576	3,808,952,741	(171,301,835)	104.5%	228,140,160	-
2007[2, 3]	4,307,194,763	3,896,814,229	(410,380,534)	110.5%	230,173,964	-
2008[1]	4,316,263,291	4,071,053,752	(245,209,539)	106.0%	232,812,606	-
2009	3,945,205,453	4,221,291,045	276,085,592	93.5%	231,795,528	119.1 %
2010[1, 2]	3,853,279,381	3,767,364,201	(85,915,180)	102.3%	228,829,999	-
2011	3,804,759,868	3,808,642,533	3,882,665	99.9%	220,461,691	1.8 %
2012[1]	3,675,459,604	3,822,676,002	147,216,398	96.1%	205,800,278	71.5 %
2013[2, 4]	3,474,538,021	3,890,143,341	415,605,320	89.3%	186,694,166	222.6 %
2014[2]	3,276,203,299	4,007,323,791	731,120,492	81.8%	132,566,687	551.5 %
2015	3,194,754,441	4,053,351,943	858,597,502	78.8%	132,722,741	646.9 %
2016	2,950,470,450	4,001,721,957	1,051,251,507	73.7%	126,865,176	828.6 %
2017	2,922,141,978	3,967,895,457	1,045,753,479	73.6%	116,288,356	899.3 %
2018[2]	2,866,303,805	3,907,378,106	1,041,074,301	73.4%	111,407,220	934.5 %
2019[2]	2,670,843,356	3,843,266,214	1,172,422,858	69.5%	105,233,078	1,114.1 %
2020	2,417,248,140	3,725,317,772	1,308,069,632	64.9%	71,842,120	1,820.8 %

[1]After changes in actuarial assumptions and/or methods.
[2]AfterPlan Amendments.
[3]2005 and 2006 assets were revised following the June 30, 2006 valuation. 2007 assets were revised after the June 30, 2007 valuation.
[4]Assumes past due contributions of $71 million are made.
[5]After POC transfer.

DATA FURNISHED FOR VALUATION

Summary of Benefit Provisions
(June 30, 2020)

Component II Frozen Benefits

All Component II benefits are frozen as of June 30, 2014 based on service and average final compensation accrued as of that date and the provisions of the Detroit Police and Fire Retirement System as it existed on June 30, 2014 and all future Cost-of-Living Adjustments ("COLA's") were reduced from 2.25% to 1.0125% per year. The benefits evaluated in this report are the frozen reduced benefits. Component II benefits are payable after separation from service, upon meeting the eligibility conditions of the plan as it existed on June 30, 2014, regardless of whether the individual is eligible to receive a Component I benefit at that time.

Our understanding of the June 30, 2014 plan provisions is provided below for completeness. The material below is a non-legal summary and is not intended to cover all potential situations that could occur. If there are discrepancies between the description below, and appropriate legal documents, the latter necessarily govern.

Age and Service Retirement

Eligibility - 25 years of service regardless of age. 20 years of service regardless of age for eligible DPOA and DFFA members. DFFA members must retire by age 60.

Annual Amount - An annuity equal to the actuarial equivalent of the member's accumulated contribution account plus a defined benefit, which, when added to the annuity will provide the following:

Pre-1969 Members - For all service earned up to April 5, 2011 for LSA and Fire equivalent members, and up to September 1, 2011 for DPOA and Fire equivalent members, 2.5% of AFC times the first 25 years of service, with a maximum allowance of 15/22 of a police officer's or firefighter's annual rate of compensation (actuarially reduced to reflect early payment).

For all service earned after April 5, 2011 for LSA and Fire equivalent members, and after September 1, 2011 for DPOA and Fire equivalent members, 2.1% of AFC times the first 25 years of service, with a maximum allowance of 15/22 of a police officer's or firefighter's annual rate of compensation.

1969 Plan Members - For all service earned up to April 5, 2011 for LSA and Fire equivalent members, and up to September 1, 2011 for DPOA and Fire equivalent members, 2.5% of AFC times the first 25 years of service plus 2.1% of AFC times each of the next 10 years of service.

For all service earned after April 5, 2011 for LSA and Fire equivalent members, and after September 1, 2011 for DPOA and Fire equivalent members, 2.1% of AFC times each year of service, up to 35 years of service.

Members may elect to receive their accumulated contribution account in a lump sum after 25 years of service (20 years of service for eligible DPOA and DFFA members). The defined benefit at retirement is then reduced by the actuarial equivalent of the amount of principal withdrawn. No reduction is made with regard to the interest portion of the withdrawal. Pre-1969 plan members may elect 1969 plan benefits at the time of retirement.

Summary of Benefit Provisions (June 30, 2020) (Continued)

Type of Average Final Compensation (AFC) - Average of the current compensation for the ranks held in each of last 5 years (last 3 years for DPCOA, Executive Members and their Fire equivalents). Pension benefits for non-union employees may not be diminished due to a reduction in compensation because of fiscal emergency. AFC includes prior longevity distributions during the averaging period in accordance with the following schedule: 1% of compensation after 5 years of service, 2% after 11 years, 3% after 16 years and 4% after 21 years. A member may elect that upon retirement or upon death before retirement either (i) a lump sum payment equal to 85% (100% for DPOA and DPCOA members) of the amount of his or her unused accumulated sick leave bank, or (ii) to have the 3-year average of 25% of the value of the accumulated unused sick leave bank added to his or her AFC. Any member electing the AFC adjustment option will also be paid a lump sum equal to the remaining value of the sick leave bank as provided in (i) above. Lump sum payments are not paid by the Retirement System.

Deferred Retirement (Vested Benefit)

Eligibility - 10 years of service for DPOA and Fire equivalents, age 40 with 8 years of service for all others.

Annual Amount - Same as regular retirement but based on average final compensation and credited service at the time of termination.

Benefit Commencement - DPOA and Fire equivalent members hired after 6/30/1985: Unreduced benefit begins at age 62. ***All other members***: Unreduced benefit begins at the age when the member would have first been eligible for regular retirement had the member continued in City service. **All** members may elect a reduced benefit payable immediately.

Note, for valuation purposes, the frozen accrued benefit was valued in the event of a death or disability. The following death and disability provisions are provided for historical purposes only.

Duty Disability Retirement

Eligibility - No age or service requirement.

Annual Amount - A basic benefit of 50% of final compensation as of June 30, 2014 and a supplemental benefit of 16-2/3% of final compensation as of June 30, 2014 is payable for 24 months. After 24 months, members disabled from any occupation continue to receive both benefits; otherwise, only the 50% benefit is then payable. Upon attaining 25 years of service, the disability benefit is 50% of final compensation as of June 30, 2014. Members convert to regular retirement benefit at age 65. Worker's compensation payments are offset. Members who have already filed under the old duty disability plan will receive 66-2/3% of final compensation as of June 30, 2014 payable to eligibility date for regular retirement. Benefits prior to age 65 are assumed to be paid from Component I. Benefits after age 65 are assumed to be paid from Component II (this plan).

Non-Duty Disability Retirement

Eligibility - 5 years of service.

Annual Amount - Computed as a regular retirement benefit, but based on average final compensation and credited service at the time of disability. Minimum benefit is 20% of average final compensation. Benefits are assumed to be paid from Component II (this plan).

Duty Death Before Retirement

Eligibility - No age or service requirement.

Annual Amount - Surviving spouse receives 5/11 of police officer's or firefighter's compensation and each child under age 18 receives 1/10 of such compensation with a maximum total of 7/33 of such compensation as of June 30, 2014. If there is no surviving spouse, each child receives 1/4 of such compensation with a maximum total of 1/2 of such compensation. If there is no surviving spouse or children, each dependent parent receives 1/6 of such compensation. Worker's compensation payments are offset. Benefits are assumed to be paid from Component I.

Non-Duty Death Before Retirement

Eligibility - No age or service requirement.

