The Police and Fire Retirement System of the City of Detroit

Annual Actuarial Valuation of Component II

June 30, 2018

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February 7, 2019

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

Dear Board Members:

This 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, 2018.**

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 provides 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 will be the subject of a separate report. The purposes of the valuation are to measure the funding progress of Component II in accordance with the terms of the POA and to provide alternate illustrative actuarially determined contribution amounts for comparison with the contribution amounts provided in the POA. 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. In our judgement, all of the actuarial assumptions used for the valuation are reasonable for purposes of the measurement being taken.

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 and Judith A. Kermans 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.

Our understanding, based on recent information provided by the Retirement System, is that in fall 2018 the Bankruptcy Court approved a change to the POA that now allows LSA members who DROP to stay in the DROP plan for up to 10 years. We have incorporated that change into this valuation.

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

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VALUATION RESULTS

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)
2019	$ 18.3
2020	18.3
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 was 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.

The Estimated Employer Contribution for FY 2024 shown below 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.

	($ millions)
UAAL * as of June 30, 2018	$ 1,041.1
Anticipated POA Contribution for FY 2019	18.3
Anticipated Expenses[@]	-
Interest at 6.75%	70.3
Projected UAAL * as of June 30, 2019	$ 1,093.0
Anticipated POA Contributions for FY 2020	**18.3**
Estimated Employer Contributions for FY 2024[!]	
Level Principal (30-year period beginning in FY 2024)	**$ 135.0**
Level Dollar (30-year period beginning in FY 2024)	**$ 105.2**

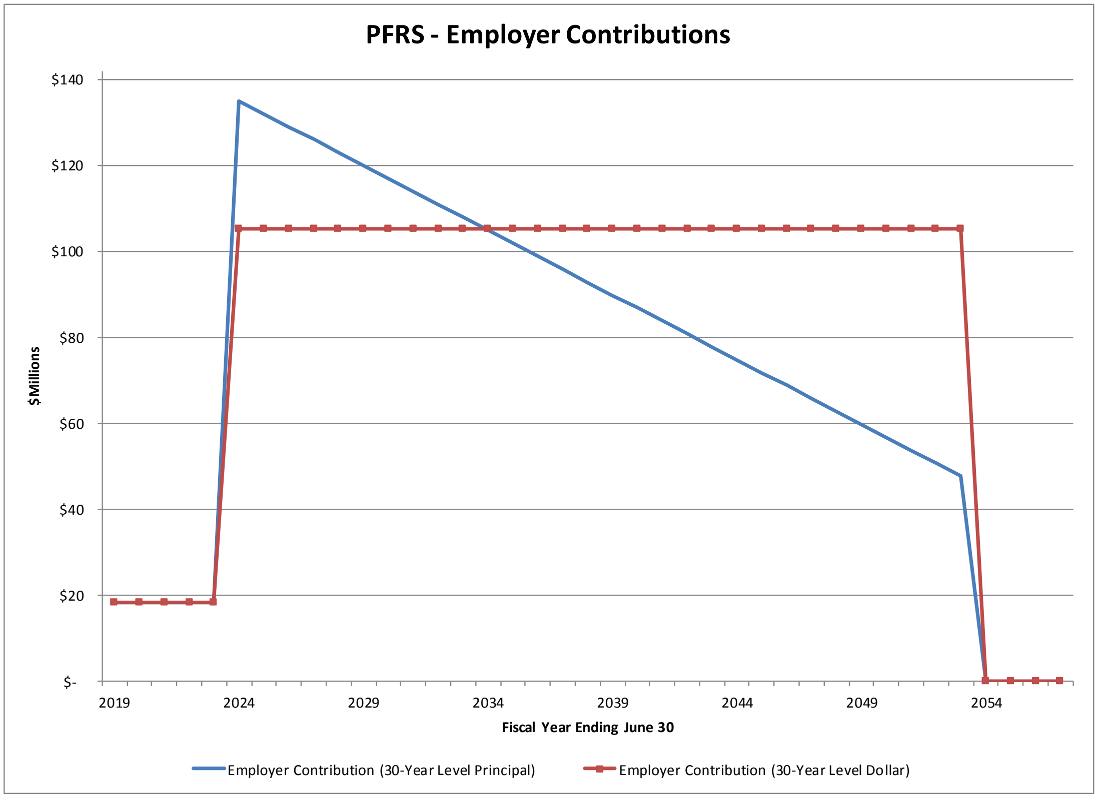
* *Unfunded Actuarial Accrued Liability.*

