BUCK

Retirement Plan for Chicago Transit Authority Employees

Actuarial Valuation Report as of January 1, 2020, including supplementary disclosure information for GASB Statement Nos. 67 and 68

July 2020

110 West Berry Street, Suite 1300
Fort Wayne, IN 46802

July 28, 2020

Board of Trustees and Executive Director
Retirement Plan for Chicago Transit Authority Employees
55 West Monroe St., Suite 1950
Chicago, IL 60603

Ladies and Gentlemen:

This report presents the results of the annual valuation of the assets and liabilities of The Retirement Plan for Chicago Transit Authority Employees (Plan) as of January 1, 2020, prepared in accordance with 40 ILCS 5/22-101(e). In addition, it includes disclosure information as of December 31, 2019, required under Governmental Accounting Standards Board Statement Nos. 67 and 68. The actuarial valuation of the Plan is performed annually and Buck Global, LLC (Buck) was retained to perform the valuation as of January 1, 2020. This valuation has been conducted in accordance with all applicable Actuarial Standards of Practice issued by the Actuarial Standards Board.

The actuarial valuation is based on unaudited financial and member data provided by the staff of the Plan and summarized in this report. The benefits considered are those delineated in the Plan and are governed by legislation contained in the Illinois Compiled statutes, particularly Chapter 40, as amended and restated effective December 31, 2012. The actuary did not verify the data submitted but did perform tests for consistency and reasonableness. The accuracy of the results contained in this report is dependent upon the accuracy of the data.

Contribution rates were determined in accordance with 40 ILCS 5/22-101(e) using the projected unit credit cost method and, under the actuarial assumptions used in the valuation, are expected to produce a funded ratio of at least 60 percent no later than ten years after the valuation year through fiscal year end 2039. Contribution rates reflect the issuance of bond or notes by the Chicago Transit Authority (Authority), as defined in 70 ILCS 3605/12c. Authority contribution rates are adjusted by a debt service credit, for debt service paid in the prior year, of up to six percent of compensation per year from 2009 to 2040, as defined in 40 ILCS 5/22-101(e)(2).

Results of this valuation deviated from those that would have been projected based on the results of the January 1, 2019 actuarial valuation for a number of reasons including market returns of 15.7% compared to the 8.25% assumed rate of return, demographic experience, updated participant data, payroll and salary increases that were greater than expected. Overall, these caused the funded ratio to meet the standards set forth in ILCS 5/22-101(e) and, therefore, there is no need to increase authority and employee contribution rates to comply with 40 ILCS 5/22-101(e). The rates will remain as follows:

Annual Contributions to the Plan (Percentage of Compensation)		
Fiscal Year	Authority	Employees
2021 to 2040	20.647%	13.324%

Based on these rates, the sum of current assets, net bond proceeds, future contributions and investment earnings, less benefit payments and expenses, assets held by the Plan are projected to be equal to at least 60 percent of actuarial liabilities by 2030 and through fiscal year end 2040, if these contributions, expressed as a percentage of compensation, are made to the Plan and the Plan experiences no net actuarial losses in the future.

40 ILCS 5/22-101(e)(4) provides for a minimum contribution, determined either by the Board of Trustees or the Auditor General, to bring the funded ratio of the Plan “up to” or “to no less than” 90% by December 31, 2059.

While not required by 40 ILCS 5/22-101(e)(3), for informational purposes, Buck has provided a contribution amount equal to the Actuarial Math Contribution:

- Fund 100% of the entry age normal cost method
- Fund the expected administrative expenses for the fiscal year
- Pay off the unfunded liability over 20 years and as a level percentage of payroll

Under this method, a contribution of approximately 34.11% of payroll (total contribution) is appropriate.

The results documented in this report are estimated based on data that may be imperfect and on assumptions about future events. Assumptions may have been made about participant data or other factors. Reasonable efforts were made in this valuation to ensure that items that were significant in the context of the actuarial liabilities or costs are treated appropriately and not excluded or included inappropriately. We believe that the use of approximation in our calculations, if any, has not resulted in a significant difference relative to the results we would have obtained using more detailed calculations.

A range of results, different from those presented in this report could be considered reasonable. The numbers are not rounded, but this is for convenience only and should not imply precision, which is not inherent in actuarial calculations.

Experience studies are performed once in every five-year period. This valuation was prepared on the basis of the demographic and economic assumptions that were recommended on the basis of an Experience Review covering the period from January 1, 2013 through December 31, 2017 and adopted by the Board of Trustees at their April 2019 meeting, which include an 8.25% per annum rate of investment return. These assumptions will remain in effect for valuation purposes until such time as the Board of Trustees adopts revised assumptions.

We believe that the economic and demographic assumptions adopted in accordance with the recent experience study are reasonable and appropriate for the purposes of this valuation. The assumptions and methods used for financial reporting and all supporting schedules fulfill the requirements of GASB Statement Nos. 67 and 68.

Historical valuation results presented in this report represent results taken from prior actuarial reports, and results shown for some years may reflect funding methods and techniques used by the prior actuary. Our report/certification does not apply to those results, other than to represent that our report has presented accurate information developed by prior actuaries.

Where presented, the “funded ratio”, “funded status” and “unfunded accrued liability” typically are measured using the actuarial value of assets. It should be noted that use of the market value of assets would result in different values of the funded ratio, funded status and unfunded accrued liability. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but not for assessment of the funded status of the plan if it were to settle (i.e., purchase annuities to cover) a portion or all of its liabilities.

Where presented, the “net pension liability” is measured on a market value of assets basis. This item presented may not be appropriate for evaluating the need and level of future contributions and make no assessment regarding the cost to settle (i.e., purchase annuities to cover) any portion of the Plan’s liabilities.

Future actuarial measurements may differ significantly from the current measurement presented in this report due to such factors as: plan experience different from that anticipated by the economic and demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements; and changes in plan provisions or applicable law. An analysis of the potential range of such future measurements is beyond the scope of this report.

Use of this report for any other purpose, or by anyone other than the Board of Trustees or the Plan’s staff or its auditors, may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the report for that purpose. Buck should be asked to review any statement to be made on the basis of the results contained in this report. Buck will accept no liability for any such statement made without prior review by Buck.

In our opinion the calculations also comply with Illinois law, and where applicable, the Statements of the Governmental Accounting Standards Board. We certify that the information presented herein is accurate and fairly portrays the actuarial position of the Plan as of January 1, 2020.

Qualified actuaries completed the valuation in accordance with accepted actuarial procedures as prescribed by the Actuarial Standards Board. The qualified actuaries are members of the American Academy of Actuaries and are experienced in performing actuarial valuations of public employee retirement systems. To the best of our knowledge, this report is complete and accurate and has been prepared in accordance with generally accepted actuarial principles and practice. The undersigned are all qualified to render the opinions contained in this report.

Respectfully submitted,

Buck Global, LLC

Troy Jaros, FSA, EA, MAAA, FCA

Director, Retirement Actuary

Kevin S. Spanier, ASA, EA, MAAA, FCA

Director, Retirement Actuary

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Executive Summary

Membership

Actives: As of January 1, 2020, there were 8,057 members in active service covered under the provisions of the Plan. The significant age, service, salary and accumulated contribution information for these members is summarized below, along with corresponding figures from the last actuarial valuation one year earlier.

	January 1, 2020	January 1, 2019
Number of active employees [1]	8,057	8,159
Average age	48.5	48.5
Average years of service	13.3	13.4
Total annual valuation salary [2]	$631,411,861	$623,036,951
Average annual salary [2]	$79,453	$77,300
Total accumulated contributions	$588,433,604	$544,522,986
Average accumulated contributions	$74,045	$67,559

1 Active statistics include all participants who are actively employed, which includes 10 participants this year & 22 participants last year who are on leave and 110 participants this year & 99 particpants last year who have opted out of participating in the Plan and are only entitled to a return of their contributions.

2 The salary information for the 110 participants this year & 99 particpants last year who have opted out of participating in the Plan is not included.

The number of active members decreased by 1.3% from the previous valuation date. The average age of the active members remained the same. The average service decreased by 0.8%. The total annual valuation salary increased by 1.3%. The average salary increased by 2.8% from the previous valuation.

Distributions of active members by age and service are given in Section 5.2.

Terminated Vested: In addition to the active members, there were 151 terminated vested members who did not elect to receive their accumulated contributions when they left covered employment. The significant age and annual benefit information for these terminated vested members is summarized below with comparative figures from the last actuarial valuation one year earlier.

	January 1, 2020	January 1, 2019
Number of deferred vested members [3]	151	113
Average age	56.8	57.4
Average annual benefit	$27,625	$27,130

3 Number of deferred vested members includes 4 in 2020 who were pending cashouts after the valuation date. These members are not included in the calculation of the average benefit.

The number of terminated vested members increased by 33.6% from the previous valuation. The average age of the terminated vested members decreased by 0.6 years. The average annual pension benefit for these members increased by 1.8% from the previous valuation.

Distributions of terminated vested members by age and pension benefit are given in Section 5.4.

Retirees and Beneficiaries: In addition to the active and terminated vested members, there were 8,070 retired members, 1,302 members with disability allowances and 1,187 beneficiaries who are receiving monthly benefit payments on the valuation date. The significant age and annual benefit information for these members are summarized below with comparative figures from the last actuarial valuation performed one year earlier.

	January 1, 2020	January 1, 2019
Number of members receiving payments [4]		
➢ Retirees	8,070	8,020
➢ Disability Allowances	1,302	1,269
➢ Beneficiaries	1,187	1,193
➢ Total	10,559	10,482
Average age	71.2	70.8
Annual benefit amounts		
➢ Retirees	$245,555,648	$238,623,759
➢ Disability Allowances	$23,749,211	$22,565,732
➢ Beneficiaries	$14,633,375	$14,239,447
➢ Total	$283,938,234	$275,428,938
Average annual benefit payments	$26,898	$26,276

4 Number of beneficiaries includes 3 in 2020 who were pending cashouts after the valuation date. These members are not included in the calculation of the average benefit.

The number of members receiving payments increased by 0.73% from the previous valuation date. The average age of these members increased by 0.4 years. The total annual benefit payments for these members increased by 3.09% from the previous valuation date.

Distributions of retired members by age and benefit amounts are given in Section 5.3.

Plan Assets

The Plan's assets are held in trust and invested for the exclusive benefit of Plan members. The trust is funded by member and employer contributions and pays benefits directly to eligible members in accordance with Plan provisions. The assets are audited annually and are reported at fair value. On a fair value basis, the Plan has Net Assets Available for Benefits of $1,890.5 million as of January 1, 2020. This includes an increase of $175.3 million over the Net Assets Available for Benefits of $1,715.2 million as of January 1, 2019. During the prior year, the investment return was 15.7% as reported by the Plan.

Starting with the January 1, 2017 valuation, the Board of Trustees adopted an actuarial value of assets to be used for funding purposes. This method recognizes differences of asset returns from their expected levels over a period of five years. The actuarial value of assets is $1,883.4 million as of January 1, 2020. This includes an increase of $47.6 million over the actuarial value of assets of $1,835.8 million as of January 1, 2019. During the prior year, the investment return on the actuarial value assets was 7.57%.

A summary of the assets held for investment, a summary of changes in assets, and the development of the actuarial value of assets is shown in Section 2.

Actuarial Experience

Differences between the expected experience based on the actuarial assumptions and the actual experience create changes in the actuarial accrued liability, actuarial value of assets, and the unfunded actuarial accrued liability from one year to the next. These changes create an actuarial gain if the experience is favorable and an actuarial loss if the experience is unfavorable. The Plan experienced a total net actuarial loss of $49.9 million during the prior year. This net loss is approximately 1.4% of the Plan's prior year actuarial accrued liability. The net loss is a combination of two principal factors, demographic experience and investment performance.

The demographic experience tracks actual changes in the Plan's population compared to the assumptions for decrements such as mortality, turnover, and retirement, as well as pay increases. The Plan experienced a demographic loss of $37.6 million during the year ending December 31, 2019. This loss increased the unfunded actuarial accrued liability by $37.6 million and decreased the funded ratio by 0.56%.

Continued tracking of the demographic experience is warranted in order to confirm the appropriateness of the actuarial assumptions. Details of the demographic, economic, and other assumptions used to value the Plan liabilities and normal cost can be found in Section 6.

On the asset side, the Plan experienced a gain on a fair value of assets basis. The actual rate of return on the fair value of plan assets was 15.7% for the year ending December 31, 2019 compared to the assumption of 8.25%.