Annual Amount - Same as a regular retirement benefit to a surviving spouse, but reduced in accordance with a 100% joint and survivor option election. Minimum benefit is 20% of average final compensation as of June 30, 2014. Each child under 18 receives 1/7 of Police Officer's or Firefighter's compensation with a maximum total of 2/7 of such compensation. If there is no spouse or children, each dependent parent receives 1/7 of such compensation. Benefits are assumed to be paid from Component II (this plan).

Post-Retirement Cost-of-Living Adjustments

Pre-1969 Members - Allowances increase in proportion to active member compensation for the corresponding rank. These increases are not considered COLAs and are therefore not reduced under the POA.

1969 Plan Members - Police retired after July 1, 2001, certain Police classes retired after July 1, 1998 and all Fire members: For all service earned up to April 5, 2011 for LSA members (September 1, 2011 for DPOA members) pensions increase by 2.25% of the **current** pension amount each July 1. No cost-of-living adjustments for service earned after April 5, 2011 for LSA members (September 1, 2011 for DPOA members). COLA is reduced by 45% according to the POA.

Member Contributions

5% of covered compensation payable until first eligible for regular retirement. Interest on member contributions provides benefits in addition to the formula benefit.

DROP Plan

Members with 25 years (20 years for DPOA members) of service may elect to participate in the DROP. When a DROP election is made, the member ceases to accrue any further age and service retirement benefits. Seventy-five percent (75%) of the member's benefit (accrued to their DROP date) is contributed to a DROP account (a defined contribution account). At retirement the member is entitled to the balance in the DROP account and a monthly benefit equal to 100% of their benefit accrued to their DROP date, increased by any post-retirement increases that the member would have received, had the member been retired. Fire members must retire from the DROP plan at age 60. Participation in the DROP is limited to 10 years for LSA members electing to DROP after April 5, 2011 and prior to July 1, 2014. Members electing DROP after July 1, 2014 are limited to 5 years of DROP participation. Effective October 31, 2018, LSA members are limited to 10 years of DROP participation. Effective May 9, 2019, DPOA members are limited to 10 years of DROP participation.

Asset Information Furnished for Valuation

Reported Assets
(Market Value)

Asset Class	Market Value	
	June 30, 2020	June 30, 2019
Cash and Cash Equivalents	$ 60,589,060	$ 57,654,902
Investments at fair value	2,354,977,122	2,610,224,281
Receivables	67,919,982	99,739,032
Cash and Investments held as collateral for securities lending	166,656,580	200,383,824
Capital Asset - Net	1,849,895	1,198,468
Accounts Payable	(234,744,499)	(298,357,151)
Total Current Assets	**$2,417,248,140**	**$2,670,843,356**

Reserve Accounts

Funds	Fund Balances	
	June 30, 2020	June 30, 2019
Annuity Savings	$ 113,856,180	$ 117,476,538
Annuity Reserve	30,419,313	30,549,540
Total Annuity Funds	144,275,493	148,026,078
Pension Accumulation	(495,301,166)	(2,079,310)
Pension Reserve	2,773,194,141	2,526,084,121
Survivor Benefit	(4,920,328)	(1,187,533)
Total Pension Funds	2,272,972,647	2,522,817,278
Total Fund Balances	$ 2,417,248,140	$ 2,670,843,356

Asset Information Used for Valuation

Revenues and Expenditures

	Annuity Savings Fund	Annuity Reserve Fund[1]	Pension Survivor Benefit	Pension Accumulation Fund	Pension Reserve Fund	Total 2020
Market Value June 30, 2019	$ 117,476,537	$ 30,549,540	$ (1,187,533)	$ (2,079,311)	$2,526,084,123	$2,670,843,356
Adjustment to Match 6-30-2019 Valuation	-	-	-	(529,615,155)	529,615,155	-
Balance after Reserve Adjustment	$ 117,476,537	$ 30,549,540	$ (1,187,533)	$ (531,694,466)	$3,055,699,278	$2,670,843,356
Additions:						
Employer Contributions	$ -	$ -	$ -	$ 18,300,000	$ -	$ 18,300,000
Member Contributions	-	-	-	-	-	-
Other Income	-	-	-	1,156,737	-	1,156,737
Annuity Interest	5,762,530	-	-	-	-	5,762,530
Annuity Loan Interest	375,342	-	-	-	-	375,342
Investment Income - Net	-	-	-	25,454,108	-	25,454,108
Total	$ 6,137,872	$ -	$ -	$ 44,910,845	$ -	$ 51,048,717
Deductions:						
Pension and Annuity Benefits	$ -	$ 313,229	$ 3,732,795	$ -	$ 282,505,137	$ 286,551,161
Refunds and Withdrawals	14,024,530	-	-	-	-	14,024,530
General and Administrative Expenses	-	-	-	2,449,246	-	2,449,246
Other	-	-	-	-	-	-
Total	$ 14,024,530	$ 313,229	$ 3,732,795	$ 2,449,246	$ 282,505,137	$ 303,024,937
Transfer from Component II to Component I	$ -	$ -	$ -	$ (1,618,996)	$ -	$ (1,618,996)
Other Transfer Out	$ (183,002)	$ -	$ -	$ (4,449,303)	$ -	$ (4,632,305)
Other Transfer In	$ 4,449,303	$ 183,002	$ -	$ -	$ -	$ 4,632,305
Market Value June 30, 2020	$ 113,856,180	$ 30,419,313	$ (4,920,328)	$ (495,301,166)	$2,773,194,141	$2,417,248,140
Market Value Rate of Return	5.45%	0.00%	0.00%	(4.52)%	0.00%	1.20%

[1]*No interest is credited to the ARF this year. Please see the comment about Reserves on page 12.*

Rates of return are dollar weighted estimates assuming mid-year cash flows with the exception of the EOY employer contributions. “Other Income” was treated as investment income.

Retirees and Beneficiaries as of June 30, 2020
Tabulated by Attained Age[1]

Attained Age	Age & Service		Disability		Death-in-Service		Totals	
	No.	Monthly Allowances	No.	Monthly Allowances	No.	Monthly Allowances	No.	Monthly Allowances
Under 20[2]	7	$ 18,941	1	$ 3,006	36	$ 20,497	44	$ 42,444
20-24	2	8,237					2	8,237
25-29	5	10,726	2	5,916	1	2,131	8	18,773
30-34	3	5,911	2	6,019			5	11,930
35-39	10	16,199	21	63,986	2	3,814	33	83,999
40-44	49	73,528	69	213,748	9	14,929	127	302,205
45-49	174	293,412	107	337,220	19	37,806	300	668,438
50-54	320	734,193	102	317,500	13	23,177	435	1,074,870
55-59	437	1,227,270	134	410,864	16	31,553	587	1,669,687
60-64	626	1,868,301	127	358,848	22	45,850	775	2,272,999
65-69	1,056	3,401,488	274	764,693	35	68,625	1,365	4,234,806
70-74	1,399	4,613,866	392	995,925	49	87,587	1,840	5,697,378
75-79	890	2,647,241	219	562,662	26	48,670	1,135	3,258,573
80-84	489	1,353,659	64	165,262	13	25,507	566	1,544,428
85-89	320	765,403	27	80,393	8	19,041	355	864,837
90-94	235	531,564	24	66,845	15	33,747	274	632,156
95 & Over	97	192,407	10	28,444	2	4,545	109	225,396
Totals	**6,119**	**$17,762,346**	**1,575**	**$4,381,331**	**266**	**$467,479**	**7,960**	**$22,611,156**

[1]Includes both pre-1969 and 1969 retirees. Allowances being paid to DROP members are not reflected. Allowances shown are amounts as reported in the data.

[2]May include records with incorrect birth dates reported.