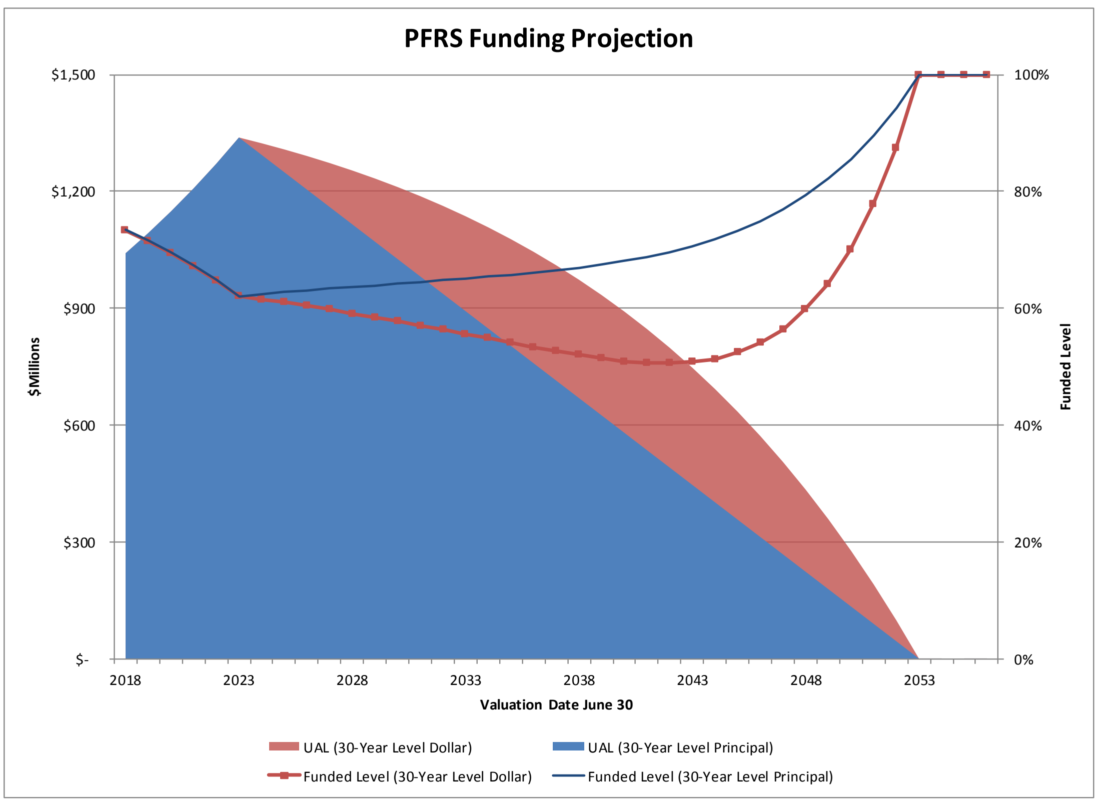
@ *In accordance with the Plan Document, the mandated 6.75% rate of return is net of investment and administrative expenses. Contributions are assumed to be made at the end of the year.*

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

The POA contributions 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 2018 is about one fourth of the interest that will accrue on the UAAL and about 6% of the annual benefit payments.

Valuation Results (Continued)





Notes: 30-year amortization periods are assumed to begin in FY 2024.
30-year level dollar is expected to result in a declining funded status for many years after June 30, 2023.

Valuation Results (Continued)

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 begun the process. Once that process has been completed we will incorporate the adopted policy in future valuation reports. Until that process is completed, we will continue to show the following two possible policies.

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 (5 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 2020 (Funding Policy 1)	$ 264.8
(2) Illustrative Contribution for FY 2020 (Funding Policy 2)	110.2
(3) POA Contribution for FY 2020	18.3
Fiscal Year 2020 Shortfall - Funding Policy 1: (1) - (3)	$ 246.5
Fiscal Year 2020 Shortfall - Funding Policy 2: (2) - (3)	$ 91.9

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.

In addition, as the Board works through the funding policy, we would suggest considering a funding period less than 30 years. Given the fact that not all of the retiree liabilities are funded, a period of 15 years or less should be considered so that progress can be made in paying off the UAAL.

Valuation Results (Continued)

Present Value	June 30, 2018	June 30, 2017
Accrued Pension Liabilities		
Retirees and beneficiaries	$3,073,060,042	$3,093,458,274
Inactive members future deferred pensions	61,836,388	59,989,302
Active members	667,994,063	693,305,462
Total accrued pension liabilities	3,802,890,493	3,846,753,038
Pension fund balances	2,761,816,192	2,800,999,559
Unfunded accrued pension liabilities	$1,041,074,301	$1,045,753,479
Accrued Annuity Liabilities		
Retirees and beneficiaries		
Future annuities	$ 3,962,935	$ 3,955,529
Reserve for outstanding refunds & contingencies	26,017,157	26,417,045
Total	$ 29,980,092	$ 30,372,574
Members annuities & future refunds	74,507,521	90,769,845
Total accrued annuity liabilities	104,487,613	121,142,419
Annuity fund balances	104,487,613	121,142,419
Unfunded accrued annuity liabilities	$ 0	$ 0
System Totals		
Actuarial accrued liabilities	$3,907,378,106	$3,967,895,457
Accrued assets	2,866,303,805	2,922,141,978
Unfunded actuarial accrued liabilities	$1,041,074,301	$1,045,753,479