The rate of return on the actuarial value of plan assets for the year ending December 31, 2019 was approximately 7.57% compared to the assumption of 8.25%. The loss on the actuarial value of assets increased the unfunded actuarial accrued liability by $12.3 million and decreased the funded ratio by 0.35%. It should be noted that the Plan's assumed asset return of 8.25% is a long-term rate and short-term performance is not necessarily indicative of expected long-term future returns.

In our opinion, the economic assumptions comply with Actuarial Standards of Practice No. 27 and the demographic assumptions comply with Actuarial Standards of Practice No. 35.

A summary of the actuarial gains and losses experienced during the prior year is shown in Section 1.4.

Funded Status

The funded status is a measure of the progress that has been made in funding the Plan as of the valuation date. It is determined as a ratio of the actuarial value of assets divided by the total actuarial accrued liability on the valuation date. The funded ratio presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the Plan if the Plan were to settle (i.e. purchase annuities) for a portion or all of its liabilities.

As of January 1, 2020, the funded ratio of the Plan is 52.55%. This represents a decrease of 0.07% from the Plan's funded ratio of 52.62% as of January 1, 2019. Unless otherwise noted, the funded status shown in the report is based on the projected unit credit cost method.

A history of the unfunded actuarial accrued liability and the funded ratio is shown in Section 1.5
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Statutory Contributions

Actual required contribution rates were determined in accordance with 40 ILCS 5/22-101(e) using the projected unit credit cost method and calculated to produce an expected funded ratio of at least 60 percent no later than ten years after the valuation year through fiscal year end 2039 and 90 percent funding by fiscal year end 2059. Contribution rates reflect the issuance of bond or notes by the Authority, as defined in 70 ILCS 3605/12c. Authority contribution rates are adjusted by a debt service

credit, for debt service paid in the prior year, of up to six percent of compensation per year from 2009 to 2040, as defined in 40 ILCS 5/22-101(e)(2).

Actuarial Math Contributions

While not required by 40 ILCS 5/22-101(e), white papers on funding policies for public sector plans developed over the past few years suggest a funding policy be sufficient to pay the normal cost on the entry age normal cost basis and amortize the unfunded actuarial accrued liability over a fixed period of 20 years. We will broadly refer to this type of policy as an Actuarial Math Funding Policy. For informational purposes, Buck has provided a contribution amount based on the Actuarial Math Funding Policy.

Under Actuarial Math, the normal cost represents the cost of the benefits that accrue during the year for active members under the Entry Age Normal Cost Method, plus a load for the expected administrative expenses to be paid during the fiscal year. The Entry Age Normal Cost is determined as a level percent of pay over each individual career attributable to the respective plan year. The normal cost for 2020 has been determined to be $57.4 million, or 9.08% of pay. This represents an increase in the normal cost rate of 0.42% of pay from last year's normal cost rate of 8.66%.

Under Actuarial Math, the cost method under which the actuarial accrued liability is determined is the entry age normal cost method. Under the entry age normal cost method, the actuarial accrued liability (AAL) is equal to the present value of projected benefits less the present value of future benefits to be accrued. The AAL amount is compared to the actuarial value of assets to determine if the Plan is ahead or behind in funding as of the valuation date. The difference between the total actuarial accrued liability and the actuarial value of assets equals the amount of unfunded actuarial accrued liability (UAAL) or surplus (if negative) on the valuation date. This amount is amortized over 20 years as a level percent of pay and added to the normal cost to determine the annual required contribution for the year suggested by public sector funding policy white papers.

The UAAL under the entry age normal cost method as of January 1, 2020 is $1,803.2 million. This represents an increase of $46.7 million in the unfunded actuarial accrued liability from last year's amount of $1,756.5 million. The annual payment required to amortize the unfunded actuarial accrued liability of $1,803.2 million as of January 1, 2020 is $149.7 million, or 23.70% of pay.

The total contribution suggested by actuarial math is the sum of the normal cost and the payment to the UAAL plus interest, or 34.11% of pay (9.08% of pay attributable to the normal cost plus 23.70% of pay attributable to the amortization of the unfunded plus 1.33% of pay for the mid-year interest adjustment).

The actuarial liabilities and development of the Actuarial Math Contribution is shown in the Comparative Summary and Section 1.1.

In our opinion, the measurement of the benefit obligations and determination of the actuarial cost of the Plan is performed in compliance with Actuarial Standards of Practice No. 4.

Accounting Information

The Governmental Accounting Standards Board (GASB) issues statements which establish financial reporting standards for defined benefit pension plans and accounting for the pension expenditures and expenses for governmental employers. The required financial reporting information for the Plan and the Employer under GASB Statement Nos. 67 and 68 can be found in Section 3.

Projections

As part of the annual actuarial valuation, a forecast of expected future valuation results is performed over a 30-year period beginning on the valuation date. This analysis provides a dynamic look into the future to identify trends in future employer contributions and funded status. The forecast replaces active members who are assumed to decrement (terminate, retire, etc.) during the period with new members resulting in a stable active membership. The forecast assumes all actuarial assumptions are

exactly realized each year during the forecast period. The results of these forecasts can be found in Section 4.

Changes in Plan Provisions

There have been no changes in the Plan provisions since the last actuarial valuation performed as of January 1, 2019. A summary of Plan and contribution provisions are outlined in Section 6.1.

Changes in Actuarial Assumptions, Methods, or Procedures

The method to determine the normal cost under the Actuarial Math Contributions has been changed to include a load for the expected administrative expenses.

There have been no other changes in the actuarial assumptions, methods and procedures from those used in the prior valuation.

The actuarial assumptions, methods and procedures are outlined in Section 6.2 and Section 6.3.

Comparative Summary of Key Actuarial Valuation Results

	January 1, 2020	January 1, 2019
1. Investment Return Assumption	8.25 %	8.25 %
2. Membership Data		
a. Active Employees		
Number	8,057	8,159
Annualized Salaries (in thousands)	631,412	623,037
Average Pay	79,453	77,300
b. Terminated Participants with Vested Benefits		
Number	151	113
Total Monthly Accrued Benefit	338,410	255,474
Average Monthly Accrued Benefit	2,302	2,261
c. Retirees and Beneficiaries		
Number	9,257	9,213
Total Monthly Pension	21,682,419	21,071,934
Average Monthly Pension	2,342	2,287
d. Disability Allowances		
Number	1,302	1,269
Total Monthly Pension	1,979,101	1,880,478
Average Monthly Pension	1,520	1,482
3. Statutory Minimum Contribution Rates (as a percentage of Payroll)*		
a. Employer Contribution Rate		
Gross Employer Rate	26.647 %	26.647 %
Credit for Debt Repayment	6.000 %	6.000 %
Net Employer Rate	20.647 %	20.647 %
b. Employee Contribution Rate	13.324 %	13.324 %
4. Actuarial Math Contribution		
a. Amortization Payment for UAAL		
i. Amount	149,667,414	145,798,099
ii. As a % of pay	23.70 %	23.40 %
b. Normal Cost		
i. Entry age normal cost amount	54,560,054	53,967,282
ii. Administrative expenses	2,800,000	N/A
iii. Normal cost	57,360,054	53,967,282
iv. As a % of pay	9.08 %	8.66 %
c. Interest Adjustment to Mid-Year		
i. Amount	8,370,659	8,077,034
ii. As a % of pay	1.33 %	1.30 %
d. Actuarial Contribution		
i. Amount	215,398,127	207,842,415
ii. As a % of pay	34.11 %	33.36 %
5. Actuarial Funded Status ($ in thousands)		
a. Actuarial Accrued Liability	3,583,859	3,488,955
b. Actuarial Value of Assets (AVA)	1,883,411	1,835,792
c. Unfunded Accrued Liability	1,700,448	1,653,163
d. Funded Ratio	52.6 %	52.6 %
e. Market Value of Assets (MVA)	1,890,466	1,715,227
f. Return on MVA (prior year)	15.7 %	(3.5) %
g. Return on AVA (prior year)	7.6 %	7.0 %

* Contribution rate applicable for the plan year following the year of valuation.

Section 1 - Actuarial Funding Results

Section 1.1
Actuarial Liabilities and Normal Cost

Actuarial Accrued Liability	January 1, 2020	January 1, 2019
1. Active Members		
a. Retirement Benefits	1,003,377,111	982,207,608
b. Withdrawal Benefits	33,536,441	32,679,062
c. Disability Benefits	92,955,107	92,705,332
d. Death Benefits	11,542,358	11,231,000
Total	1,141,411,017	1,118,823,002
2. Inactive Members with Deferred Benefits	24,060,387	18,314,002
3. Retired Members and Beneficiaries Receiving Benefits	2,418,387,610	2,351,817,783
4. Total Actuarial Accrued Liability (1. + 2. + 3.)	**3,583,859,014**	**3,488,954,787**

Normal Cost	January 1, 2020	January 1, 2019
1. Active Members		
a. Retirement Benefits	52,964,949	52,136,585
b. Withdrawal Benefits	4,219,737	4,143,614
c. Disability Benefits	6,903,142	6,841,387
d. Death Benefits	847,849	826,310
2. Normal Cost	**64,935,677**	**63,947,896**
3. Total Normal Cost (As a % of pay)	**10.28%**	**10.26%**

Section 1.2
Actuarial (Gain) / Loss

Development of Actuarial (Gain) / Loss	Amount
1. Expected Actuarial Accrued Liability	
a. Actuarial Accrued Liability at January 1, 2019	3,488,954,787
b. Normal Cost at January 1, 2019	63,947,896
c. Interest on a. + b. to End of Year	293,114,471
d. Benefit Payments for 2019, with Interest to End of Year	299,762,623
e. Expected Actuarial Accrued Liability Before Changes (a. + b. + c. - d.)	3,546,254,531
2. Actuarial Accrued Liability at January 1, 2020	3,583,859,014
3. Liability (Gain) / Loss (2. – 1.e.)	37,604,483
4. Expected Actuarial Value of Assets	
a. Actuarial Value of Assets at January 1, 2019	1,835,791,586
b. Interest on a. to End of Year	151,452,807
c. Contributions Made for 2019	202,966,211
d. Interest on c. to End of Year	8,206,452
e. Benefit Payments and Administrative Expenses for 2019, with Interest to End of Year	302,691,104
f. Expected Actuarial Value of Assets at January 1, 2020 (a. + b. + c. + d. – e.)	1,895,725,952
5. Actuarial Value of Assets as of January 1, 2020	1,883,410,704
6. Actuarial Value Asset (Gain) / Loss (4.f. - 5.)	12,315,248
7. Total Actuarial (Gain) / Loss (3. + 6.)	49,919,731

Section 1.3
Actuarial Balance Sheet

Financial Resources	January 1, 2020	January 1, 2019
1. Actuarial Value of Assets	1,883,410,704	1,835,791,586
2. Present Value of Future Contributions	495,433,607	494,249,791
3. Unfunded Actuarial Accrued Liability/(Reserve)	1,700,448,310	1,653,163,201
4. Total Assets (1 + 2 + 3)	4,079,292,621	3,983,204,578

Benefit Obligations	January 1, 2020	January 1, 2019
1. Present Value of Future Benefits		
a. Active Members	1,636,844,624	1,613,072,793
b. Inactive Members	24,060,387	18,314,002
c. Retirees, disabilities and beneficiaries	2,418,387,610	2,351,817,783
d. Total	4,079,292,621	3,983,204,578

Section 1.4
Analysis of Financial Experience

Analysis of Actuarial (Gains) and Losses Resulting from Differences Between Assumed Experience and Actual Experience

Type of (Gain) or Loss	Year End December 31, 2019	As a % of Last Year's AAL
(1) COLA Experience	0	0.00%
(2) Salary Experience	17,402,611	0.50%
(3) Retiree Mortality Experience	9,666,998	0.28%
(4) Other (turnover, retirement ages, service purchase, etc.)		0.00%
(a) Unexpected Participant Pick Up	3,947,357	0.11%
(b) Unexpected Data Change for Decrementing Actives	1,016,090	0.03%
(c) Unexpected Data Change for Continuing Actives	(574,053)	-0.02%
(d) Unexpected Data Change for Continuing Inactives	(2,480,045)	-0.07%
(e) Unexpected Rehires	(450,589)	-0.01%
(f) Difference between actual and expected benefit payments	(2,095,547)	-0.06%
(g) Miscellaneous	263,734	0.01%
(h) Total	(373,053)	-0.01%
(5) Active Decrements	6,643,646	0.19%
(6) New Entrants	4,264,281	0.12%
(7) Liability (Gain) or Loss During Year, (1) + (2) + (3) + (4)(h) + (5) + (6)	37,604,483	1.08%
(8) Investment Experience	12,315,248	0.35%
(9) Total (Gain) or Loss During Year (8) + (9)	49,919,731	1.43%