Inactive Vested Members June 30, 2020

Attained Age	No.	Estimated Annual Allowances
Under 40	32	$ 460,613
40-44	111	2,045,095
45-49	111	2,210,977
50-54	76	1,544,880
55-59	29	685,454
60-64	20	491,902
65 & over	10	185,333
Totals	**389**	**$7,624,254**

Pre-1969 Retirees and Beneficiaries as of June 30, 2020
Tabulated by Attained Age

Attained Age	Age & Service[1]		Disability[1]		Death-in-Service		Totals	
	No.	Monthly Allowances	No.	Monthly Allowances	No.	Monthly Allowances	No.	Monthly Allowances
60-64	7	$ 7,341			1	$ 2,126	8	$ 9,467
65-69	13	27,579			2	4,754	15	32,333
70-74	118	254,633	26	$ 68,895	12	27,056	156	350,584
75-79	307	712,183	106	273,249	13	28,530	426	1,013,962
80-84	291	701,388	50	127,268	11	21,711	352	850,367
85-89	215	463,223	19	49,723	6	13,264	240	526,210
90-94	167	350,152	21	57,631	13	27,855	201	435,638
95 & Over	88	171,741	9	24,699	2	4,545	99	200,985
Totals	**1,207**	**$2,689,480**	**231**	**$601,465**	**60**	**$129,841**	**1,498**	**$3,420,786**

[1]*Includes survivor beneficiaries of service and disability retirees.*

DROP Participants June 30, 2020

Attained Age	No.	Estimated Monthly Allowances[1]
Under 25	2	$ 3,408
35-39	2	2,172
40-44	50	58,550
45-49	160	216,626
50-54	210	426,827
55-59	213	531,267
60-64	78	230,749
65-69	31	117,856
70-74	9	38,384
75-79	2	9,220
Totals	**757**	**$1,635,059**

[1]*Reflects the 75% of reported monthly benefits being paid into DROP accounts.*

Active Members as of June 30, 2020
by Attained Age and Years of Service (Excludes DROP)

Note the following active member schedules show eligibility service (total service) and reported payroll as of the valuation date. However, benefits are based on service and AFC as of June 30, 2014.

Police Members

Attained Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	No.	Valuation Payroll
20-24									$ 0
25-29		26						26	965,131
30-34	1	42	23					66	2,824,270
35-39	1	28	58	33	5			125	6,133,429
40-44		11	38	79	89	2		219	11,686,023
45-49		5	21	53	158	14		251	14,269,837
50-54		3	14	34	95	13	1	160	9,097,355
55-59		2	4	13	28	5	4	56	3,100,161
60				2	4			6	334,467
61				1	1			2	116,004
62			1	1		1		3	155,244
63							1	1	52,783
64									0
68									0
69									0
Totals	**2**	**117**	**159**	**216**	**382**	**36**	**7**	**919**	**$48,961,976**

Fire Members

Attained Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	No.	Valuation Payroll
20-24		1						1	$ 32,629
25-29	3	14	1					18	600,603
30-34		22	3	2				27	1,001,622
35-39		18	9	9	3			39	1,666,810
40-44		4	11	32	41			88	4,508,104
45-49		1	5	44	63	14		127	6,729,019
50-54			4	17	58	26	5	110	6,021,419
55-59				5	16	9	5	35	2,052,988
Totals	**3**	**61**	**33**	**109**	**185**	**49**	**10**	**450**	**$22,880,144**

Total Active Members as of June 30, 2020
by Attained Age and Years of Service (Excludes DROP)

Note the following active member schedules show eligibility service (total service) and reported payroll as of the valuation date. However, benefits are based on service and AFC as of June 30, 2014.

Total Members

Attained Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	No.	Valuation Payroll
20-24		1						1	$ 32,629
25-29	3	40	1					44	1,565,734
30-34	1	64	26	2				93	3,825,892
35-39	1	46	67	42	8			164	7,800,239
40-44		15	49	111	130	2		307	16,194,127
45-49		6	26	97	221	28		378	20,998,856
50-54		3	18	51	153	39	6	270	15,118,774
55-59		2	4	18	44	14	9	91	5,153,149
60				2	6			8	453,307
61				1	2			3	179,668
62			1	1	1	1		4	187,501
63							1	1	52,783
64									
68		1						1	52,189
69									
Totals	**5**	**178**	**192**	**325**	**567**	**85**	**17**	**1,369**	**$71,842,120**

	Group Averages		
	Police	Fire	Total
Age:	44.6 years	45.6 years	44.9 years
Benefit Service:	11.8 years	12.8 years	12.1 years
Eligibility Service:	17.7 years	18.8 years	18.1 years
Annual Pay:	$53,277	$50,845	$52,478

Summary of Membership Data by Category

	June 30, 2020	June 30, 2019
Active Members (Excluding DROP)		
Number	1,369	1,551
Average age (years)	44.9	44.1
Average service (years)	18.1	17.4
Average salary	$ 52,478	$ 67,849
Total payroll supplied, annualized	$ 71,842,120	$ 105,233,078
Members in DROP		
Number	757	764
Average age (years)	54.0	54.0
Total annual benefits[1]	$ 19,620,706	$ 21,221,995
Average annual benefit[1]	$ 25,919	$ 27,777
Vested Inactive Members		
Number	389	394
Average age (years)	48.3	49.6
Total annual deferred benefits	$ 7,624,254	$ 8,714,989
Average annual deferred benefit	$ 19,600	$ 22,119
Service Retirees		
Number	4,924	4,975
Average age (years)	69.1	69.0
Total annual benefits	$ 181,804,035	$ 182,363,445
Average annual benefit	$ 36,923	$ 36,657
Disability Retirees		
Number	1,575	1,641
Average age (years)	66.5	65.9
Total annual benefits	$ 52,575,972	$ 54,129,360
Average annual benefit	$ 33,377	$ 32,981
Beneficiaries (Including Death in Service)		
Number	1,461	1,486
Average age (years)	74.8	75.0
Total annual benefits	$ 36,953,865	$ 36,389,907
Average annual benefit	$ 25,294	$ 24,488

[1]*Reflects the 75% of reported monthly benefits being paid into DROP accounts.*

Reconciliation of Reported Data as of June 30, 2020

Active Data

A) Count reported in PF_Benefits table:	1,384
B) In PF_Benefits file but not in Hybrid file:	-
C) Hired after plan closed:	(4)
D) Non-active Status:	(3)
E) Agency "88":	-
F) Non-eligible class code & bargaining unit:	-
G) No hire date in Hybrid file:	-
H) Zero salary in Hybrid file:	-
I) Also in retiree file (including DROP):	(8)
J) Actives excluding DROP:	1,369

Retired Data

A) Number of records reported on data file:	44,412
B) Number of records not in P/F plan:	(27,770)
C) Records not currently in receipt of benefits based on reported status codes:	(7,662)
D) Component I (Hybrid) Records:	(263)
E) Records in DROP:	(757)
F) Number of records valued:	7,960

Deferred Data

A) Number of records reported on data file	455
B) Deceased[1]	(35)
C) Less than 8 years of vesting service	(31)
D) Number of records to value	389

[1] *In part, this is the result of an audit.*

Active Row D: The Active data file contains a field titled "Stat". Active members were only valued if the record for this field had a value of "1".
Active Row E: Agency "88" is the 36th District Court. We understand that members in that agency are not eligible to receive benefits.
Active Row F: For both this valuation and the prior valuation, we have received a separate list of Class Codes and Bargaining Units that are not eligible to receive benefits.
Retired Row C: The Retired_Life file has a field named "STATUS". We understand that if this field is populated with a number that is one or greater, the member is no longer receiving a benefit and should not be valued.
Deferred Row B: Service provided in the data file is vesting service. Since benefit service was frozen as of June 30, 2014 for members that terminated after June 30, 2014, benefit service was determined by subtracting service in the Hybrid inactive file from service in the Legacy inactive file with service.