Valuation Results (Concluded)

Funded Ratio - POA

		Defined Benefit	Annuity Funds	Total
A	Actuarial Accrued Liability	$ 3,802,890,493	$ 104,487,613	$ 3,907,378,106
B	Market Value of Assets	$ 2,761,816,192	$ 104,487,613	$ 2,866,303,805
C	Unfunded Actuarial Accrued Liability (A - B)	$ 1,041,074,301	$ -	$ 1,041,074,301
D	Funded Ratio (B/A)	72.6%	100.0%	73.4%
E	Prior Years Funded Ratio	72.8%	100.0%	73.6%

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.

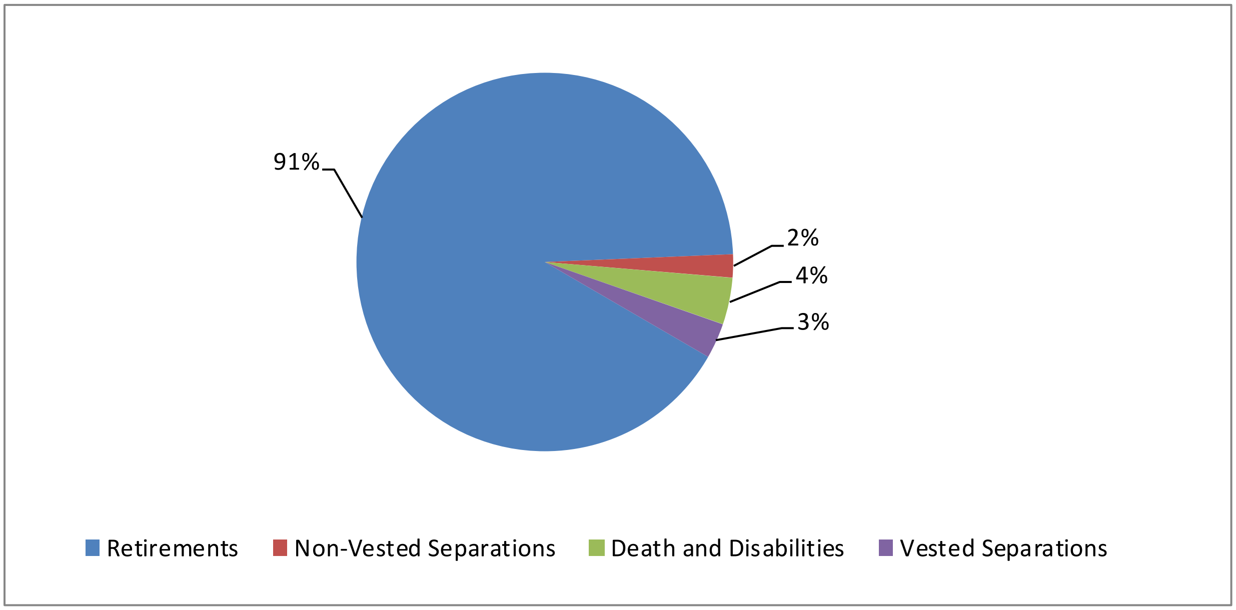
Funded Ratio - Solvency

		Defined Benefit	Annuity Funds	Total
A	Actuarial Accrued Liability	$ 5,417,933,109	$ 104,487,613	$ 5,522,420,722
B	Market Value of Assets	$ 2,761,816,192	$ 104,487,613	$ 2,866,303,805
C	Unfunded Actuarial Accrued Liability (A - B)	$ 2,656,116,917	$ -	$ 2,656,116,917
D	Funded Ratio (B/A)	51.0%	100.0%	51.9%

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 3.62% as of June 30, 2018, based on the long-term municipal bond rate ("20-Year Municipal GO AA Index" rate from the Fidelity Index as of June 29, 2018). 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.