Section 1.5
History of UAAL and Funded Ratio
($'s in 000's)

Valuation Date	Actuarial Accrued Liability (AAL)	Actuarial Value of Assets (AVA)	Funded Ratio (AVA as a % of AAL)	Unfunded Actuarial Accrued Liability (UAAL)
January 1, 2020	3,583,859	1,883,411	52.55%	1,700,448
January 1, 2019	3,488,955	1,835,792	52.62%	1,653,163
January 1, 2018	3,423,218	1,802,216	52.65%	1,621,002
January 1, 2017	3,338,641	1,752,473	52.49%	1,586,168
January 1, 2016 *	3,267,121	1,743,216	53.36%	1,523,904
January 1, 2015 *	3,186,187	1,855,912	58.25%	1,330,275
January 1, 2014 *	3,105,567	1,892,714	60.95%	1,212,853
January 1, 2013 *	2,867,335	1,702,788	59.39%	1,164,547
January 1, 2012 *	2,808,184	1,662,196	59.19%	1,145,988
January 1, 2011	2,724,191	1,909,967	70.11%	814,224
January 1, 2010	2,588,462	1,936,849	74.83%	651,613
January 1, 2009	2,632,356	1,995,953	75.82%	636,403

* Actuarial Value of Assets is Fair Market Value

Section 1.6
Solvency Test

Comparative Summary of Accrued Liability and Actuarial Value of Assets

	Accrued Liability for:				Portion of Accrued Liability Covered by Actuarial Value of Assets		
Valuation as of January 1	(1) Active Member Contributions	(2) Retirees, Beneficiaries, TVRs and Disabled	(3) Active Member (Employer Financed Portion)	Actuarial Value of Assets[1]	(1)	(2)	(3)
2020	588,433,604	2,442,447,997	552,977,413	1,883,410,704	100.00 %	53.02 %	0.00 %
2019	544,522,986	2,370,131,785	574,300,017	1,835,791,586	100.00 %	54.48 %	0.00 %
2018	496,944,601	2,334,464,478	591,809,348	1,802,216,284	100.00 %	55.91 %	0.00 %
2017	449,593,044	2,284,019,564	605,028,706	1,752,472,572	100.00 %	57.04 %	0.00 %
2016[2]	417,390,393	2,216,132,003	633,598,241	1,743,216,432	100.00 %	59.83 %	0.00 %

1. Excludes health care assets.
2. Actuarial Value of Assets is Fair Market Value

Section 1.7
Projected Actuarial Results

Projection of Funded Status based on Board Approved Contribution Rates

	Board Adopted Contribution Rates			Board Adopted Contributions					
Year	Employee Contribution Percent	Employer Contribution Percent	Total Percent	Employee Contribution	Employer Contribution	Total Contribution	Actuarial Accrued Liability	Actuarial Value of Assets	Funded Ratio
2020	13.324%	20.647%	33.971%	84,127,661	130,370,609	214,498,270	3,583,859,014	1,883,410,704	52.55%
2021	13.324%	20.647%	33.971%	85,006,468	131,732,476	216,738,944	3,640,306,618	1,947,749,639	53.51%
2022	13.324%	20.647%	33.971%	86,050,306	133,350,087	219,400,393	3,694,780,137	2,015,473,131	54.55%
2023	13.324%	20.647%	33.971%	87,511,905	135,615,091	223,126,996	3,744,568,732	2,062,945,726	55.09%
2024	13.324%	20.647%	33.971%	89,574,385	138,811,267	228,385,652	3,790,422,634	2,153,475,246	56.81%
2025	13.324%	20.647%	33.971%	91,903,789	142,421,088	234,324,877	3,832,569,381	2,221,662,184	57.97%
2026	13.324%	20.647%	33.971%	94,310,894	146,151,321	240,462,215	3,871,012,218	2,293,599,281	59.25%
2027	13.324%	20.647%	33.971%	96,764,212	149,953,169	246,717,381	3,905,434,815	2,369,795,816	60.68%
2028	13.324%	20.647%	33.971%	99,325,635	153,922,544	253,248,179	3,936,783,871	2,452,050,056	62.29%
2029	13.324%	20.647%	33.971%	102,181,033	158,347,485	260,528,518	3,964,173,507	2,540,483,378	64.09%
2030	13.324%	20.647%	33.971%	105,254,765	163,110,775	268,365,540	3,987,560,524	2,636,581,078	**66.12%**
2031	13.324%	20.647%	33.971%	108,594,937	168,286,959	276,881,896	4,009,398,779	2,743,894,419	68.44%
2032	13.324%	20.647%	33.971%	112,127,493	173,761,276	285,888,769	4,031,182,458	2,865,386,468	71.08%
2033	13.324%	20.647%	33.971%	115,712,325	179,316,603	295,028,928	4,054,139,392	3,003,589,917	74.09%
2034	13.324%	20.647%	33.971%	119,442,037	185,096,448	304,538,485	4,079,226,933	3,160,585,917	77.48%
2035	13.324%	20.647%	33.971%	123,352,925	191,157,057	314,509,982	4,107,813,191	3,339,198,529	81.29%
2036	13.324%	20.647%	33.971%	127,477,280	197,548,470	325,025,750	4,141,890,652	3,542,836,230	85.54%
2037	13.324%	20.647%	33.971%	131,761,806	204,188,097	335,949,903	4,183,414,734	3,775,143,959	90.24%
2038	13.324%	20.647%	33.971%	136,162,921	211,008,400	347,171,321	4,234,126,160	4,039,537,459	95.40%
2039	13.324%	20.647%	33.971%	140,590,004	217,868,943	358,458,947	4,295,025,505	4,338,962,574	101.02%
2040	13.324%	20.647%	33.971%	145,114,290	224,880,121	369,994,411	4,366,969,756	4,676,178,720	107.08%

Section 2 - Plan Assets

Section 2.1
Statement of Net Plan Assets
($'s in 000's)

	As of December 31	
	2019	2018
ASSETS		
1. Total investments, at fair value	1,755,608	1,699,863
2. Invested securities lending cash collateral	53,594	73,566
3. Receivables:		
a. Employer contributions	12,217	8,974
b. Employee contributions	8,095	5,944
c. Securities sold, but not received	136,178	13,340
d. Accrued interest and dividends	1,796	2,685
e. Other	1,749	992
4. Total assets	1,969,237	1,805,364
LIABILITIES		
1. Payable upon return of securities	53,595	73,566
2. Accounts payable	3,608	3,212
3. Other payables	101	106
4. Securities purchased, but not paid	21,467	13,253
5. Total liabilities	78,771	90,137
Net assets held in trust for Plan benefits	**1,890,466**	**1,715,227**

Section 2.2
Changes in Net Plan Assets
($'s in 000's)

	As of December 31	
	2019	2018
ADDITIONS		
1. Net investment (loss) income	$ 263,202	$ (61,343)
2. Employer contributions	121,668	117,115
3. Employee contributions	81,298	78,340
4. Other income	-	-
Total additions	$ 466,168	$ 134,112
DEDUCTIONS		
1. Benefit payments	$ 281,004	$ 274,465
2. Contribution refunds, including interest	7,110	7,402
3. Administrative expenses	2,815	2,918
Total liabilities	$ 290,929	$ 284,785
NET ASSETS HELD IN TRUST FOR PLAN BENEFITS		
1. Beginning of year	$ 1,715,227	$ 1,865,900
2. Net (decrease) increase	175,239	(150,673)
End of year	**$ 1,890,466**	**$ 1,715,227**

Section 2.3
Actuarial Value of Assets

Development of Actuarial Value of Assets	8.25%	Amount
1. Actuarial Value of Assets as of January 1, 2019		$ 1,835,791,586
2. Unrecognized Return as of January 1, 2019		(120,564,521)
3. Fair Value of Assets as of January 1, 2019		$ 1,715,227,065
4. Contributions		
a. Member (includes purchased service)		$ 81,298,269
b. Employer		121,667,942
c. Miscellaneous contributions		-
d. Total		$ 202,966,211
5. Distributions		
a. Benefit payments		$ 281,003,629
b. Refund of contributions		7,109,817
c. Administrative expenses		2,814,677
d. Total		$ 290,928,123
6. Expected Return at 8.25% on		
a. Item 1.		$ 151,452,806
b. Item 2.		(9,946,573)
c. Item 4.d.		8,206,452
d. Item 5.d.		11,762,981
e. Total [a. + b. + c. – d.]		$ 137,949,704
7. Actual Return on Fair Value for Fiscal Year, Net of Investment Expenses		$ 263,201,019
8. Return to be Spread for Fiscal Year (7. – 6.e) *		$ 125,251,315
9. Total Fair Value of Assets as of January 1, 2020		$ 1,890,466,172
10. Return to be Spread		

Fiscal Year	Return to be Spread	Unrecognized Percent	Unrecognized Return
2019	$ 125,251,315	80%	$ 100,201,052
2018	(211,667,812)	60%	(127,000,687)
2017	94,702,377	40%	37,880,951
2016	(20,129,242)	20%	(4,025,848)
2015		0%	-
		Total	$ 7,055,468

11. Actuarial Value of Assets as of January 1, 2020 (9. – 10.)	**$ 1,883,410,704**
12. Recognized Rate of Return for the Year on Actuarial Value of Assets	**7.57%**
13. Rate of Return for the Year on Fair Value of Assets (reported by investment consultant-net of inv. exp.)	**15.7%**

* The Annual Return to be Spread calculation is based on an assumed 8.25% investment return which includes an assumption that all expenses and revenues are on average paid at mid-year

Section 2.4
Historical Asset Rate of Return

Year Ending December 31	Fair Value Annual Recognized Rate of Return [1]	Actuarial Value Annual Recognized Rate of Return
2019	15.70%	7.57%
2018	-3.53%	6.99%
2017	14.40%	9.10%
2016	6.80%	8.00%
2015	-0.20%	N/A
2014	4.80%	N/A

1 As reported by the Plan.

Section 2.5
Forecast of Expected Benefit Payments

Year Ending December 31	Active Members	Inactive Members	Total Payments
2020	13,304,492	284,181,029	297,485,521
2021	29,389,120	275,992,880	305,382,000
2022	44,966,278	269,191,934	314,158,212
2023	59,795,218	262,016,331	321,811,549
2024	74,183,427	254,824,504	329,007,931
2025	88,664,003	247,265,299	335,929,302
2026	103,277,682	239,453,801	342,731,483
2027	116,814,485	231,284,617	348,099,102
2028	131,061,309	222,899,855	353,961,164
2029	145,136,841	214,363,749	359,500,590
2030	158,243,362	205,599,531	363,842,893
2031	170,114,041	196,700,537	366,814,578
2032	181,221,462	187,558,314	368,779,776
2033	191,712,021	178,338,514	370,050,535
2034	201,241,828	169,036,869	370,278,697
2035	209,390,620	159,767,319	369,157,939
2036	216,338,268	150,455,986	366,794,254
2037	222,270,917	141,185,246	363,456,163
2038	227,235,393	132,085,882	359,321,275
2039	231,191,816	123,024,381	354,216,197
2040	234,355,112	114,131,222	348,486,334
2041	236,780,986	105,477,379	342,258,365
2042	238,625,750	97,074,914	335,700,664
2043	239,795,099	89,002,971	328,798,070
2044	240,534,798	81,259,839	321,794,637
2045	240,718,625	73,886,853	314,605,478
2046	240,601,038	66,839,693	307,440,731
2047	239,911,041	60,187,726	300,098,767
2048	238,743,279	53,944,213	292,687,492
2049	236,973,564	48,117,727	285,091,291
2050	235,115,179	42,711,009	277,826,188
2051	232,603,671	37,722,435	270,326,106
2052	229,321,106	33,145,842	262,466,948
2053	225,415,379	28,971,479	254,386,858
2054	220,737,617	25,186,620	245,924,237
2055	215,549,637	21,775,689	237,325,326
2056	209,368,074	18,720,673	228,088,747
2057	202,472,795	16,001,592	218,474,387
2058	194,891,731	13,597,135	208,488,866
2059	186,724,217	11,484,756	198,208,973
2060	178,132,588	9,641,219	187,773,807
2061	169,229,902	8,043,178	177,273,080
2062	160,187,017	6,667,411	166,854,428
2063	151,053,518	5,491,344	156,544,862
2064	141,954,508	4,493,265	146,447,773
2065	132,979,463	3,652,467	136,631,930
2066	124,134,746	2,949,621	127,084,367
2067	115,494,441	2,366,753	117,861,194
2068	107,089,744	1,887,220	108,976,964
2069	98,951,614	1,495,842	100,447,456
2070	91,107,201	1,178,986	92,286,187
2071	83,578,064	924,547	84,502,611
2072	76,381,280	721,882	77,103,162