Reconciliation of Year-to-Year Data
as of June 30, 2020

	Active		Term. Vested	DROP		Retirees		Totals
	Count	Pay[1]	Count	Count	Monthly Benefits	Count	Monthly Benefits	Count
2019	**1,551**	**$105,233,078**	**394**	**764**	**$1,991,524**	**8,102**	**$22,740,226**	**10,811**
Change in Pay/Pensions	N/A	(21,187,647)	N/A	N/A	14,540	N/A	255,925	
Rehired (Not Vested)	5	210,643	-					5
Rehired (Vested)	3	178,254	(1)	-	-	(2)	(6,851)	-
New Beneficiary						91	200,635	91
DROP	(100)	(6,831,786)	-	100	161,386			-
Retired	(21)	(1,409,351)	(10)	(100)	(292,463)	156	380,130	25
Non-Duty Disabled	-	-				-	-	-
Duty Disabled	(8)	(512,041)	(1)			9	30,785	-
Death/Off			(31)	(7)	(17,746)	(398)	(992,099)	(436)
Vested Term	(45)	(2,921,065)	38					(7)
Non-Vested Terminated	(16)	(917,965)						(16)
Data Adjustment	-	-	-	-	(1,768)	2	2,405	2
2020	**1,369**	**$71,842,120**	**389**	**757**	**$1,855,473**	**7,960**	**$22,611,156**	**10,475**

[1]*This represents current pay and is not used for the Component II (Legacy) valuation.*

Notable Data Changes:

7 active vested terminations were not reported on the Terminated Vested file. We have assumed these members refunded and forfeited their defined benefit.

25 new retirees came from nowhere. We believe most of these are a result of EDRO's.

31 Terminated Vested members were valued last year but will not be valued this year. We have assumed these members refunded and forfeited their defined benefit.

The data adjustments relate to records where we could not specifically identify the activity during the year. This could be the result of duplicate member IDs or corrected Member IDs.

Data Approximations and Assumptions

As part of our review of the data received from the System, we discussed questionable or missing data with System staff and developed approximations and assumptions in order to perform the valuation. We provided System staff with a letter dated March 22, 2021 with additional information regarding data reconciliation, processing instructions, and assumptions regarding unresolved issues. Note, that letter disclosed our remaining data processing procedures and assumptions and details our reconciliation and final valuation data. System staff has approved the detail and final data disclosed in that letter.

The purpose of this section in this report is to summarize any unresolved concerns about questionable data that are relevant and could have a significant effect on the valuation as disclosed in that letter. This summary also discusses any significant steps we have taken to improve the data due to identifying questionable data values or relationships, significant judgments, or assumptions we have applied to the data. The rationale for the demographic assumptions made for the data processing are 1) instructions/discussions with System staff and 2) professional judgement. All data assumptions have been reviewed with and approved by staff before implementation.

Active

These records are reported in the Microsoft Access data file in the table titled PF_Benefits. Legacy specific fields (salary, Annuity Savings Fund (ASF) balance, service, and Average Final Compensation (AFC)) are taken from this file and combined with the Hybrid active file. That information is used in conjunction with information obtained from the Master tables (sick leave bank) and information carried over from prior valuations (AFC, sick leave, class code, and annual pay as of 2014).

For active members, frozen AFC amounts and frozen service as of June 30, 2014 was reported. The frozen AFC reported on the June 30, 2020 data file was not useable. As such, we used the frozen AFC as reported on the June 30, 2018 data file. For purposes of this valuation, we matched the June 30, 2018 AFC to the AFC data reported for the June 30, 2014 valuation to check against AFC as of June 30, 2014. In cases where the frozen AFC as reported in the 2018 data file was less than 75% of the AFC as reported on the 2014 data file, the AFC as reported on the 2014 data file was used. This boundary was determined after an analysis of the raw AFC data showed that the AFC for several members was unreasonably low. The class code used to distinguish between LSA and DPOA was taken from the 2014 data file.

These procedures are unchanged from the 2019 valuation.

Deferred

These records are reported in the Microsoft Access data file in the table titled PF_Benefits_Vested. Information from the Hybrid inactive file (Hybrid service) is appended to the Legacy file.

Data provided for deferred vested members was incomplete. As part of the processing of deferred member data, in cases where AFC was incomplete, we used $30,000 to estimate the AFC. This procedure is unchanged from the 2019 valuation.

Component II benefit service is not directly provided on the file. The Component II (Legacy) file includes total vesting service and the Component I (Hybrid) file includes Component I benefit service. Since Component II benefit service was frozen as of June 30, 2014 for members that terminated after June 30, 2014, Component II (Legacy) benefit service was determined by subtracting service in the Component I (Hybrid) inactive file from total vesting service in the corresponding Component II (Legacy)

inactive file. Members with estimated vesting service of less than 8 years were assumed to be non-vested and were not valued.

Retired and Beneficiary

These records are reported in the Microsoft Access data file in the table titled Retired_Life. This file is used in conjunction with information from the Master file (class code and agency). Note, General and P/F members are both reported in this table.

Adjustment assumptions include:

- In cases where the benefit is identified to be a joint and survivor benefit and a beneficiary is not listed in the data, it was assumed that male spouses were 3 years older than females;
- For non-equated members that elected a pop-up benefit, the pop-up amount is estimated based on the chosen option and benefit amounts provided in the data;
- Benefits for dependent children are assumed to cease at age 21; and
- For non-converted disabled members:
    - Converted benefits are assumed to commence at age 65.
    - For disabilities prior to 2014, converted benefits were estimated using 25 years of service and the multiplier in effect for the member. For disabilities after 2014, converted benefits were estimated using service as of June 30, 2014 and the multiplier in effect for the member; and
    - At 25 years of service, disability benefits are assumed to equal 50% of final compensation.

These procedures are unchanged from the 2019 valuation.

Comparative Statement of Active Members and Valuation Payroll

June 30	No. of Members 1969 Plan	No. of Members Pre-1969	Total Members No.	% Change	Ratio of Active to Retired	Annual Payroll*	Average Pay $	Average Pay Change
2001	5,453	132	5,585	2 %	0.7	253,297,027	45,353	4.6 %
2002	5,290	92	5,382	(4)%	0.7	248,663,133	46,203	1.9 %
2003	5,181	76	5,257	(2)%	0.6	248,681,461	47,305	2.4 %
2004	5,007	53	5,060	(4)%	0.6	258,699,581	51,126	8.1 %
2005	4,768	31	4,799	(5)%	0.6	250,491,872	52,197	2.1 %
2006	4,298	14	4,312	(10)%	0.5	228,140,160	52,908	1.4 %
2007	4,204	8	4,212	(2)%	0.5	230,173,964	54,647	3.3 %
2008	4,071	7	4,078	(3)%	0.5	232,812,606	57,090	4.5 %
2009	4,030	7	4,037	(1)%	0.5	231,795,528	57,418	0.6 %
2010	3,985	7	3,992	(1)%	0.5	228,829,999	57,322	(0.2)%
2011	3,809	7	3,816	(4)%	0.5	220,461,691	57,773	0.8 %
2012	3,580	7	3,587	(6)%	0.4	205,800,278	57,374	(0.7)%
2013[1]	3,260	6	3,266	(9)%	0.4	186,694,166	57,163	(0.4)%
2014[2]	2,608	0	2,608	(20)%	0.3	132,566,687	50,831	(11.1)%
2015	2,386	0	2,386	(9)%	0.3	132,722,741	55,626	9.4 %
2016	2,205	0	2,205	(8)%	0.3	126,865,176	57,535	3.4 %
2017	1,914	0	1,914	(13)%	0.2	116,288,356	60,757	5.6 %
2018	1,752	0	1,752	(8)%	0.2	111,407,220	63,589	4.7 %
2019	1,551	0	1,551	(11)%	0.2	105,233,078	67,849	6.7 %
2020	1,369	0	1,369	(12)%	0.2	71,842,120	52,478	(22.7)%

[1]*Payroll used was the greater of the payroll reported for the current and prior fiscal years.*
[2]*Post Bankruptcy.*

Prior to 2014, DROP members are included.