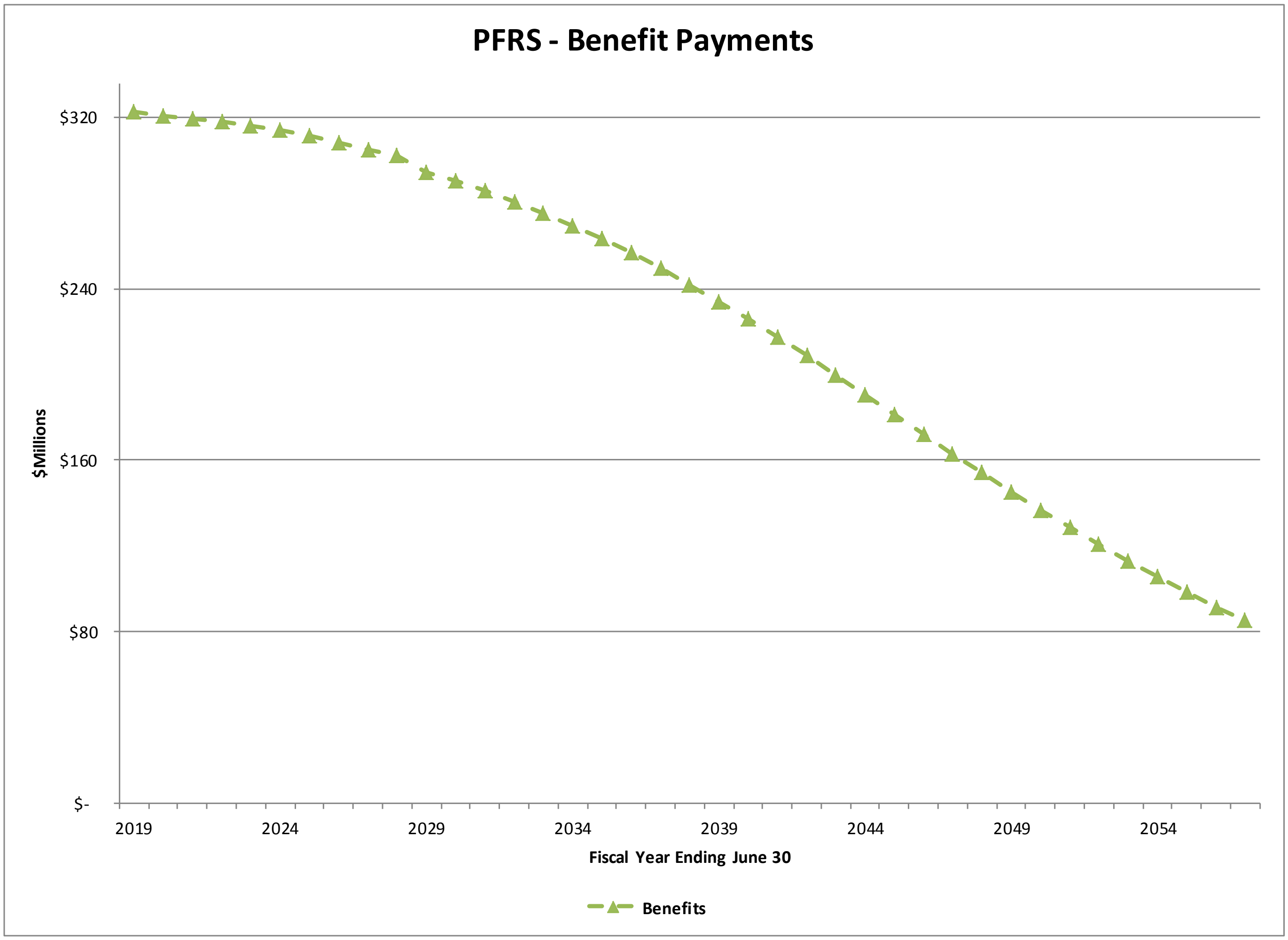
Expected Terminations from Active Employment for Current Active Members



The chart above shows the expected future development of the present population in simplified terms. The Retirement System presently covers 1,752 active members (excluding 694 members currently in the DROP). Eventually, 29 members are expected to terminate covered employment prior to retirement and forfeit eligibility for an employer provided benefit. 1,646 members are expected to receive monthly retirement benefits either by retiring directly from active service (including DROP), or by retiring from vested deferred status. 77 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.



Comments, Recommendations and Conclusion

Benefit Changes

We understand that new DROP plan provisions have been adopted. The new provisions allow DPLSA (Detroit Police Lieutenants and Sergeants Association) members to participate in the DROP program for a maximum of 10 years, up from the prior maximum of 5 years. We modeled this change by changing the DROP assumptions for this group. The assumptions we used are consistent with our February 24, 2017 supplemental valuation modeling proposed changes to the DROP provisions. For eligible DPLSA members, it was assumed that 65% of members would DROP and would stay in DROP for an average of seven (7) years. The change in the DROP provision combined with the corresponding change in the DROP assumption resulted in a $3 million decrease in the UAAL.

Experience

Experience was more favorable than assumed during the year ending June 30, 2018. The chart below shows the estimated total experience gain and the portion of the gain/loss due to investments.