Section 2.5
Forecast of Expected Benefit Payments, continued

Year Ending December 31	Active Members	Inactive Members	Total Payments
2073	69,525,836	561,654	70,087,490
2074	63,022,570	435,832	63,458,402
2075	56,876,593	337,594	57,214,187
2076	51,089,887	261,254	51,351,141
2077	45,663,671	202,115	45,865,786
2078	40,597,235	156,362	40,753,597
2079	35,888,968	120,963	36,009,931
2080	31,536,175	93,570	31,629,745
2081	27,534,218	72,362	27,606,580
2082	23,876,336	55,942	23,932,278
2083	20,554,300	43,237	20,597,537
2084	17,557,808	33,426	17,591,234
2085	14,874,721	25,873	14,900,594
2086	12,490,345	20,081	12,510,426
2087	10,388,337	15,655	10,403,992
2088	8,551,372	12,281	8,563,653
2089	6,961,329	9,701	6,971,030
2090	5,599,536	7,712	5,607,248
2091	4,446,629	6,156	4,452,785
2092	3,482,851	4,920	3,487,771
2093	2,688,333	3,922	2,692,255
2094	2,043,205	3,106	2,046,311
2095	1,527,788	2,431	1,530,219
2096	1,123,025	1,871	1,124,896
2097	810,923	1,411	812,334
2098	574,844	1,039	575,883
2099	399,775	744	400,519
2100	272,613	516	273,129
2101	182,213	346	182,559
2102	119,338	224	119,562
2103	76,562	139	76,701
2104	48,115	82	48,197
2105	29,620	47	29,667
2106	17,860	26	17,886
2107	10,544	14	10,558
2108	6,094	7	6,101
2109	3,450	4	3,454
2110	1,911	2	1,913
2111	1,035	1	1,036
2112	548	0	548
2113	283	0	283
2114	142	0	142
2115	69	0	69
2116	32	0	32
2117	15	0	15

Note: Forecast based on the present members without assumption about replacement members

Section 3 - Accounting Information

Section 3.1
Actuarial Methods and Assumptions for GASB 67/68 Disclosure Purposes

The total pension liability as of December 31, 2019 was determined by rolling forward the total pension liability as of January 1, 2019 to December 31, 2019 using the following actuarial methods and assumptions, applied to all periods included in the measurement. All other assumptions such as retirement rates, termination rates, and disability rates used to determine the total pension liability are set forth in Section 6 - Basis of the Actuarial Valuation.

Valuation Date:	January 1, 2019
Actuarial Cost Method:	Entry Age Normal – Level Percentage of Pay
Amortization Method:	For pension expense; the difference between expected and actual liability experience and changes of assumptions are amortized over the average of the expected remaining service lives of all members. The difference between projected and actual earnings is amortized over a closed period of five years.
Mortality:	Active members and *Healthy pensioners,* including beneficiaries prior to their associated member's death*:* The SOA Public Mortality General Below Median generational with Improvement Scale MP-2018 with an adjustment for female. *Disabled pensioners:* The SOA Public Disability Mortality General Below Median generational with Improvement Scale MP-2018. Survivors*:* The SOA Public Survivor Mortality General Below Median generational with Improvement Scale MP-2018.
Experience Study:	The actuarial assumptions used were based on the results of an actuarial experience study for the period January 1, 2013 through December 31, 2017, which have been adopted by the Board.

Section 3.2
Schedule of Expected Changes in Net Pension Liability as of December 31, 2019

The GASB Statement No. 67 Change in Net Pension Liability

Fiscal Year Ending	Dec. 31, 2019	Dec. 31, 2018
Total Pension Liability		
Service Cost	$ 53,967,282	$ 54,814,019
Interest	286,687,425	283,756,721
Changes of Benefit Terms	-	-
Difference between Expected and Actual Experience	41,530,311	7,455,309
Change of Assumptions	-	(24,726,963)
Benefit Payments, including Refund of Member Contributions	(288,113,446)	(281,867,646)
Net Change in Total Pension Liability	94,071,572	39,431,440
Total Pension Liability - Beginning of Year	$ 3,562,233,946	$ 3,522,802,506
Total Pension Liability - End of Year	$ 3,656,305,518	$ 3,562,233,946
Plan Fiduciary Net Position		
Employer Contributions	$ 121,667,942	$ 117,114,749
Member Contributions	81,298,269	78,339,932
Net Investment Income	263,201,019	(61,342,883)
Benefit Payments, including Refund of Member Contributions	(288,113,446)	(281,867,646)
Administrative Expenses	(2,814,677)	(2,917,728)
Other	-	-
Net Change in Plan Fiduciary Net Position	175,239,107	(150,673,576)
Plan Fiduciary Net Position - Beginning of Year	$ 1,715,227,065	$ 1,865,900,641
Plan Fiduciary Net Position - End of Year	$ 1,890,466,172	$ 1,715,227,065

Section 3.3
Net Pension Liability (Asset)

The GASB Statement No. 67 Net Pension Liability

Net Pension Liability (Asset)		
Valuation Date	**Dec. 31, 2019**	**Dec. 31, 2018**
Total Pension Liability	$ 3,656,305,518	$ 3,562,233,946
Plan Fiduciary Net Position	1,890,466,172	1,715,227,065
Net Pension Liability (Asset)	$ 1,765,839,346	$ 1,847,006,881
Plan Fiduciary Net Position as a Percentage of the Total Pension Liability (Asset)	51.70%	48.15%

Section 3.4
Sensitivity

The GASB Statement No. 67 Sensitivity of Net Pension Liability

Sensitivity of the Net Pension Liability to Changes in the Discount Rate			
December 31, 2019	**1% Decrease**	**Current**	**1% Increase**
Discount Rate	7.25%	8.25%	9.25%
Net Pension Liability (Asset)	$ 2,112,390,828	$ 1,765,839,346	$ 1,468,250,178

The discount rate used to measure the total pension liability was 8.25%. The projection of cash flows used to determine the discount rate assumed that the Plan's contributions will continue to follow the current funding policy. Based on those assumptions, the Plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. In the event of benefit payments not covered by the Plan's fiduciary net position, a municipal bond rate of 3.26% would be used to discount the benefit payments not covered by the Plan's fiduciary net position. The 3.26% rate equals the S&P Municipal Bond 20-Year High Grade Index at December 31, 2019. The rate was 3.64% as of December 31, 2018. Please see the supporting exhibits for additional detail.

Long-term expected rate of return. The long-term expected rate of return on system investments was determined using a building-block method in which best-estimate ranges of expected future real rates of return (expected returns, net of system investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and by adding expected inflation. Best estimates of long-term geometric rates of return for each major asset class included in the system's target asset allocation as of December 31, 2019 are summarized below:

Asset Class	Long-Term Expected Rate of Return
Inflation	3.03%
Fixed Income	1.83%
Domestic Equity	9.04%
International Equity	8.45%
Private Equity	12.80%
Real Estate	4.76%
Hedge Funds	4.32%
Infrastructure	6.17%

Section 3.5
Pension Expense

The GASB Statement No. 68 Pension Expense

Pension Expense		
Measurement Year Ending	**Dec. 31, 2019**	**Dec. 31, 2018**
Service Cost	$ 53,967,282	$ 54,814,019
Interest	286,687,425	283,756,721
Projected Earnings on Plan Investments	(137,949,704)	(150,324,930)
Member Contributions	(81,298,269)	(78,339,932)
Administrative Expense	2,814,677	2,917,728
Current Period:		
Changes of Benefit Terms	-	-
Changes of Assumptions	-	(5,556,621)
Difference between Expected and Actual Experience	10,055,766	1,675,350
Difference between Expected and Actual Investment Earnings	(25,050,263)	42,333,563
Recognition of Prior Years:		
Deferred Inflows	(24,497,096)	(18,940,475)
Deferred Outflows	92,107,232	65,518,868
Others	-	-
Total Pension Expense	$ 176,837,050	$ 197,854,290

Section 3.6
Supporting Exhibits

Schedule of Deferred Inflows and Outflows

Amortization of the Difference Between Expected and Actual Experience

Measurement Date	2014	2015	2016	2017	2018	2019	Outflows	Inflows	Total
Amount Established	$ -	$ 13,082,408	$ 51,517,655	$ 13,679,323	7,455,309	41,530,311			
Recognition Period	-	4.52	4.49	4.42	4.45	4.13			
Amount Recognized in FY									
2014	$ -						$ -	$ -	$ -
2015	-	$ 2,894,338					2,894,338	-	2,894,338
2016	-	2,894,338	$ 11,473,865				14,368,203	-	14,368,203
2017	-	2,894,338	11,473,865	$ 3,094,869			17,463,072	-	17,463,072
2018	-	2,894,338	11,473,865	3,094,869	$ 1,675,350		19,138,422	-	19,138,422
2019	-	1,505,056	11,473,865	3,094,869	1,675,350	$ 10,055,766	27,804,906	-	27,804,906
2020	-	-	5,622,195	3,094,869	1,675,350	10,055,766	20,448,180	-	20,448,180
2021	-	-	-	1,299,847	1,675,350	10,055,766	13,030,963	-	13,030,963
2022	-	-	-	-	753,909	10,055,766	10,809,675	-	10,809,675
2023	-	-	-	-	-	1,307,247	1,307,247	-	1,307,247
Deferred Balance at 12/31									
2014	$ -						$ -	$ -	$ -
2015	-	$ 10,188,070					10,188,070	-	10,188,070
2016	-	7,293,732	$ 40,043,790				47,337,522	-	47,337,522
2017	-	4,399,394	28,569,925	$ 10,584,454			43,553,773	-	43,553,773
2018	-	1,505,056	17,096,060	7,489,585	$ 5,779,959		31,870,660	-	31,870,660
2019	-	-	5,622,195	4,394,716	4,104,609	$ 31,474,545	45,596,065	-	45,596,065
2020	-	-	-	1,299,847	2,429,259	21,418,779	25,147,885	-	25,147,885
2021	-	-	-	-	753,909	11,363,013	12,116,922	-	12,116,922
2022	-	-	-	-	-	1,307,247	1,307,247	-	1,307,247

Amortization of Changes in Assumptions

Measurement Date	2014	2015	2016	2017	2018	2019	Outflows	Inflows	Total
Amount Established	$ -	$ -	$ -	$ -	(24,726,963)	$ -			
Recognition Period					4.45				
Amount Recognized in FY									
2014	$ -						$ -	$ -	$ -
2015	-	$ -					-	-	-
2016	-	-	$ -				-	-	-
2017	-	-	-	$ -			-	-	-
2018	-	-	-	-	$ (5,556,621)		-	(5,556,621)	(5,556,621)
2019	-	-	-	-	(5,556,621)	$ -	-	(5,556,621)	(5,556,621)
2020	-	-	-	-	(5,556,621)	-	-	(5,556,621)	(5,556,621)
2021	-	-	-	-	(5,556,621)	-	-	(5,556,621)	(5,556,621)
2022	-	-	-	-	(2,500,479)	-	-	(2,500,479)	(2,500,479)
2023	-	-	-	-	-	-	-	-	-
Deferred Balance at 12/31									
2014	$ -						$ -	$ -	$ -
2015	-	$ -					-	-	-
2016	-	-	$ -				-	-	-
2017	-	-	-	$ -			-	-	-
2018	-	-	-	-	$ (19,170,342)		-	(19,170,342)	(19,170,342)
2019	-	-	-	-	(13,613,721)	$ -	-	(13,613,721)	(13,613,721)
2020	-	-	-	-	(8,057,100)	-	-	(8,057,100)	(8,057,100)
2021	-	-	-	-	(2,500,479)	-	-	(2,500,479)	(2,500,479)
2022	-	-	-	-	-	-	-	-	-