Comparative Statement of Annual Retirement Allowances Being Paid to Retirees and Beneficiaries (Excluding DROP Members)

June 30	No. Retired		% of Current Allowances			Current Allowances		Allowances as a % of Payroll
	Pre-69	Total	Annuities	Pensions	Escalators	Total	Average	
2001	4,394	8,166	0.6%	67.4%	32.0%	180,239,652	22,072	71%
2002	4,229	8,179	0.5%	68.4%	31.1%	185,658,396	22,699	75%
2003	4,104	8,277	0.5%	69.8%	29.7%	191,634,636	23,153	77%
2004	3,961	8,328	0.4%	68.5%	31.1%	203,083,524	24,386	79%
2005	3,791	8,376	0.4%	69.5%	30.1%	211,114,020	25,205	84%
2006	3,666	8,550	0.4%	70.9%	28.7%	222,357,372	26,007	97%
2007	3,501	8,498	0.3%	70.6%	29.1%	227,671,788	26,791	99%
2008	3,318	8,442	0.3%	70.0%	29.7%	234,223,368	27,745	101%
2009	3,168	8,424	0.3%	70.1%	29.6%	240,094,968	28,501	104%
2010	3,035	8,356	0.3%	70.3%	29.4%	243,688,596	29,163	106%
2011	2,861	8,379	0.2%	71.6%	28.2%	250,376,700	29,881	114%
2012	2,723	8,451	0.2%	72.2%	27.6%	258,660,084	30,607	126%
2013	2,544	8,476	0.2%	72.9%	26.9%	266,438,460	31,434	143%
2014[1]	2,362	8,395	0.2%	73.5%	26.3%	269,579,544	32,112	203%
2015	2,185	8,279	0.2%	74.2%	25.6%	266,597,448	32,202	201%
2016	2,040	8,204	0.2%	74.3%	25.5%	267,432,588	32,598	211%
2017	1,915	8,187	0.1%	74.3%	25.6%	270,114,360	32,993	232%
2018	1,795	8,151	0.1%	74.2%	25.7%	271,526,640	33,312	244%
2019	1,675	8,102	0.1%	73.9%	26.0%	272,882,712	33,681	259%
2020	1,498	7,960	0.1%	74.2%	25.7%	271,333,872	34,087	378%

[1]*Post Bankruptcy.*

Schedule of Employer Contributions

Fiscal Year Ended June 30	Reported Employer Contributions	
	From Pension Obligation Certificates (POCs)	Employer Contributions Other than from POCs
2001		$ 14,443,382
2002		8,449,645
2003		66,843,029
2004		69,475,202
2005	$ 630,829,189	51,602,596
2006[1]		57,766,542
2007		57,423,366
2008		33,934,636
2009[2]		36,151,057
2010		32,808,485
2011		81,642,112
2012[2]		49,760,229
2013		0
2014		0
2015		114,300,000
2016		37,787,744
2017		18,300,000
2018		18,300,000
2019		18,300,000
2020		18,300,000

[1]2006 assets were revised following the 6/30/2006 valuation.
[2]Contribution receivable.

APPENDIX I – ASSUMPTIONS AND GLOSSARY

Summary of Assumptions Used for PFRS Actuarial Valuation
Assumptions Adopted by Board of Trustees
After Consulting with Actuary

Assumption Review

All assumptions are estimates of future experience except as noted. If the rationale for the assumptions is based on experience studies, it is noted.

Economic Assumptions

The investment return rate used in the valuation was 6.75% per year, compounded annually (net of investment and administrative expenses). This assumption is prescribed by the Eighth Amended Plan for the Adjustment of Debts of the City of Detroit (POA).

Price inflation is not directly used in the valuation. For purposes of assessing the reasonability of the investment return assumption we assumed price inflation of 2.50% per year.

Non-Economic Assumptions

The mortality table used to measure retired life mortality is the RP-2014 Blue Collar Annuitant Table for males and females. Tables were extended below age 50 with a cubic spline to the published Juvenile rates. Pre-retirement mortality is the RP-2014 Blue Collar Employee Tables for males and females. The tables are projected to be fully generational, based on the 2-dimensional, sex distinct mortality improvement scale MP-2014. This table was first used as of June 30, 2014. The rationale for the mortality assumption is based on the 2008-2013 Mortality Experience Study issued February 13, 2015.

The probabilities of age/service retirement for members eligible to retire are shown on page 47. The rationale is based on the 2002-2007 Experience Study. However, probabilities were modified effective with the June 30, 2014 valuation to reflect a change in the modeling of future DROP members, consistent with the plan closure. The revised probabilities were selected so that, when combined with the model change, the effect on the present value of benefits would be immaterial.

The probabilities of separation from service (including *death-in-service*) are shown for sample ages on page 48. These probabilities were first used for the June 30, 2008 valuation. The rationale is based on the 2002-2007 Experience Study.

Miscellaneous and Technical Assumptions
June 30, 2020

Marriage Assumption:	100% of males and 100% of females are assumed to be married for purposes of death-in-service benefits. This assumption accounts for potential dependent children/dependent parent death benefits. No other assumption is made for surviving children/dependent parents. Male spouses are assumed to be three years older than female spouses.
Pay Increase Timing:	N/A
Decrement Timing:	Decrements are assumed to occur mid-year.
Eligibility Testing:	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date of decrement.
Decrement Relativity:	Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
Decrement Operation:	Disability and mortality decrements do not operate during the first 5 years of service. Disability and withdrawal do not operate during retirement eligibility.
Incidence of Contributions:	Employer contributions are assumed to be received on the last day of the fiscal year.
Longevity in AFC:	Longevity payments were included directly in the AFC data provided by the System. No further adjustment was included.
Unused Sick Leave Payout:	Sick leave banks as of June 30, 2014 were included in the 2014 data file provided by the System. No further adjustment to the sick banks was included.
Post-Retirement COLA:	Active members are assumed to receive a 0.9% COLA rather than 1.0125% because the annuity portion is not subject to the COLA. Post-retirement increases for retired members were based on the plan in effect at retirement. For the pre-69 plan members, future COLA's are assumed to be the same as wage inflation for active members (not reduced in POA). For other members retiring before 2014, the COLA rate is prorated by the ratio of COLA eligible service to total service at retirement before applying the POA mandated reduction to 1.0125%. The service ratio is provided on the data file.
AFC Period:	AFC data was provided by the System.

Miscellaneous and Technical Assumptions
June 30, 2020 (Continued)

Disability Change Age:	For active members that become duty disabled, the Component II (Legacy) plan is assumed to only be responsible for the frozen benefit which becomes payable starting at age 65.
Duty Death Benefit:	For current active members, the duty death pension benefit is assumed to be payable entirely by the Component I (Hybrid) plan. It was assumed that the Component II (Legacy) plan would only be responsible for the refund of member contributions.
Mandatory Retirement Age	Currently most members of the PFRS are subject to a mandatory retirement age of 60. However, we understand that the mandatory retirement age is currently not enforced for Police members. Recent membership data indicates that very few Police members stay in employment past age 65. We have, therefore, assumed employment would end at age 65 for Police members and age 60 for Fire members regardless of the length of their DROP participation at that age.
DROP Assumption:	All active members not in the DROP are assumed to have a 40% chance of retiring or entering the DROP in their first five years of retirement eligibility (see page 31). For Police members, 65% of eligible members are assumed to enter the DROP and remain in the DROP for seven years. For Fire members, 60% of eligible members are assumed to enter the DROP and remain in the DROP for five years.
Workers Comp Offset:	No Workers Compensation offsets are assumed for duty disability benefits.
DROP Account:	DROP account balances are not reported. No liability is included for DROP account balances.
Class Codes:	For valuation purposes, members are categorized as DPOA, DFFA or LSA based on class codes provided by the Retirement System and are primarily used in the valuation to determine normal retirement eligibility (20 & Out versus 25 & Out). The class codes used for this valuation were taken from the 2014 data file. Therefore, counts in the valuation may not represent actual membership in the respective associations.
Frozen Benefit Estimate:	Reported frozen AFC was adjusted to include 25% of unused sick leave (to a maximum of 25 days per year of service).