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

		$ Millions
(1) UAAL as of June 30, 2017	$	1,045.8
(2) POA Contribution FY 2018		18.3
(3) Interest at 6.75%		70.6
(4) Benefit Changes		(3.2)
(5) Projected UAAL* as of June 30, 2018 (1) - (2) + (3) + (4)	$	1,094.9
(6) Actual UAAL* as of June 30, 2018		1,041.1
Gain (Loss): (5) - (6)	$	53.8
Gain (Loss) from Investments		48.6
Gain (Loss) from Liabilities		5.2

** Unfunded Actuarial Accrued Liability.*

Type of Risk Area	Gain (Loss) in Period*	
	Totals ($ in millions)	Percent of Beginning of Year Liabilities^
Data Improvements**	$ (2.6)	(0.1)%
Risks Related to Assumptions		
Economic Risk Areas:		
Investment Return	48.6	1.2 %
Demographic Risk Areas:[@]		
Full and Reduced Service Retirements	9.4	0.2 %
Death Benefits	0.1	0.0 %
Disability Benefits	(3.8)	(0.1)%
Other Terminations	(7.2)	(0.2)%
Post-Retirement Mortality	9.3	0.2 %
Total Gain (or Loss) During Period	53.8	1.4 %

* *Results are approximate due to limitations in data.*

^ *Beginning of year accrued liabilities is equal to $3,967.9 million.*

****Includes adjustments to modeling as a result of improved data.*

[@] *Includes both the gain/loss due to the decrement category plus the gain/loss due to benefits computed upon decrement.*

Comments, Recommendations and Conclusion

The main sources of gains were:

- Investment experience
- Retirements (fewer members retired then assumed)
- Quits (more members quit then assumed)
- Mortality (more members died then assumed)

These gains were partially offset by experience losses. The main sources of the losses were:

- Benefits for members terminating active status (other than retirements) larger then modeled

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, 2017 valuation to our estimate from this valuation (June 30, 2018). For purposes of this reconciliation, amortized periods are 30 years.

	$ Millions	
	Level Principal	Level Dollar
Estimated FY 2024 Employer Contribution from 6/30/2017 Valuation	$ 142.9	$ 111.4
Benefit Changes	(0.4)	(0.3)
Investment Loss (Gain)	(6.8)	(5.3)
Other Experience	(0.7)	(0.6)
Estimated FY 2024 Employer Contribution from 6/30/2018 Valuation	$ 135.0	$ 105.2

Annuity Reserve Fund (ARF)

The ARF, as reported, was $26 million higher than the related accrued liabilities for Retirees and Beneficiaries. If the Board chooses to transfer some or all of the $26 million from the ARF to the Pension Accumulation Fund (PAF) within Component II, the transfer would reduce the UAAL.

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. However, since the fund earned approximately 10% during FY 2017 and approximately 8% in FY 2018, we expect that there will be a transfer of excess ASF interest to Component I in FY 2019 and FY 2020. Approximately $2.8 million was added to the liabilities in this report to account for anticipated excess earnings expected to occur as a result of return on assets in the 2017 and 2018 fiscal year. We have previously discussed this 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.

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)	FY 2 Years Prior to Transfer: 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 Trasferred Out (BOY) (K) = (H) x (J)
2019	$ 74,507,521	$ 9,519,859	$ 68,652,607	2017	10.06%	4.81%	$ 3,583,812	>100%	50%	$ 1,791,906
2020	68,652,607	9,519,859	62,490,310	2018	8.46%	3.21%	2,203,749	>100%	50%	1,101,875

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.

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.

Plan Maturity 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. Generally accepted plan maturity measures include the following:

	2018
Ratio of the market value of assets to total payroll*	19.5
Ratio of actuarial accrued liability to payroll*	26.6
Ratio of actives to retirees and beneficiaries	0.2
Ratio of net cash flow to market value of assets	-10.1%
Duration of the actuarial accrued liability	9.7

**Payroll for this purpose is Component I payroll of $146.7 million.*

Ratio of Market Value of 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.

Ratio of Actives to Retirees and Beneficiaries

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

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Ratio of Net 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.

Duration of 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, duration of 10 indicates that the liability would increase approximately 10% if the assumed rate of return were lowered 1%.

Additional Risk Assessment

The Solvency Liability shown on page 5 may be considered as a 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 included additional risk assessments in the funding policy discussions based on the 2017 actuarial valuation. We can update those at the Board's request.

Comments, Recommendations and Conclusion

Reserves

As discussed in the 2017 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). The interest credit to the Annuity Savings Fund is approximately 4.5% of the beginning of year ASF balance. However, that amount is approximately 3.3% of the sum of the ASF and ARF at the beginning of the year. We, therefore, recommend that the development of these reserves be reviewed. Note ASF interest credits are determined by Plan provisions and Board policy and are calculated by System staff. Section C-1(20) of the Combined PFRS Plan details the method in which the ASF is credited interest. We recommend the System review the administration of the ASF interest crediting.