Amortization of the Difference Between Projected and Actual Earnings

Measurement Date	2014	2015	2016	2017	2018	2019	Outflows	Inflows	Total
Amount Established	$ 80,156,326	$ 139,993,404	$ 20,129,242	$ (94,702,377)	211,667,813	(125,251,315)			
Recognition Period	5.00	5.00	5.00	5.00	5.00	5.00			
Amount Recognized in FY									
2014	$ 16,031,265						$ 16,031,265	$ -	$ 16,031,265
2015	16,031,265	$ 27,998,681					44,029,946	-	44,029,946
2016	16,031,265	27,998,681	$ 4,025,849				48,055,795	-	48,055,795
2017	16,031,265	27,998,681	4,025,849	$ (18,940,475)			48,055,795	(18,940,475)	29,115,320
2018	16,031,266	27,998,681	4,025,849	(18,940,475)	$ 42,333,563		90,389,359	(18,940,475)	71,448,884
2019	-	27,998,680	4,025,849	(18,940,475)	42,333,563	$ (25,050,263)	74,358,092	(43,990,738)	30,367,354
2020	-	-	4,025,846	(18,940,475)	42,333,563	(25,050,263)	46,359,409	(43,990,738)	2,368,671
2021	-	-	-	(18,940,477)	42,333,563	(25,050,263)	42,333,563	(43,990,740)	(1,657,177)
2022	-	-	-	-	42,333,561	(25,050,263)	42,333,561	(25,050,263)	17,283,298
2023	-	-	-	-	-	(25,050,263)	-	(25,050,263)	(25,050,263)
Deferred Balance at 12/31									
2014	$ 64,125,061						$ 64,125,061	$ -	$ 64,125,061
2015	48,093,796	$ 111,994,723					160,088,519	-	160,088,519
2016	32,062,531	83,996,042	$ 16,103,393				132,161,966	-	132,161,966
2017	16,031,266	55,997,361	12,077,544	$ (75,761,902)			84,106,171	(75,761,902)	8,344,269
2018	-	27,998,680	8,051,695	(56,821,427)	$ 169,334,250		205,384,626	(56,821,427)	148,563,199
2019	-	-	4,025,846	(37,880,952)	127,000,687	$ (100,201,052)	131,026,534	(138,082,004)	(7,055,470)
2020	-	-	-	(18,940,477)	84,667,124	(75,150,789)	84,667,124	(94,091,266)	(9,424,142)
2021	-	-	-	-	42,333,561	(50,100,526)	42,333,561	(50,100,526)	(7,766,965)
2022	-	-	-	-	-	(25,050,263)	-	(25,050,263)	(25,050,263)

Schedule of CTA Contributions ($'s in 000's)

	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
Employer Portion of Required Contribution on a statutory basis	$ 116,367	$ 112,265	$ 106,662	$ 82,001	$ 81,731	$ 80,488	$ 76,899	$ 61,982	$ 55,976	$ 56,474
Actual Employer Contributions	$ 121,668	$ 117,115	$ 104,523	$ 83,855	$ 82,800	$ 82,268	$ 79,518	$ 62,788	$ 60,318	$ 56,216
Contribution deficiency (excess)	$ (5,301)	$ (4,850)	$ 2,139	$ (1,854)	$ (1,069)	$ (1,780)	$ (2,619)	$ (806)	$ (4,342)	$ 258
Covered payroll	$ 645,799	$ 623,037	$ 595,047	$ 575,444	$ 573,548	$ 564,827	$ 550,616	$ 548,515	$ 541,354	$ 528,288
Contributions as a percentage of covered payroll	18.02%	18.02%	17.93%	14.25%	14.25%	14.25%	13.97%	11.30%	10.34%	10.69%

Notes to Schedule -

Valuation Date: Actuarially determined contribution rates are calculated as of January 1, one year prior to the end of the fiscal year in which contributions are reported

Other information:

1. The demographic assumptions were updated in 2019 to bring the assumptions more in line with actual plan experience.

Projection of Fiduciary Net Position

Year	Projected Beginning Fiduciary Net Position (a)	Projected Total Contributions* (b)	Projected Benefit Payments (c)	Projected Administrative Expense (d)	Projected Investment Earnings (e)	Projected Ending Fiduciary Net Position (f) = (a) + (b) - (c) - (d) + (e)
2020	1,890,466,172	214,496,923	297,485,521	2,800,000	152,494,803	1,957,172,377
2021	1,957,172,377	213,578,347	305,400,254	2,856,000	157,638,647	2,020,133,117
2022	2,020,133,117	212,840,906	314,193,297	2,913,120	162,445,256	2,078,312,862
2023	2,078,312,862	212,955,907	321,861,781	2,971,382	166,937,323	2,133,372,928
2024	2,133,372,928	214,058,314	329,071,319	3,030,810	171,230,448	2,186,559,561
2025	2,186,559,561	215,532,320	336,003,743	3,091,426	175,395,196	2,238,391,908
2026	2,238,391,908	217,095,865	342,815,005	3,153,255	179,456,687	2,288,976,200
2027	2,288,976,200	218,546,142	348,189,905	3,216,320	183,468,658	2,339,584,775
2028	2,339,584,775	220,095,278	354,057,622	3,280,646	187,466,653	2,389,808,438
2029	2,389,808,438	222,317,704	359,600,883	3,346,259	191,473,182	2,440,652,182
2030	2,440,652,182	225,068,754	363,945,261	3,413,184	195,600,663	2,493,963,154
2031	2,493,963,154	228,596,998	366,917,395	3,481,448	200,018,543	2,552,179,852
2032	2,552,179,852	232,708,291	368,881,504	3,551,077	204,905,421	2,617,360,983
2033	2,617,360,983	236,942,923	370,149,724	3,622,099	210,399,932	2,690,932,016
2034	2,690,932,016	241,624,233	370,374,158	3,694,541	216,646,817	2,775,134,368
2035	2,775,134,368	246,876,870	369,248,711	3,768,431	223,848,406	2,872,842,502
2036	2,872,842,502	252,809,056	366,879,571	3,843,800	232,241,923	2,987,170,110
2037	2,987,170,110	259,227,163	363,535,483	3,920,676	242,065,554	3,121,006,668
2038	3,121,006,668	266,026,743	359,394,263	3,999,089	253,546,264	3,277,186,323
2039	3,277,186,323	273,049,915	354,282,684	4,079,071	266,918,492	3,458,792,975
2040	3,458,792,975	280,482,084	348,546,321	4,160,653	282,430,181	3,668,998,266
2041	3,668,998,266	288,209,361	342,311,911	4,243,866	300,333,260	3,910,985,110
2042	3,910,985,110	296,224,293	335,748,029	4,328,743	320,883,201	4,188,015,832
2043	4,188,015,832	304,604,431	328,839,544	4,415,318	344,352,895	4,503,718,296
2044	4,503,718,296	313,340,768	321,830,610	4,503,624	371,031,400	4,861,756,230
2045	4,861,756,230	322,454,587	314,636,407	4,593,697	401,225,263	5,266,205,976
2046	5,266,205,976	331,924,641	307,467,022	4,685,571	435,261,428	5,721,239,453
2047	5,721,239,453	341,751,631	300,120,939	4,779,282	473,492,253	6,231,583,116
2048	6,231,583,116	351,906,840	292,706,046	4,874,868	516,302,146	6,802,211,188
2049	6,802,211,188	362,294,944	285,106,737	4,972,365	564,102,297	7,438,529,327
2050	7,438,529,327	372,977,901	277,838,917	5,071,812	617,320,320	8,145,916,818
2051	8,145,916,818	383,986,807	270,336,605	5,173,249	676,424,143	8,930,817,914
2052	8,930,817,914	395,233,310	262,475,647	5,276,714	741,946,864	9,800,245,727
2053	9,800,245,727	406,862,435	254,394,108	5,382,248	814,467,346	10,761,799,152
2054	10,761,799,152	418,960,297	245,930,340	5,489,893	894,622,511	11,823,961,727
2055	11,823,961,727	431,550,697	237,330,536	5,599,691	983,103,259	12,995,685,456
2056	12,995,685,456	444,628,965	228,093,274	5,711,685	1,080,668,213	14,287,177,676

*The contributions displayed contain both employer and employee contributions.

Since the projected investment earnings become greater than the projected benefit payments including administrative expenses, the Plan's fiduciary net position is sufficient to cover all the projected future benefit payments of current Plan members.

Actuarial Present Value of Projected Benefit Payments

					8.25%	3.26%	8.25%
Year	Projected Beginning Fiduciary Net Position	Projected Benefit Payments	Funded Portion of Projected Benefit Payments	Unfunded Portion of Projected Benefit Payments	Present Value of Funded Benefit Payments	Present Value of Unfunded Benefit Payments	Present Value of Benefit Payments Using Single Discount Rate
2020	1,890,466,172	297,485,521	297,485,521	-	274,813,414	-	274,813,414
2021	1,957,172,377	305,400,254	305,400,254	-	260,623,507	-	260,623,507
2022	2,020,133,117	314,193,297	314,193,297	-	247,692,696	-	247,692,696
2023	2,078,312,862	321,861,781	321,861,781	-	234,400,099	-	234,400,099
2024	2,133,372,928	329,071,319	329,071,319	-	221,386,180	-	221,386,180
2025	2,186,559,561	336,003,743	336,003,743	-	208,822,209	-	208,822,209
2026	2,238,391,908	342,815,005	342,815,005	-	196,817,852	-	196,817,852
2027	2,288,976,200	348,189,905	348,189,905	-	184,668,548	-	184,668,548
2028	2,339,584,775	354,057,622	354,057,622	-	173,469,371	-	173,469,371
2029	2,389,808,438	359,600,883	359,600,883	-	162,757,758	-	162,757,758
2030	2,440,652,182	363,945,261	363,945,261	-	152,170,026	-	152,170,026
2031	2,493,963,154	366,917,395	366,917,395	-	141,720,750	-	141,720,750
2032	2,552,179,852	368,881,504	368,881,504	-	131,620,675	-	131,620,675
2033	2,617,360,983	370,149,724	370,149,724	-	122,007,565	-	122,007,565
2034	2,690,932,016	370,374,158	370,374,158	-	112,777,406	-	112,777,406
2035	2,775,134,368	369,248,711	369,248,711	-	103,865,785	-	103,865,785
2036	2,872,842,502	366,879,571	366,879,571	-	95,334,292	-	95,334,292
2037	2,987,170,110	363,535,483	363,535,483	-	87,265,889	-	87,265,889
2038	3,121,006,668	359,394,263	359,394,263	-	79,696,811	-	79,696,811
2039	3,277,186,323	354,282,684	354,282,684	-	72,575,799	-	72,575,799
2040	3,458,792,975	348,546,321	348,546,321	-	65,959,066	-	65,959,066
2041	3,668,998,266	342,311,911	342,311,911	-	59,842,276	-	59,842,276
2042	3,910,985,110	335,748,029	335,748,029	-	54,221,516	-	54,221,516
2043	4,188,015,832	328,839,544	328,839,544	-	49,058,506	-	49,058,506
2044	4,503,718,296	321,830,610	321,830,610	-	44,353,687	-	44,353,687
2045	4,861,756,230	314,636,407	314,636,407	-	40,057,463	-	40,057,463
2046	5,266,205,976	307,467,022	307,467,022	-	36,161,389	-	36,161,389
2047	5,721,239,453	300,120,939	300,120,939	-	32,607,309	-	32,607,309
2048	6,231,583,116	292,706,046	292,706,046	-	29,378,015	-	29,378,015
2049	6,802,211,188	285,106,737	285,106,737	-	26,434,453	-	26,434,453
2050	7,438,529,327	277,838,917	277,838,917	-	23,797,318	-	23,797,318
2051	8,145,916,818	270,336,605	270,336,605	-	21,390,055	-	21,390,055
2052	8,930,817,914	262,475,647	262,475,647	-	19,185,280	-	19,185,280
2053	9,800,245,727	254,394,108	254,394,108	-	17,177,434	-	17,177,434
2054	10,761,799,152	245,930,340	245,930,340	-	15,340,356	-	15,340,356
2055	11,823,961,727	237,330,536	237,330,536	-	13,675,683	-	13,675,683
2056	12,995,685,456	228,093,274	228,093,274	-	12,141,714	-	12,141,714

Since the projected investment earnings become greater than the projected benefit payments including administrative expenses, the Plan's fiduciary net position is sufficient to cover all the projected future benefit payments of current Plan members.