Miscellaneous and Technical Assumptions
June 30, 2020 (Concluded)

Form of Payment:	The actuarial equivalent basis for optional forms of payment and early retirement are based on the RP-2014 Mortality Table with Blue Collar adjustments projected 11 years, a 6.75% interest rate, 90%/10% unisex mix and a 1.0125% COLA assumption per System Policy. Annuity withdrawal factors use the same mortality and interest rate assumptions with a 0% COLA assumption. No adjustment has been made for alternate forms of payment elections. Principal balances of accumulated member contributions were converted to life annuity offsets based on plan factors for the valuation.
Retiree Pop-Up Factor:	If a retiree has a pop-up option but no pop-up factor is provided in the data, the pop-up factor is determined by using an average age at retirement of 50.2, beneficiary age of 47.2, and the optional form of payment assumptions (determined above).
Member Contributions:	Member contributions to this Component II plan are assumed to have ceased with the bankruptcy. However, for purposes of determining refunds on member contributions, contribution balances are assumed to earn 5.25% interest.
Limit Testing:	We understand the System has specific outside counsel regarding I.R.C. section 415 testing. We have not adjusted liabilities for potential 415 limits.
Data Assumptions:	Assumptions regarding incomplete or missing data are reviewed annually with the System and adjusted as directed by the System.

The rationale for the miscellaneous and technical assumptions is the 2002-2007 Experience Study, modified as necessary for changes in data or administration.

Funding Methods

The unit credit cost method was used in determining liabilities and normal cost. Under this method, there is no normal cost since benefits are frozen and there are no future accruals and Actuarial Accrued Liability is the present value of each individual's accrued benefit.

Unfunded Actuarial Accrued Liabilities (UAAL). UAAL contribution is not actuarially determined. Actual employer contributions through June 30, 2023 are set by the POA. The funding policy after 2023 has not yet been established by the Board.

Employer contribution dollars were assumed to be *paid in a single sum on the last day* of the employer fiscal year. (Adopted for the June 30, 1979 actuarial valuation.)

Present assets are set equal to the Market Value in accordance with the POA.

The data about persons now covered and about present assets was furnished by the System's administrative staff. Although examined for general reasonableness, the data was not audited by the actuary.

Single Life Retirement Values Based on RP-2014 Blue Collar for Males and Females

Sample Attained Ages in 2020	Future Life Expectancy (Years)	
	Men	Women
45	39.81	43.14
50	34.82	38.06
55	30.01	33.13
60	25.42	28.35
65	21.06	23.73
70	16.99	19.36
75	13.27	15.31
80	9.97	11.69

Probabilities of Service Retirement

Service	Percent of Eligible Active Members Retiring within Next Year			
	Police		Fire	
	20 & Out	25 & Out	20 & Out	25 & Out
19	40%		40%	
20	40%		40%	
21	40%		40%	
22	40%		40%	
23	40%		40%	
24	100%	40%	100%	40%
25	100%	40%	100%	40%
26	100%	40%	100%	40%
27	100%	40%	100%	40%
28	100%	40%	100%	40%
29	100%	100%	100%	100%
30	100%	100%	100%	100%
31	100%	100%	100%	100%
32	100%	100%	100%	100%
33	100%	100%	100%	100%
34	100%	100%	100%	100%
35	100%	100%	100%	100%
36	100%	100%	100%	100%
37	100%	100%	100%	100%
38	100%	100%	100%	100%
39	100%	100%	100%	100%
40	100%	100%	100%	100%
Ref	922	922	922	922

Age	Percent of Eligible Active Members Retiring within Next Year	
	Police	Fire
60	40%	100%
61	40%	100%
62	40%	100%
63	40%	100%
64	40%	100%
65	100%	100%
66	100%	100%
67	100%	100%
68	100%	100%
69	100%	100%
70	100%	100%
Ref	922	1

Members eligible for 20 & Out are assumed to be first eligible for normal retirement after 19 years of service due to their ability (and experience) to purchase service. Members eligible for 25 & Out are assumed to be eligible for normal retirement after 24 years of service due to their ability (and experience) to purchase service. Members are also eligible to retire at age 60 with no service requirement. The rationale for these assumptions is the 2002-2007 Experience Study.

Probabilities of Separation

Sample Ages	Years of Service	% of Active Members Withdrawing within Next Year	
		Police	Fire
ALL	0	8.50%	5.00%
	1	7.50%	4.00%
	2	6.00%	3.00%
	3	5.00%	2.00%
	4	4.50%	2.00%
25	5 & Over	4.50%	1.96%
30		3.30%	1.62%
35		2.30%	1.11%
40		1.70%	0.77%
45		1.50%	0.60%
50		1.10%	0.51%
55		0.80%	0.51%
60		0.80%	0.51%
Ref		566 207	230 113 x 0.85

Sample Ages	% of Active Members Becoming Disabled within Next Year			
	Police		Fire	
	Ordinary	Duty	Ordinary	Duty
25	0.06%	0.13%	0.07%	0.34%
30	0.07%	0.19%	0.08%	0.52%
35	0.08%	0.34%	0.09%	0.90%
40	0.11%	0.49%	0.12%	1.30%
45	0.16%	0.73%	0.18%	1.92%
50	0.47%	1.16%	0.53%	3.06%
55	0.73%	1.96%	0.82%	5.18%
60	0.83%	2.82%	0.94%	7.47%
Ref	105 x 0.75	90 x 0.85	105 x 0.85	90 x 2.25

The rationale for these assumptions is the 2002-2007 Experience Study.

Glossary

Actuarial Accrued Liability. The difference between (i) the actuarial present value of future plan benefits, and (ii) the actuarial present value of future normal cost. Sometimes referred to as "accrued liability" or "past service liability."

Accrued Service. The service credited under the plan which was rendered before the date of the actuarial valuation.

Actuarial Assumptions. Estimates of future plan experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

Actuarial Cost Method. A mathematical budgeting procedure for allocating the dollar amount of the "actuarial present value of future plan benefits" between the actuarial present value of future normal cost and the Actuarial Accrued Liability. Sometimes referred to as the "actuarial funding method."

Actuarial Equivalent. A single amount or series of amounts of equal value to another single amount or series of amounts, computed on the basis of the rate(s) of interest and mortality tables used by the plan.

Actuarial Present Value. The amount of funds presently required to provide a payment or series of payments in the future. It is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

AFC. Average Final Compensation.

Amortization. Paying off an interest-bearing liability by means of periodic payments of interest and principal, as opposed to paying it off with a lump sum payment.

ARF. Annuity Reserve Fund.

ASF. Annuity Savings Fund.

Contribution Budgeting Liability. An expected return based measure of pension obligation.

DPOA. Detroit Police Officers Association.

DFFA. Detroit Fire Fighters Association.

DPCOA. Detroit Police Command Officers Association.

DROP. Deferred Retirement Option Program.

Glossary (Concluded)

Experience Gain (Loss). A measure of the difference between actual experience and that expected based upon a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the Actuarial Cost Method being used.

GASB: Governmental Accounting Standards Board.

PFA: Funding Plan Assets

FY: Fiscal Year

LSA. Lieutenants and Sergeants Association.

MVA: Market Value Assets

Normal Cost. The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as "current service cost." Any payment toward the Unfunded Actuarial Accrued Liability is not part of the Normal Cost.

PAF. Pension Accumulation Fund.

POA. The 8th Amended Plan for the Adjustment of the Debt of the City of Detroit.

Reserve Account. An account used to indicate that funds have been set aside for a specific purpose and are not generally available for other uses.

Solvency Liability. A market-based measure of the present value of accrued benefits at a municipal bond discount rate unadjusted for the credit quality of the plan sponsor.

Unfunded Actuarial Accrued Liability. The difference between the Actuarial Accrued Liability and Valuation Assets. Sometimes referred to as "unfunded accrued liability."

Valuation Assets. The value of current plan assets recognized for valuation purposes.