Census Data and Approximations

Data was reported separately for Component I and Component II. Additional time was needed to reconcile these two data sets as they came from different source data. 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. Additional information about the data approximations and assumptions may be found on page 28.

Disability Retirees

The Police and Fire Retirement System Combined Plan provide 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. In addition, assets reported for Component I do not appear to be consistent with that interpretation. We estimate that of the disability gains and losses accounted for on page 9, a loss of approximately $3.5 million is attributable to this activity and the rest is attributable to other disability experience. We understand that staff has reviewed this issue and has made administrative changes effective after the valuation date. For purposes of this valuation, we have aligned the assumptions for disability benefits with our understanding of this administrative change. In particular, for future retirees, duty disability 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 benefits are assumed to be paid out of Component II (this plan).

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.

Comments, Recommendations and Conclusion

Actuarial Assumptions

The Retirement System routinely has five-year experience studies in accordance with the City ordinance. The last experience study for the period from July 1, 2007 through June 30, 2012 was started but not completed due to the bankruptcy. We conducted a review of the mortality experience in 2013. We recommend that the System consider the experience study schedule. The next experience study would be scheduled for the period from July 1, 2012 through June 30, 2017. However, in order to avoid distortions from the bankruptcy, the next experience study could be scheduled to begin just after the City emerged from bankruptcy. This, however, would suggest a study based on the period July 1, 2015 through June 30, 2020. We understand the Board has chosen to follow this suggestion and has scheduled the next experience study to begin subsequent to the June 30, 2020 valuation.

Additional Contributions

We understand the City has set aside money to be contributed to the General and Police and Fire Component II (Legacy) plans. We have not included any of this money in the valuations or projections since: 1) it has not been determined how the money will be split between the two Legacy plans; and 2) it has not been reported in the audited assets of the trust. Once the money has been contributed (or has been legally determined to be irrevocably allocated to the trust), we will reflect it.

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 2019 investment performance has not yet been provided to us, the S&P 500 and the Dow Jones Industrial Average have so far both returned substantially less than 6.75%. If the Retirement System's experience is similar, this will result in downward pressure on the funded status and upward pressure on the FY 2024 contribution requirements (above what is shown in this report).

The POA mandated contributions for FY 2019 and beyond are expected to defund the Retirement System from 74% to approximately 62% (see page 2), even if all assumptions are realized. In FY 2019, the POA mandated contributions will be about ¼ of the interest accrued on the UAAL.

Comments, Recommendations and Conclusion (Concluded)

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 just over $300 million compared to FY 2018 contributions of $18 million.

Prior Recommendation

We understand that the Retirement System has undergone a service and AFC audit on active member data in lieu of computing frozen accrued benefits.

Prior Recommendation

The Board is currently working on the development of a funding policy for FY 2024 and beyond.

Conclusion

The funded status of the plan as of June 30, 2018 was very close to the funded status as of June 30, 2017 primarily due to strong investment performance. While it is possible this result will be similar in 2019, it is still likely that the funded status will decline and the unfunded actuarial accrued liability will increase between now and FY 2024 to approximately 62% if assumptions are met.

DATA FURNISHED FOR VALUATION

Summary of Benefit Provisions
(June 30, 2018)

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, 2018) (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.

Summary of Benefit Provisions
(June 30, 2018) (Concluded)

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.

Asset Information Furnished for Valuation

Reported Assets
(Market Value)

Market Value - June 30, 2018	
Cash and Cash Equivalents	$ 126,938,089
Investments at fair value	2,737,490,181
Receivables	98,187,067
Cash and Investments held as collateral for securities lending	235,392,139
Capital Asset - Net	551,830
Accounts Payable	(332,255,501)
Total Current Assets	**$ 2,866,303,805**

Asset Information Used for Valuation

Reserve Accounts

Funds	Fund Balances June 30, 2018	Fund Balances June 30, 2017
Annuity Savings	$ 74,507,521	$ 90,769,845
Annuity Reserve	29,980,092	30,372,574
Total Annuity Funds	104,487,613	121,142,419
Pension Accumulation	(49,397,010)	(5,688,439)
Pension Reserve	2,808,564,732	2,800,881,977
Accrued Liability Fund Reserve	0	0
Survivor Benefit	2,648,470	5,806,021
Market Stabilization Fund	0	0
Total Pension Funds	2,761,816,192	2,800,999,559
Total Fund Balances	$2,866,303,805	$2,922,141,978