Section 4 - Actuarial Funding Projections

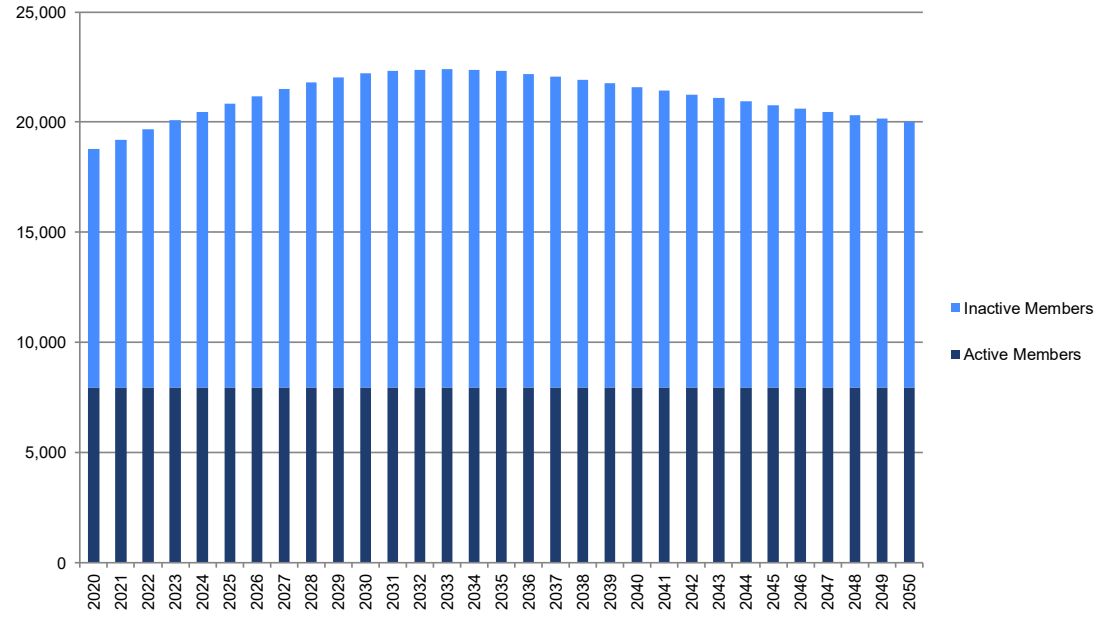
Section 4.1
Projection Assumptions and Methods

Key Assumptions

- 8.25% investment return on the Fair Value of Assets in all future years.
- The Actuarial Value of Assets is based on a five-year smoothing method.
- Actuarial assumptions and methods as described in Section 6. All future demographic experience is assumed to be exactly realized.
- The statutory contribution is contributed each year.
- Projections assume a 0% increase in the total active member population. All new future members are expected to enter the plan after 12 months of continuous service and contribution rates are determined as a percent of total payroll.

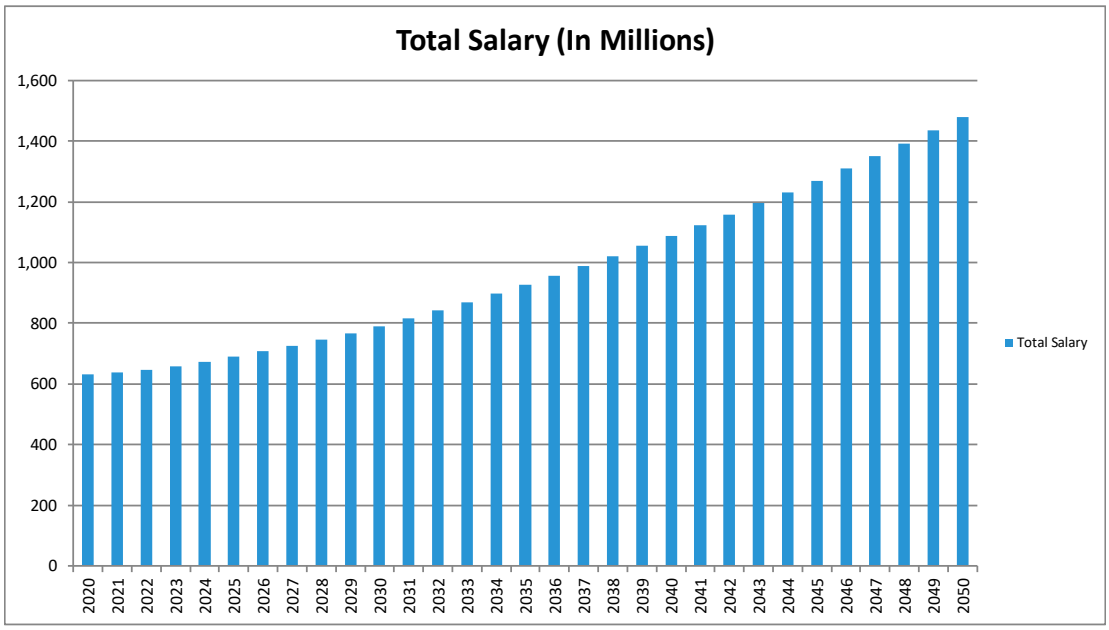
Section 4.2
Membership Projection

Projected Member Count

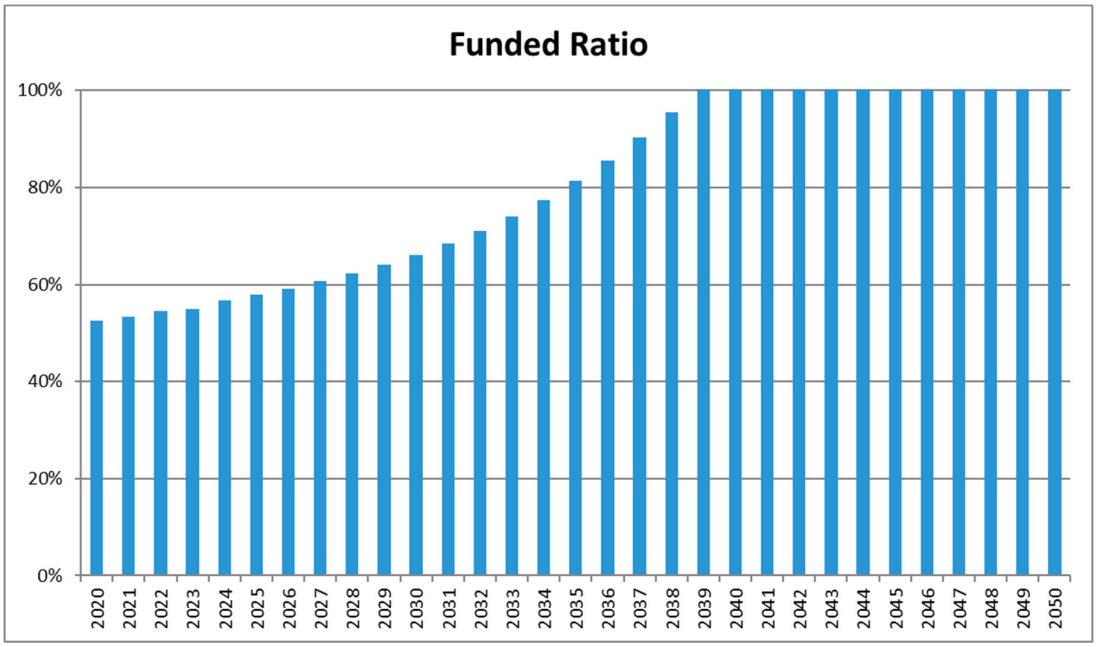


Section 4.2
Membership Projection, continued

Projected Current and New Member Payroll



Section 4.3
Projection of Funded Status



Section 5 - Member Data

Section 5.1
Summary of Membership Data as of January 1, 2020
(Annual Salaries and Annual Benefits $ in 000's)

Item	Male	Female	Total
Number of Members [1]	5,575	2,482	8,057
Annual Salaries [2]	$465,435	$165,977	$631,412
Average Age [1]	48.96	47.53	48.52
Average Service [1]	13.72	12.19	13.25

Terminated Vested Employees

Item	Male	Female	Total
Number of Members	101	50	151
Annual Accrued Benefit	$2,745	$1,316	$4,061
Average Age	57.26	55.77	56.77

Retirees and Beneficiaries

Item	Male	Female	Total
Number of Members	6,592	2,665	9,257
Annual Retirement Benefit	$204,290	$55,899	$260,189
Average Age	72.33	71.99	72.23

Disability Allowances

Item	Male	Female	Total
Number of Members	706	596	1,302
Annual Disability Benefit	$13,868	$9,881	$23,749
Average Age	64.75	62.88	63.89

1 Active statistics include all participants who are actively employed, 10 participants who are on leave and 110 participants who have opted out of participating in the Plan and are only entitled to a return of their contributions.

2 The salary information for the 110 participants who have opted out of participating in the Plan is not included.

Section 5.2
Age and Service Distribution of Active Members as of January 1, 2020

Number of Participants

	Years of Service									
Age	**Under 5**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**Over 40**	**Total**
Under 25	25	-	-	-	-	-	-	-	-	25
25-29	259	37	-	-	-	-	-	-	-	296
30-34	386	188	46	1	-	-	-	-	-	621
35-39	307	247	197	87	6	-	-	-	-	844
40-44	325	217	184	240	97	4	-	-	-	1,067
45-49	251	252	179	326	286	66	1	-	-	1,361
50-54	197	215	158	329	330	204	50	1	-	1,484
55-59	156	170	132	286	285	179	91	6	-	1,305
60-64	77	123	84	159	178	120	57	14	8	820
Over 65	19	44	28	41	46	24	19	3	10	234
Total	2,002	1,493	1,008	1,469	1,228	597	218	24	18	8,057

Section 5.3
Retirement Retiree and Beneficiary Data as of January 1, 2020

Number and Average Annual Allowance

Age Last Birthday	Number	Annual Allowance	Average Allowance
Retired Annuitants			
Under 50	18	$872,918	$48,495
50-54	174	$7,767,848	$44,643
55-59	468	$20,345,232	$43,473
60-64	938	$36,703,832	$39,130
65-69	1665	$54,474,783	$32,718
70-74	2050	$59,722,056	$29,133
75-79	1479	$38,724,906	$26,183
Over 79	1278	$26,944,073	$21,083
Total	8,070	$245,555,648	$30,428
Surviving Spouses [1]			
Under 50	6	$49,697	$9,939
50-54	20	$268,977	$13,449
55-59	81	$1,001,210	$12,674
60-64	121	$1,705,265	$14,093
65-69	168	$2,525,255	$15,031
70-74	220	$3,022,261	$13,738
75-79	214	$2,669,577	$12,475
Over 79	357	$3,391,133	$9,499
Total	1,187	$14,633,375	$12,359
Disability Allowances			
Under 50	121	$2,046,970	$16,917
50-54	157	$3,347,503	$21,322
55-59	213	$4,566,322	$21,438
60-64	226	$4,745,484	$20,998
65-69	200	$3,635,654	$18,178
70-74	188	$2,863,895	$15,234
75-79	106	$1,426,923	$13,461
Over 79	91	$1,116,460	$12,269
Total	1,302	$23,749,211	$18,241

1 Number of beneficiaries includes 3 in 2020 who were pending cashouts after the valuation date. These members are not included in the calculation of the average benefit.

Section 5.4
Inactive Vested Employee Data as of January 1, 2020

Number and Average Accrued Benefit

Age Last Birthday	Number	Annual Accrued Benefit	Average Accrued Benefit
Terminated Vested [1]			
Under 35	-	-	N/A
35-39	2	$32,963	$16,481
40-44	5	$104,207	$26,052
45-49	16	$290,549	$20,754
50-54	29	$699,163	$24,970
55-59	40	$1,161,715	$29,043
60-64	54	$1,707,729	$31,625
65-69	4	$52,019	$13,005
Over 70	1	$12,574	$12,574
Total	151	$4,060,919	$27,625

1 Number of deferred vested members includes 4 in 2020 who were pending cashouts after the valuation date. These members are not included in the calculation of the average benefit.

Section 6 - Basis of the Actuarial Valuation

Section 6.1
Summary of Plan and Contribution Provisions

Eligibility—All full-time permanent employees of the Chicago Transit Authority are included in the Plan after completing 12 months of continuous service unless specifically excluded by the terms of a collective bargaining agreement. Exempt non-vested employees may opt out of the Plan. Chicago Transit Authority Board members are not included.

Contributions—The Chicago Transit Authority will contribute a percent of compensation for all participating employees and each participating employee will contribute a percent of his compensation to the Plan:

Annual Contributions to the Plan (Percentage of Compensation)	
Authority	**Employees**
20.647%	13.324%

For years through 2040, the amount paid by the Authority with respect to debt service on bonds issued for contribution to the Plan shall be treated as a credit against the amount of required contribution up to an amount not to exceed six percent of compensation paid by the Authority in the following year. The amount paid in debt service is always greater than six percent of projected compensation.