APPENDIX II – FUNDING POLICY

Police and Fire Retirement System of the City of Detroit
Actuarial Funding Policy

Introduction

The purpose of this Actuarial Funding Policy is to record the funding objectives and policy set by the Board of Trustees (Board) for the Police and Fire Retirement System of the City of Detroit (the System). The Board establishes this Actuarial Funding Policy to help ensure the systematic funding of future benefit payments for members of the Plan.

In 2014, the Plan for the System was written and approved by the bankruptcy court as part of the City's Plan of Adjustment (POA). At that time, the original retirement plan was split into two Retirement Plans: Component I (Hybrid) and Component II (Legacy). In accordance with the POA, employer contributions and certain assumptions cannot be changed until fiscal year 2024. This Policy is intended to recognize those items as fixed until 2024 and establish a funding policy for the period beginning in fiscal year 2024, when employer contributions must be determined on an actuarial basis. Nothing in this Policy is intended to prevent the Board from altering the Policy prior to fiscal year 2024 as conditions change or additional information becomes available to the Board.

This Policy shall be regularly reviewed by the Board.

Funding Objectives

1. Provide benefit security to members of the System:
    a. For purposes of this policy, benefit security means having adequate liquidity to pay benefits when due.
2. Establish an appropriate employer contribution based on the following objectives:
    a. Fully funding the Legacy Plan liability no later than 2054;
    b. Keeping the Hybrid Plan fully funded; and
    c. Managing employer contribution volatility.
3. Provide a reasonable margin for adverse experience to help offset risks.
4. Measure and monitor funding status, post-2024 contribution estimates and risk.
    a. Perform annual valuations; and
    b. Include post-2024 contribution estimates (based on this Policy) in annual actuarial valuations.

The Plans will have annual actuarial valuations each June 30. Employer contributions will be determined for the fiscal year ending two years after the valuation date. For example, the actuarially determined employer contribution for the fiscal year ending June 30, 2024 will be determined by the June 30, 2022 annual actuarial valuation.

Annual actuarial valuations may or may not also serve other purposes such as Legacy Plan restoration, Hybrid plan Section 9.5 fiscal responsibility calculations, and/or Annuity Savings Fund excess interest transfers between components. Unless otherwise stated, those purposes are not subject to this Policy.

For all other funding purposes, annual actuarial valuations will include the following elements of the Actuarial Funding Policy:

1. **Actuarial Cost Method**

   a. Hybrid Plan: The Entry Age actuarial cost method shall be used in determining the Actuarial Accrued Liability (AAL) and Normal Cost with the entry age based on date of hire. Since this component was created in July 2014 and granted eligibility and vesting service prior to July 2014 (for members hired before that date), this Plan had an unfunded actuarial accrued liability on the effective date, known as the transition cost. As of June 30, 2017, the AAL (including the transition cost) in the Hybrid Plan was fully funded. This Plan could become less than fully funded in the future if experience is less favorable than assumed or there are changes in assumptions or Plan provisions.

   b. Legacy Plan: The Unit Credit Normal actuarial cost method shall be used in determining Actuarial Accrued Liability (AAL) and Normal Cost. Since this component is closed and accrued benefits are frozen as of June 30, 2014, this method results in no normal costs and an AAL that equals the Present Value of Accrued Benefits (PVAB) of each member.

2. **Asset Smoothing Method**

   a. For estimating contributions prior to June 30, 2023, the Funding Value of Assets (or actuarial value of assets) will be equal to the Market Value of Assets, as mandated by the Plan of Adjustment. For determining (or estimating) employer contributions on or after fiscal year 2024, the Funding Value of Assets will be based on a method that employs smoothing of market gains and losses over a closed period. The smoothing period for recognized market gains and losses (above or below the assumed rate of return) will be a 3-year period.

   b. The Funding Value of Assets shall not diverge from the Market Value of Assets by more than 15%.

   c. The annual actuarial valuation will calculate results on both the smoothed value of assets and the (non-smoothed) Market Value of Assets beginning with the June 30, 2019 valuation (the Funding Value of Assets will initially be set to the Market Value of Assets as of June 30, 2018 with smoothing beginning prospectively). The post-2024 contribution estimate will always be based on the smoothed value of assets. Other results (UAAL, Funded Status, etc.) will be based on the Market Value of Assets prior to 2024 and the smoothed value of assets after 2023.

3. Amortization Method

a. Hybrid Plan

a) A Level Percent of Payroll amortization method shall be used to systematically eliminate (pay off) the Unfunded Actuarial Accrued Liability (UAAL) over a closed 15-year period from the later of July 1, 2023 or the applicable fiscal year after the funded status falls below 100%.

b) If funded status is above 100%, the contribution requirements for the UAAL will be $0 (thereby creating a minimum employer contribution of employer normal cost).

c) Layered amortizations will be considered by the Board post-2024.

b. Legacy Plan

a) The Level Dollar amortization method shall be used to systematically eliminate (pay off) the Unfunded Actuarial Accrued Liability (UAAL) over a closed period of 20 years from July 1, 2023 for the UAAL as of July 30, 2022 (projected to July 1, 2023), and

b) Layered amortizations that use 20-year closed periods for gains and losses occurring after June 30, 2022 (each 20-year period starts with the first payment after the applicable gain or loss occurs).

4. Funding Target and Cash Flow Projections

a. The targeted funded ratio shall be 100%.

b. The Legacy Plan annual actuarial valuation shall include projections of estimated employer contributions, expected benefit payments and estimated funded status to the later of fiscal year 2054 or 30 years after the applicable employer contribution fiscal year.

c. Section 9.5 of the Plan details the actions to be taken if the 5-year projected funded status falls below 90% (Hybrid Plan, only).

5. Risk Management

a. Assumption Changes

a) The actuarial assumptions used shall be those last adopted by the Board based on the most recent experience study and upon the advice and recommendation of the actuary. In accordance with the City Ordinance, the actuary shall conduct an experience study at least every five years. The results of the study shall be the basis for the actuarial assumption changes recommended to the Board. However, the assumed rate of return and the actuarial value of assets are mandated by the City's POA and cannot be changed prior to June 30, 2023.

b) The actuarial assumptions may be updated at any time, as advised by the actuary, if significant Plan design changes or other significant events occur.

c) The next experience study will be performed after the 2020 actuarial valuation and will include both economic (investment return, inflation, etc.) and demographic (mortality, retirement, disability, etc.) assumptions. Even though the investment rate of return may not be changed for determining employer contributions until after June 30, 2023, the Board may elect to show valuation results under an alternative reasonable assumed rate of investment return prior to 2023.

b. Risk Measures

a) Risk measures will be included in the annual actuarial valuations. Below is a list of potential measures to be included. The measures may be changed over time as deemed appropriate.

(i) Classic measures currently determined

- Funded ratio (assets / liability) on both a market value and funding value (if funding value is not equal to market).
- UAAL amortization period (years required to pay down the UAAL based on current funding rates).
- Portfolio rate of return for the year on both the market value and funding value of assets.
- 5- and 10-year geometric average portfolio rate of return on both the market value and funding value of assets (developed prospectively beginning with the 2019 valuation).
- 5- and 10-year standard deviation of return on both the market value and funding value of assets (developed prospectively beginning with the 2019 valuation).

(ii) Duration of the Actuarial Accrued Liability

- Measures the sensitivity of the liability to a 1% change in assumed rate of return. A decrease in this measure indicates a decrease in assumed rate sensitivity and vice versa.

(iii) Total UAAL / Covered Payroll

- Measures the risk associated with contribution rates relative to the impact on the ability to fund the UAAL. A decrease in this measure indicates a decrease in UAAL contribution risk and vice versa.
- Consideration will be given to using total payroll or revenue source, if available.

(iv) Total Assets / Covered Payroll

- Measures the risk associated with the potential impact of asset experience on contributions. A decrease in this measure indicates a decrease in asset risk and vice versa.
- Consideration will be given to using total payroll or revenue source, if available.