Revenues and Expenditures

	Pension Funds	Annuity Funds +	Total Funds
Market Value July 1, 2017	$2,800,999,559	$121,142,419	$2,922,141,978
Revenues			
Member Contributions	27,139	14,975	42,114
Employer Contributions	18,300,000	0	18,300,000
Investment Income	234,321,368	3,669,852	237,991,220
Less Investment Expense	0	0	0
Other Income	1,153,145	0	1,153,145
Total	$ 253,801,652	$ 3,684,827	$ 257,486,479
Expenditures			
Benefit Payments	288,051,091	392,482	288,443,573
Refund of Member Contributions	0	19,947,151	19,947,151
Other	0	0	0
Administrative Expenses	4,933,928	0	4,933,928
Total	$ 292,985,019	$ 20,339,633	$ 313,324,652
Other Adjustment	$ 0	$ 0	$ 0
Market Value June 30, 2018	$2,761,816,192	$104,487,613	$2,866,303,805
Market Value Rate of Return	8.7%	3.3%	8.5%

\+ *Reported Market Value of Annuity Savings Fund (ASF) and Annuity Reserve Fund (ARF). The ARF is credited with a fixed rate of return by the Plan document/ordinance (see comment on page 15). ASF interest credit is determined by the Board based on parameters set forth in the Plan document/ordinance.*

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, 2018
Tabulated by Attained Age@

Attained Age	Age & Service		Disability		Death-in-Service		Totals	
	No.	Monthly Allowances	No.	Monthly Allowances	No.	Monthly Allowances	No.	Monthly Allowances
Under 20*	7	$ 22,540	1	$ 2,972	36	$ 17,997	44	$ 43,509
20-24	1	845					1	845
25-29	2	5,366	2	5,925			4	11,291
30-34	4	7,603	0	0			4	7,603
35-39	8	11,022	45	135,293	4	6,276	57	152,591
40-44	48	79,595	70	216,930	13	22,275	131	318,800
45-49	169	292,908	113	351,449	14	23,996	296	668,353
50-54	332	884,662	115	349,903	14	26,598	461	1,261,163
55-59	401	1,119,881	125	362,860	14	25,124	540	1,507,865
60-64	737	2,213,503	175	489,750	30	56,395	942	2,759,648
65-69	1,283	4,190,722	363	941,986	45	83,606	1,691	5,216,314
70-74	1,240	3,879,156	366	909,524	37	67,030	1,643	4,855,710
75-79	806	2,283,604	175	425,370	23	44,200	1,004	2,753,174
80-84	410	1,005,442	45	126,695	15	29,254	470	1,161,391
85-89	382	876,097	33	85,929	18	39,824	433	1,001,850
90-94	291	608,965	31	83,402	12	25,852	334	718,219
95 & Over	83	153,896	12	32,958	1	2,040	96	188,894
Totals	**6,204**	**$17,635,807**	**1,671**	**$4,520,946**	**276**	**$470,467**	**8,151**	**$22,627,220**

@ 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.

** May include records with incorrect birth dates reported.*

Inactive Vested Members June 30, 2018

Attained Age	No.	Estimated Annual Allowances
Under 40	59	$975,518
40-44	110	2,180,681
45-49	106	2,358,538
50-54	63	1,430,999
55-59	30	741,972
60-64	15	406,109
65 & over	27	733,256
Totals	**410**	**$8,827,073**

Pre-1969 Retirees and Beneficiaries as of June 30, 2018
Tabulated by Attained Age

Attained Age	Age & Service# No.	Age & Service# Monthly Allowances	Disability# No.	Disability# Monthly Allowances	Death-in-Service No.	Death-in-Service Monthly Allowances	Totals No.	Totals Monthly Allowances
40-44	1	$ 1,935					1	$ 1,935
45-49	1	1,150					1	1,150
55-59	4	4,558					4	4,558
60-64	6	7,517			1	$ 1,968	7	9,485
65-69	19	35,163	0		5	10,608	24	45,771
70-74	202	413,665	78	$ 190,590	12	25,654	292	629,909
75-79	370	832,837	110	262,736	15	29,529	495	1,125,102
80-84	277	601,858	28	68,105	13	24,641	318	694,604
85-89	244	482,291	27	66,671	15	30,466	286	579,428
90-94	235	468,692	28	74,411	11	23,700	274	566,803
95 & Over	80	147,445	12	32,958	1	2,040	93	182,443
Totals	**1,439**	**$2,997,111**	**283**	**$695,471**	**73**	**$148,606**	**1,795**	**$3,841,188**

 # Includes survivor beneficiaries of service and disability retirees.

DROP Participants June 30, 2018

Attained Age	No.	Estimated Monthly Allowances &
Under 25	3	$ 4,784
35-39	1	1,099
40-44	45	59,030
45-49	133	227,266
50-54	216	516,854
55-59	181	481,843
60-64	86	287,830
65-69	23	91,054
70-74	5	19,112
75-79	1	5,375
Totals	**694**	**$1,694,247**

& Reflects the 75% of reported monthly benefits being paid into DROP accounts.