In order to be eligible for the credit, the debt service payment may not be paid with the proceeds of bonds or notes issued by the CTA for any calendar year after 2008. Buck has confirmed that the debt service payment for the year triggering the credit was not paid with the proceeds of bonds or notes issued by the CTA for any calendar year after 2008.

Minimum contributions as set forth elsewhere in this report may also apply.

Normal Retirement—The normal retirement age is 65. For employees retiring on or after January 1, 2001 the annual normal retirement pension is equal to the sum of (a) and (b) below, but not greater than 70.0% of the employee's average annual compensation:

(a) 1% of the employee's past service compensation as of May 31, 1948, for each full year of continuous service prior to June 1, 1949, plus
(b) 2.15% of average annual compensation for each year (and fraction of completed calendar months) of continuous service after June 1, 1949.

Average annual compensation is equal to the highest average compensation over any four calendar years out of the final 10 calendar years prior to normal retirement (or actual retirement, if later). If an employee has at least 20 years of service, his minimum annual pension is $2,220.

Early Retirement:

Employees hired before January 18, 2008: An employee may retire early after attaining age 55 and completing at least three years of continuous service, or after completion of 25 years of continuous service. The early retirement pension is equal to the accrued normal retirement pension based on compensation and service at early retirement, reduced by 5% for each year or fraction younger than age 65. The 5% per year reduction is not applied if the employee has at least 25 years of service. Employees hired after September 5, 2001 may retire early with unreduced benefits after attaining age 55 and completing at least 25 years of service.

Employees hired on and after January 18, 2008: An employee may retire with unreduced benefits upon attainment of age 64 with 25 years of service. An employee may retire with a benefit reduced as described above upon attainment of age 55 with 10 years of continuous service.

Disability Allowance:

An employee is eligible for a disability allowance if he becomes disabled after completing 10 years of service, or if his disability after completing five years of service is covered under the Workmen's Compensation Act. An employee is disabled if he either (a) is totally and permanently disabled or (b) is unable to return to work at their same job after receiving 26 weeks of benefits under the Authority's Group Accident and Sickness Insurance or from the Authority under the Workmen's Compensation Act. The disability allowance is equal to the normal retirement pension based on compensation and service at disability subject to a minimum annual pension of $4,800.

Death Benefits:

If an employee dies prior to retirement or disability and after one year of service, his contributions, accumulated with interest, are paid to his beneficiary. "Interest" is equal to the rate of interest earned by the Fund (to a maximum of 2%) prior to January 1, 1971, 1/2 of the rate of interest earned by the Fund (to a maximum of 3%) between January 1, 1971, and January 1, 1980, and 3% after December 31, 1979. If an employee dies after 90 days of service but prior to one year of service, his contributions, without interest, are paid to his beneficiary; and if he dies prior to 90 days of service, his contributions are not refunded.

If an employee is eligible for early retirement, he is automatically covered by a surviving spouse benefit, payable upon his death prior to retirement, in lieu of a return of his contributions. The spouse benefit is equal to 1/2 of the pension which would have been payable to the employee if he had retired on the first day of the month of his death and had elected an optional form of pension providing 1/2 of his reduced pension to his surviving spouse. Employees may elect not to be covered by this option and provide for the payment of their contributions with interest to their beneficiary in lieu thereof.

If an employee dies after his retirement pension has commenced, his beneficiary receives the excess, if any, of his contributions, accumulated with interest to his retirement date, over the sum of the pension payments made to him. However, if his surviving spouse is entitled to a pension after his death, such excess will not be paid to his beneficiary. At the death of the surviving spouse, the excess, if any, of the contributions accumulated with interest to his retirement date over the sum of the pension payments made to him and his surviving spouse will be paid.

A retired employee's beneficiary will receive a death benefit equal to the amount from the following schedule according to the employee's age and service at retirement:

Age	Service	Age + Service	Death Benefit
65	20	N/A	$8,000
60	N/A	90	$8,000
N/A	25	N/A	$8,000
N/A	N/A	94	$8,000
60-64	20	N/A	$6,000
55-59	20	N/A	$5,000
All Others			$2,000

Termination Benefits:

If an employee terminates his employment prior to eligibility for retirement or disability and after completing one year of service, he receives a refund of his contributions plus interest (3% after December 31, 1979). If he terminates after 90 days but prior to one year, he receives his contributions without interest, and if he terminates less than 90 days after hire, he receives no refund. If an employee has completed 10 years of continuous service and elects to leave his contributions in the Plan, he remains entitled to his normal retirement pension beginning at age 65 but based on his compensation and service at termination.

Optional Benefit Forms:

In lieu of a normal pension, an employee may elect an optional annuity of equivalent actuarial value providing payments of 1/2, 2/3, or all of his reduced pension to his spouse after his death (Option A).

Alternatively, an employee may elect an optional annuity of equivalent actuarial value providing payments of 1/2, 2/3, or all of his reduced pension to his spouse after his death with the further provision that his benefit will be restored to the full amount to him after the death of his spouse (Option B).

Retired Employees:

Benefits for retired employees have been valued according to benefits in effect at time of retirement as modified by subsequent amendments. Such benefits are kept on records maintained by the Authority.

Voluntary Early Retirement Incentive Program:

During 1997, the Plan was amended to offer enhanced retirement benefits to all employees who have at least 25 years of continuous service on or before December 31, 1999, and who have not retired prior to January 1, 1997. Those eligible on or before June 30, 1997 must elect to participate during the period March 1, 1997, to June 30, 1997. Employees eligible during the period July 1, 1997, to December 31, 1999, must elect to participate between July 1, 1997, and February 28, 1998. All eligible employees who elect to participate must retire no later than December 31, 1999. The benefit is determined based on a formula multiplier of 2.40% of average annual compensation with the benefit cap at 70.0% of such average annual compensation.

Ad hoc increases in retiree benefits:
As part of the Arbitration Award ruling of November 13, 2003, the following ad hoc increases were given to retirees in payment status as of January 1, 2000:

(a) $75 per month for members retired before January 1,1980
(b) $50 per month for members who retired on or after January 1, 1980, but before January 1, 1991
(c) $40 per month for members who retired on or after January 1, 1991, but before January 1, 2000

As part of an Arbitration Award ruling of June 26, 2007, another ad hoc adjustment was made for participants.

Contribution Requirements Under P.A. 95-0708

Beginning January 18, 2008, the Authority shall make contributions to the Plan in an amount equal to 12 percent of compensation and participating employees shall make contributions in an amount equal to six percent of compensation. For years through 2040, the amount paid by the Authority with respect to debt service on bonds issued for contribution to the Retirement Plan shall be treated as a credit against the amount of required contribution, up to an amount not to exceed six percent of compensation paid by the Authority in the following year.

If the funded ratio is projected to decline below 60 percent in any year before 2040 using reasonable actuarial assumptions and the projected unit credit funding method, the contribution shall be increased so that the funded ratio is not projected to drop below 60 percent. If the funded ratio drops below 60 percent in any year before 2040, the contribution shall be increased so that the funded ratio is projected to reach 60 percent within 10 years. The increase in contributions shall be effective as of the January 1 following the determination, or 30 days following the determination, whichever is later. One-third of the increase in contributions shall be paid by participating employees and two-thirds by the Authority.

Beginning in 2040, the minimum contribution for each fiscal year shall be predetermined each year as the amount required to bring the total assets of the Plan up to 90 percent of the total actuarial liabilities by the end of 2059, using the projected unit credit funding actuarial cost method and reasonable actuarial assumptions. Participating employees shall be responsible for one-third of the required contribution and the Authority shall be responsible for two-thirds of the required contribution.

Beginning in 2060, the minimum contribution for each year shall be an amount needed to maintain the total assets of the Plan at 90 percent of the total actuarial liabilities of the Plan and the contribution shall be funded one-third by participating employees and two-thirds by the Authority.

Section 6.2
Description of Actuarial Methods and Valuation Procedures

A. Actuarial Cost Method

Liabilities and contributions shown in this report are computed using the **Projected Unit Credit Cost Method** of funding.

Sometimes called a "funding method," this is a particular technique used by actuaries for establishing the amount and incidence of the annual actuarial cost of pension plan benefits, or normal cost, and the related unfunded actuarial accrued liability. Ordinarily the annual contribution to the plan is comprised of (1) the normal cost and (2) an amortization payment on the unfunded actuarial accrued liability.

Under the Projected Unit Credit Cost Method, the **Normal Cost** for the given year is computed as the present value of the unit of benefit attributable to that year for each active member. The Normal Cost for the Plan is determined by summing individual results for each active member.

The **Actuarial Accrued Liability** under this method at any point in time is equal to the present value of benefits accrued to the measurement date using a service pro-rate method.

The **Unfunded Actuarial Accrued Liability** is the excess of the Actuarial Accrued Liability over the Actuarial Value of Plan Assets actually on hand on the valuation date.

Under this method experience gains or losses, i.e. decreases or increases in accrued liabilities attributable to deviations in experience from the actuarial assumptions, adjust the Unfunded Actuarial Accrued Liability.

The **Funded Ratio** is the ratio of the actuarial value of assets to the Actuarial Accrued Liability.

B. Asset Valuation Method

The actuarial value of assets is based on a five-year smoothing method and is determined by spreading the effect of each year's investment return in excess of or below the expected return. The Fair Value of assets at the valuation date is reduced by the sum of the following:

1. 80% of the return to be spread during the first year preceding the valuation date,
2. 60% of the return to be spread during the second year preceding the valuation date,
3. 40% of the return to be spread during the third year preceding the valuation date,
4. 20% of the return to be spread during the fourth year preceding the valuation date

C. Valuation Procedures

No actuarial liability is included for members who terminated non-vested prior to the valuation date, except those due a refund of contributions.

The compensation amounts used in the projection of benefits and liabilities were January 1, 2020 rates of pay provided by staff of the Retirement Board of Trustees. As discussed with the staff, the January 1, 2020 rates of pay used provided were adjusted by 26/27th of the actual amount reported due to the extra pay period in calendar year 2019.

No termination or retirement benefits were projected to be greater than the dollar limitation required by the Internal Revenue Code Section 415 for governmental plans.

Annual increases in salary were limited to the dollar amount defined under Internal Revenue Code Section 401(a)(17) for affected members.

Section 6.3
Summary of Actuarial Assumptions and Changes in Assumptions

Rate of Covered Pay: The rate of covered pay for participants has been estimated at $631,411,861 for 2020. The following adjustments were made to the actual covered earnings for 2019 supplied by the Authority:

(a) No earnings or a fractional year of earnings were submitted for employees with a work status date in 2019 who were hired during 2018. We have annualized the 2018 earnings and assumed minimum earnings of $50,750 per year for this group.

(b) For employees on layoff, extended leave of absence, or inactive status, we have assumed minimum earnings of $50,750 per year.

(c) For all employees, 2020 salary was assumed to increase 1.50% from 2019.

(d) As discussed with the staff of the Retirement Board of Trustees, except for participants described in items (a) or (b), the January 1, 2020 rate of covered pay used reflect a 26/27th adjustment to the actual amount reported due to the extra pay period in calendar year 2019.

Retiree Benefits: The benefit amounts received for retirees were compared to information received from the Authority for the prior valuation.

Earnings on Plan Assets: 8.25% per annum, compounded annually, net of investment expenses.

Salary Inflation: 3.10% per annum

Compensation Increases: According to the following table, compounded annually, assumed end of year (includes inflation):

Years of Service	Rate
1	11.00%
2	12.00%
3	16.00%
4	8.00%
>=5	3.50%

Mortality:

(a) *Active Members & Healthy Retirees* — The SOA Public Mortality General Below Median generational with Improvement Scale MP-2018 with a 13% increase adjustment for female.

(b) *Survivors* — The SOA Public Survivor Mortality General Below Median generational with Improvement Scale MP-2018. Beneficiaries of current retirees are assumed to have the same mortality as active members & healthy retirees prior to the death of the member retiree.

(c) *Disabled Retirees* — The SOA Public Disability Mortality General Below Median generational with Improvement Scale MP-2018.

Withdrawals from Service: According to the following table shown for illustrative ages:

Age	Rates of Termination for Reasons Other than Death or Disability
25	8.50%
30	7.00%
35	4.90%
40	3.80%
45	3.20%
50	2.70%
55 & Older	0.00%

If service is 25 or greater, no withdrawal is assumed.