(v) Total AAL / Covered Payroll

- Measures the risk associated with the potential impact of liability experience on contributions. A decrease in this measure indicates a decrease in experience risk and vice versa. This also provides a long-term measure of the asset risk where the System has a target funded ratio of 100%.
- Consideration will be given to using total payroll or revenue source, if available.

(vi) Non-Investment Cash flow / Beginning of year assets

- Measures depletion risk, sensitivity to annual investment gains and losses risk and the maturity of the plan. For a mature open plan, this may converge to the negative of the real rate of return assumption (investment return less wage inflation). A less negative number (or a positive number) indicates a less mature plan and/or a plan that is at lower risk of fund depletion and less sensitive to annual gains and losses. A more negative number indicates a more mature plan and/or a plan that is more at risk of fund depletion and more sensitive to annual gains and losses. For a super-mature closed plan such as the Legacy plan, this may become more negative over time as liquidity needs increase.

(vii) Market Value of Assets / Benefit Payments

- Measure depletion risk. A low value estimates the number of years to depletion disregarding future contributions and investment return.

(viii) Solvency Liability

- Measures the estimated cost of accrued benefits as a result of minimizing investment risk in the portfolio.

b) Risk Control: The Board shall carefully monitor the risk measures above and shall consider steps to mitigate risk, particularly as the Legacy Plan funded ratio increases. Examples of risk mitigating techniques include, but are not limited to:

(i) Reviewing investment risk in accordance with the Board's Investment Policy

(ii) Adding provisions for adverse deviation in the actuarial assumptions

(iii) Increasing employer contributions (through a change in methods, assumptions, or amortization period)

(iv) Other

Glossary

1. **Actuarial Accrued Liability (AAL):** The difference between (i) the actuarial present value of future plan benefits; and (ii) the actuarial present value of future normal cost. Sometimes referred to as "accrued liability" or "past service liability."
2. **Actuarial Assumptions:** Estimates of future plan experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.
3. **Actuarial Cost Method:** A mathematical budgeting procedure for allocating the dollar amount of the "actuarial present value of future plan benefits" between the actuarial present value of future normal cost and the actuarial accrued liability. Sometimes referred to as the "actuarial funding method."
4. **Actuarial Gain (Loss):** A measure of the difference between actual experience and that expected based upon a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used. For example, if during a given year the assets earn more than the investment return assumption, the amount of earnings above the assumption will cause an unexpected reduction in UAAL, or "actuarial gain" as of the next valuation. These include contribution gains and losses that result from actual contributions made being greater or less than the level determined under the policy.
5. **Actuary:** A person who is trained in the applications of probability and compound interest to problems in business and finance that involve payment of money in the future, contingent upon the occurrence of future events. Most actuaries in the United States are Members of the American Academy of Actuaries (MAAA). The Society of Actuaries is an international research, education and membership organization for actuaries in the life and health insurance, employee benefits, and pension fields. It administers a series of examinations leading initially to Associateship and the designation ASA and ultimately to Fellowship with the designation FSA.
6. **Amortization:** Paying off an interest-bearing liability by means of periodic payments of interest and principal, as opposed to paying it off with a lump sum payment.
7. **Unit Credit Normal Actuarial Cost Method:** A funding method that calculates the Normal Cost as the present value of the change in accrued benefits for active members.
8. **Experience Study:** An actuarial investigation of demographic and economic experiences of the system during the period studied. The investigation was made for the purpose of updating the actuarial assumptions used in valuing the actuarial liabilities.
9. **Funding Value of Assets**: The value of current plan assets recognized for valuation purposes. Generally based on a phased-in recognition of all or a portion of market related investment return. Sometimes referred to as Actuarial Value of Assets or Smoothed value of Assets.
10. **Market Value of Assets:** The fair value of plan assets as reported in the plan's audited financial statements.
11. **Normal Cost (NC):** The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as "current service cost." Any payment toward the unfunded actuarial accrued liability is not part of the normal cost.
12. **Unfunded Actuarial Accrued Liability (UAAL):** The positive difference, if any, between the actuarial accrued liability and valuation assets. Sometimes referred to as "unfunded accrued liability."

Actuarial Value of Assets

	2018	2019	2020	2021	2022
A. Funding Value Beginning of Year	$ 2,922,141,978	$ 2,866,303,805	$ 2,728,941,361		
B. Market Value End of Year	2,866,303,805	2,670,843,356	2,417,248,140		
C. Market Value Beginning of Year	2,922,141,978	2,866,303,805	2,670,843,356		
D. Contributions During Year:					
D1. City Contributions (End of Year)	18,300,000	18,300,000	18,300,000		
D2. Member Contributions	42,114	3,600	0		
D3. Total	18,342,114	18,303,600	18,300,000		
E. Disbursements:					
E1. Benefits Paid During Year	288,443,573	286,557,514	286,551,161		
E2. Refunds	19,947,151	19,054,169	14,024,530		
E3. Transfers	0	4,030,561	1,618,996		
E4. Total	308,390,724	309,642,244	302,194,687		
F. Investment Income:					
F1. Average Funding Value	2,767,967,673	2,711,484,483	2,577,844,018		
F2. Assumed Rate	6.75%	6.75%	6.75%		
F3. Amount for Immediate Recognition: F1 X F2		183,025,203	174,004,471		
F4. Market Total: B - C - D3 + E4	234,210,437	95,878,195	30,299,471		
F5. Amount for Phased-In Recognition: F4-F3		(87,147,008)	(143,705,000)		
G. Phased-In Recognition of Investment Income:					
G1. Current Year: F5/3		(29,049,003)	(47,901,667)		
G2. 1st Prior Year		0	(29,049,003)	(47,901,667)	
G3. 2nd Prior Year		0	0	(29,049,002)	(47,901,666)
G3. Total Recognized Investment Gain		(29,049,003)	(76,950,670)	(76,950,669)	(47,901,666)
H. Total Interest Distributed - Current Year: F3 + G3	234,210,437	153,976,200	97,053,801		
I. Funding Value End of Year:					
I1. Preliminary Funding Value End of Year: A + D - E + H		2,728,941,361	2,542,100,475		
I2. Upper Corridor Limit 115% x B		3,071,469,859	2,779,835,361		
I3. Lower Corridor Limit 85% x B		2,270,216,853	2,054,660,919		
I4. **Funding Value End of Year**	**2,866,303,805**	**2,728,941,361**	**2,542,100,475**		
J. Difference Between Market & Funding Value: B - I4	0	(58,098,005)	(124,852,335)		
K. Recognized Rate of Return: H / F1	8.46%	5.68%	3.76%		
L. Market Rate of Return: F4 / (F1 + C - A)	8.46%	3.54%	1.20%		
M. Ratio of Funding Value to Market Value: I4 / B	100.00%	102.18%	105.17%		

The Funding Value of Assets recognizes assumed investment income (line F3) fully each year. Differences between actual and assumed investment income (line F5) are phased-in over a closed 3-year period. During periods when investment performance exceeds the assumed rate, Funding Value of Assets will tend to be less than market value. During periods when investment performance is less than the assumed rate, Funding Value of Assets will tend to be greater than market value. The Funding Value of Assets is unbiased with respect to Market Value. At any time, it may be either greater or less than Market Value. If assumed rates are exactly realized for two consecutive years, the Funding Value will become equal to Market Value.

800.521.0498 | P: 248.799.9000 | www.grsconsulting.com

June 8, 2021

Mr. David Cetlinski, Executive Director
The Police and Fire Retirement System
of the City of Detroit
One Detroit Center
500 Woodward Avenue, Suite 3000
Detroit, MI 48226

Re: June 30, 2020 Actuarial Valuation

Dear Dave:

Enclosed are 30 copies of the Revised June 30, 2020 Component II annual actuarial valuation.

Sincerely,

Kenneth G. Alberts

KGA:ah
Enclosures

cc: Kelly Tapper, City of Detroit Retirement Systems
Gail Oxendine, City of Detroit Retirement Systems
Ryan Bigelow, City of Detroit Retirement Systems
David T. Kausch, GRS
Judith A. Kermans, GRS