Active Members as of June 30, 2018
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	4							4	$ 217,566
25-29	40	11						51	2,830,228
30-34	26	53	22	1				102	6,017,770
35-39	13	33	47	82				175	10,788,778
40-44	5	14	29	202	55			305	19,699,167
45-49		18	13	192	156	7		386	25,862,579
50-54	3	6	7	70	55	10	4	155	10,278,261
55-59		2	2	25	16	3	2	50	3,108,859
60			1	2		1		4	235,948
61					1		1	2	133,994
62				1				1	62,074
63					1	1		2	218,201
64				1			1	2	115,916
68									0
69				1				1	59,118
Totals	**91**	**137**	**121**	**577**	**284**	**23**	**9**	**1,242**	**$79,770,731**

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	6							6	$ 330,540
25-29	22	3						25	1,267,677
30-34	25	3	2	1				31	1,668,751
35-39	11	5	16	36	1			69	4,026,821
40-44	1	3	16	71	15			106	6,363,266
45-49	2		8	75	50	16		151	9,604,624
50-54		3	2	25	26	23	8	87	5,924,840
55-59				12	12	9	1	34	2,385,258
Totals	**67**	**17**	**44**	**221**	**104**	**48**	**9**	**510**	**$31,636,489**

Total Active Members as of June 30, 2018
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	10							10	$ 548,106
25-29	62	14						76	4,097,905
30-34	51	56	24	2				133	7,686,521
35-39	24	38	63	118	1			244	14,815,599
40-44	6	17	45	273	70			411	26,062,433
45-49	2	18	21	267	206	23		537	35,467,203
50-54	3	9	9	95	81	33	12	242	16,203,101
55-59		2	2	37	28	12	3	84	5,494,117
60			1	3		1		5	300,660
61					1		1	2	133,994
62				1				1	62,074
63					1	1		2	218,201
64				1			1	2	115,916
68									
69				1				1	59,118
Totals	**158**	**154**	**165**	**798**	**388**	**71**	**18**	**1,752**	**$111,407,220**

	Group Averages		
	Police	**Fire**	**Total**
Age:	43.4 years	44.0 years	43.6 years
Benefit Service:	12.7 years	13.3 years	12.9 years
Eligibility Service:	16.6 years	17.3 years	16.8 years
Annual Pay:	$64,228	$62,032	$63,589

Reconciliation of Reported Data
as of June 30, 2018

Active Data

A) Count reported in PF_Benefits table:	2,454
B) In PF_Benefits file but not in Hybrid file:	(2)
C) Hired after plan closed:	(4)
D) Non-active Status:	(11)
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):	(685)
J) Rehire estimated termination prior to 2012:	-
K) Actives excluding DROP:	1,752

Retired Data

A) Number of records reported on data file:	42,943
B) Number of records not in P/F plan:	(26,943)
C) Records not currently in receipt of benefits based on reported status codes:	(6,953)
D) Component I (Hybrid) Records:	(202)
E) Records in DROP:	(694)
F) Number of records valued:	8,151

Deferred Data

A) Number of records reported on data file:	425
B) In Legacy active file but not otherwise in database and not in Hybrid active file:	2
C) Valued as inactive in prior year and would not have otherwise been valued in Legacy this year:	-
D) Valued as a vested active member in prior year but not in this year's active file and would not have otherwise been valued in Legacy this year:	16
E) Non-eligible class code & bargaining unit:	-
F) Valued as Legacy Retiree:	(4)
G) Less than 8 years of service:	(29)
H) Number of records to value:	410

Data Approximations and Assumptions

Active

For active members, frozen AFC amounts and frozen service as of June 30, 2014 was reported. For purposes of this valuation, we matched the June 30, 2018 actives to the active 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.

Deferred

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. Since vesting service is not directly provided on the file, we estimated vesting service based on reported Component II (Legacy) benefit service increased by Component I (Hybrid) benefit service as reported on the corresponding Component I (Hybrid) file. Members with estimated vesting service of less than 8 years were assumed to be non-vested and were not valued.

Retired and Beneficiary

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 as 50% of final compensation; and
  - at 25 years of service, disability benefits are assumed to equal 50% of final compensation.

Please see our 2018 data summary letter dated December 17, 2018 for additional details.

APPENDIX

Summary of Assumptions Used for DPFRS 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 28. 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 29. 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, 2018

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 for the June 30, 2014 (date of freeze) valuation.

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 DPFRS 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 35). For DPLSA members, 65% of eligible members are assumed to enter the DROP and remain in the DROP for seven years. For all other active 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, 2018 (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.

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 2018	Future Life Expectancy (Years)	
	Men	Women
45	39.59	42.94
50	34.61	37.87
55	29.81	32.94
60	25.23	28.17
65	20.88	23.56
70	16.83	19.19
75	13.12	15.16
80	9.84	11.56

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.

LSA. Lieutenants and Sergeants Association.

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 8^{th} 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.