Recovery from disability without returning to work: Disabled members are assumed to recover according to the following table as shown for illustrative ages:

Sample Attained Ages	Disabled Recovery [1]	
	Men	Women
30	3.419%	3.954%
35	2.899%	3.463%
40	2.215%	2.881%
45	1.392%	2.204%
50	0.549%	1.419%
55	0.029%	0.580%
60	0.000%	0.021%
65	0.000%	0.000%
70	0.000%	0.000%
75	0.000%	0.000%
80	0.000%	0.000%

1. Disability recovery after verification of the ability to return to work in the same position as determined by the Plan's Disability manager.

Disability Allowance: According to the following table as shown for illustrative ages:

Age	Rate of Disability
25	0.10%
30	0.10%
35	0.25%
40	0.50%
45	0.73%
50	0.85%
55	1.15%
60	1.25%
65 & older	1.25%

Service Retirements:

Age	Pre 1/19/2008 Hires Probability of Retirement		Post 1/18/2008 Hires Probability of Retirement	
	Service<25	Service>25	Service<25	Service>25
45-54	0.00%	20.00%	0.00%	0.00%
55	2.00%	20.00%	2.00%	2.00%
56	2.00%	20.00%	2.00%	2.00%
57	2.50%	20.00%	2.50%	2.50%
58	3.00%	20.00%	3.00%	3.00%
59	3.50%	25.00%	3.50%	3.50%
60	4.00%	25.00%	4.00%	4.00%
61	5.00%	35.00%	5.00%	5.00%
62	15.00%	35.00%	15.00%	15.00%
63	15.00%	35.00%	15.00%	15.00%
64	20.00%	35.00%	20.00%	20.00%
65	30.00%	40.00%	30.00%	30.00%
66	30.00%	30.00%	30.00%	30.00%
67	30.00%	30.00%	30.00%	30.00%
68	30.00%	30.00%	30.00%	30.00%
69	30.00%	30.00%	30.00%	30.00%
70-74	30.00%	30.00%	30.00%	30.00%
75	100.00%	100.00%	100.00%	100.00%

Spouse Data: 75% of employees eligible at retirement are assumed to be married, 40% of those married are assumed to elect a 50% J&S option (Option A or B–50%). Of those electing a 50% J&S, 75% are assumed to elect the pop up feature (Option B–50%) and the average equivalency factors to convert their accrued pension to a spouse option (Option A–50%) and (Option B-50%) are assumed to be 88% and 86%, respectively. A wife is assumed to be 3 years younger than her husband. Actual dependent coverage data was used for participants retired as of the valuation date.

Miscellaneous and Technical Assumptions:

Pay Increase Timing:	End of (Fiscal) year.
Decrement Timing:	Decrements of all types 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 the decrement is assumed to occur.
Benefit Service:	Exact fractional service from date of participation is used to determine the amount of benefit payable.
Decrement Relativity:	Decrement rates are used directly based on assumptions, without adjustment for multiple decrement table effects.
Decrement Operation:	Disability and turnover do not operate after 25 years of service.
Actuarial Math Contribution Expense Load:	Prior year expenses rounded to the nearest $100,000

Summary of changes since January 1, 2019 Valuation

There have been no changes from those used in the prior valuation.

Section 7 - ASOP 51

Actuarial Standard of Practice No. 51 Disclosures

Funding future retirement benefits prior to when those benefits become due involves assumptions regarding future economic and demographic experience. These assumptions are applied to calculate actuarial liabilities and the corresponding funded status of the Plan. However, to the extent future experience deviates from the assumptions used, variations will occur in these calculated values. These variations create risk to the Plan. Understanding the risks to the funding of the Plan is important. Therefore, a new Actuarial Standard of Practice has been adopted. Actuarial Standard of Practice No. 51 (ASOP 51) requires certain disclosures of potential risks to the Plan and provides useful information for intended users of actuarial reports that determine Plan contributions or evaluate the adequacy of specified contribution levels to support benefit provisions. While this public pension plan is not subject to the funding provisions of ERISA, The Retirement Plan for Chicago Transit Authority Employees uses the information presented to assist in making contribution decisions.

Under ASOP 51, risk is defined as the potential of actual future measurements deviating from expected future measurements resulting from actual future experience deviating from actuarially assumed experience.

It is important to note that not all risk is “negative” but all risk should be understood and accepted based on knowledge, judgment and educated decisions. Future measurements may deviate in ways that produce “positive” or “negative” financial impacts to the Plan.

In the actuary’s professional judgment, the following risks may reasonably be anticipated to significantly affect the plan’s future financial condition.

- Investment risk – the risk that assets will not return as expected
- Interest rate risk – the risk that the general level of interest rates will increase or decrease significantly from current levels
- Contribution risk – the risk that the actual contribution made will be different than the actuarially determined contribution
- Asset liability mismatch - potential that changes in asset values are not matched by changes in the value of liabilities
- Longevity and other demographic risk – the risk that mortality or other demographic experience will be different from expected

The following information is provided to comply with ASOP 51 and furnish beneficial information on potential risks to the Plan. This list is not all-inclusive; it is an attempt to identify the most significant risks and how those risks might affect the results shown in this report.

Note that ASOP 51 does not require the actuary to evaluate the ability or willingness of the Plan sponsor to make contributions to the Plan. In addition, this valuation report in not intended to provide investment advice or to provide guidance on the management or reduction of risk. Buck welcomes the opportunity to assist in such matters as part of a separate project or projects utilizing the appropriate staff and resources for those objectives.

Section 7 - ASOP51, continued

Assessment of Risks

- Investment return - One type of investment risk is that assets materially underperform expected return.

    - Lower assets mean higher unfunded liability and larger contribution amounts. For example, if the trust earns 1% less than assumed each year for ten years, the projected fair value of assets would be approximately 11% lower than expected.
    - The five-year smoothing method used for the actuarial value of assets defers a portion of investment gain/loss in each of the previous five years. If the assumed return on assets consistently overestimates the actual return on assets, the actuarial value of assets will be consistently higher than the true market value. Consistent underestimation of the unfunded liability can prevent the Plan from achieving anticipated funding goals even when all minimum required contributions are made timely.

- Asset growth does not keep pace with liability increases over time - One type of investment risk is that asset returns do not keep pace with liability growth over time. Plan liabilities are based on the discounted present value of anticipated future benefit payments. That present value grows at the discount rate as time passes and the future payouts move closer. If investment returns are lower than the rates used to discount liabilities, plan liabilities will increase more rapidly than plan assets. Over extended periods of time, such as those involved in pension obligations, these discrepancies can accumulate to significant shortfalls.

- Market shocks or regime changes - Invested assets are subject to significant disruptions from market shocks, such as the financial crisis of 2008/2009, or as a result of systemic regime changes that persist for years, such as historically low interest rates over the recent decade.

- Liability duration versus asset duration: Unless assets are explicitly structured to mimic the characteristics of plan liabilities, there is a risk that economic scenarios that effect interest rates will have a larger impact on liability than on assets. This is because plan liability is the discounted value of benefit payments that extend way out into future years, i.e. have a long duration. Even relatively small changes in interest rates can have a significant impact on plan liability; a decline in interest rates increases liability, while a rise in interest rates decreases liability. Plan investments typically have a shorter duration with respect to interest rate changes, often holding fixed income securities with lower durations than plan liabilities, and typically maintaining some moneys in equity investments that are not as directly sensitive to interest rate changes.

  For this Plan, a 1% decline in the discount rate used to value funding liabilities (from 8.25% to 7.25%), would increase the Plan’s liabilities by approximately 9.48%.

- Salary increases - Plan costs are sensitive to salary increases, with higher rates leading to higher obligations. This is because benefits at retirement are pay related, meaning that higher pay generates higher benefit levels at retirement. Compensation increases greater than assumed lead to actuarial losses since projected benefits are higher than predicted by assumed rates.

- Longevity and other demographic risks - Potential that mortality or other demographic experience (retirement, turnover, disability) may be different than expected. As the Plan matures and the majority of participants reach (or have reached) retirement eligibility, risks associated when participants retire can become significant. The Plan provides for unreduced early retirement benefits after meeting certain age and service conditions. These benefits are highly subsidized and thus can be significantly more valuable than normal retirement benefits and regular early retirement benefits. The demographic assumptions used to determine the actuarial valuation attempt to account for unreduced early retirement based on historical plan experience. However, due to the unpredictable nature of such benefits, future experience could differ significantly from past experience.

In addition to the risk that participants will not retire as expected, the Plan is subject to longevity risk the risk that participants will live longer (or shorter) than expected.

- Declining active workforce - since employer contributions are based on a percentage of participant's salaries, a declining active workforce will have the impact of the Plan potentially receiving lower contributions. In addition, if the required dollar amount of contributions remain level or increase, a declining active workforce will result in higher contribution rates in order to meet required contribution levels.

- Contribution risk – risk of not contributing an actuarially determined contribution. The Plan contribution is a statutory amount. There is a risk associated with the employer's contribution when the statutory amount and the actuarially determined contribution (Actuarial Math Contribution) amount differ. Actuarially determined contributions are calculated to adequately fund the Plan. Therefore, when the statutory contribution is lower than the actuarially determined contribution, there is an increased risk the Plan may not be sustainable in the long term.

Historical Results

The following table shows selected historical values of key valuation measures. These items illustrate how actual volatility has impacted the Plan in recent years and gives additional context to the risks described above. Further information can be found in the actuarial valuation reports for each year.

Valuation Date	1/1/2016	1/1/2017	1/1/2018	1/1/2019	1/1/2020
Actuarial Value of Assets (Billion)	1.74 *	1.75	1.80	1.84	1.88
Asset Return in Prior Year	-0.20%	6.80%	14.40%	-3.53%	15.70%
Investment gain/(loss) - AVA basis (Million)	(146.6)	(20.1)	13.6	(22.2)	(12.3)
Actuarial Accrued Liability (Billion)	3.27	3.34	3.42	3.49	3.58
Liability duration	9.81	9.76	9.66	9.50	9.48
The ratio of retired life** actuarial accrued liability to total actuarial accrued liability	67.4%	68.0%	67.7%	67.4%	67.5%
The ratio of cashflow to actuarial value of assets	-6.9%	-7.2%	-5.8%	-4.9%	-4.7%
The ratio of actuarial value of assets to participant payroll	303.9%	304.5%	302.9%	294.7%	298.3%
Normal cost (Million)	60.5	60.7	62.9	64.0	64.9
Discount rate	8.25%	8.25%	8.25%	8.25%	8.25%
Non-Investment gain/(loss) (Million)	(20.9)	(16.3)	(31.1)	(67.3)	(37.6)
Funding Policy contribution (Million)	81.6	103.0	107.1	112.3	130.4

* Actuarial Value of Assets is Fair Market Value

** Retired members and beneficiaries

Commentary on Plan Maturity Measures

The ratio of retired life actuarial accrued liability to total actuarial accrued liability

A mature plan will often have a ratio above 60 - 65 percent. A higher percentage will generally indicate an increased need for asset / liability matching due to inability to absorb volatility in future returns.

The ratio of cashflow to actuarial value of assets

The cashflow as a percentage of assets means the fund may need to invest in more liquid assets to cover the benefit payments. More liquid assets may not garner the same returns as less liquid assets and therefore increase the investment risk. However, there may already be enough liquid assets to cover the benefit payments, less investment return is needed to cover the shortfall, or only a small portion of assets will need to be converted to cash. Therefore, the investment risk is likely not amplified at this time. This maturity measure should be monitored for continual negative trend with greater magnitude.

The ratio of actuarial value of assets to participant payroll

Plans that have higher asset-to-payroll ratios experience *more* volatile employer contributions (as a percentage of payroll) due to investment return. For example, if lower than expected asset return increases the unfunded liability of two plans by the same percent the plan with a higher assets-to-payroll ratio may experience higher contribution volatility than a plan with a lower asset-to-payroll ratio.

Glossary of Terms

Actuarial Accrued Liability	Total accumulated cost to fund pension benefits arising from service in all prior years.
Actuarial Cost Method	Technique used to assign or allocate, in a systematic and consistent manner, the expected cost of a pension plan for a group of plan members to the years of service that give rise to that cost.
Actuarial Present Value of Future Benefits	Amount which, together with future interest, is expected to be sufficient to pay all future benefits.
Actuarial Valuation	Study of probable amounts of future pension benefits and the necessary amount of contributions to fund those benefits.
Actuary	Person who performs mathematical calculations pertaining to pension and insurance benefits based on specific procedures and assumptions.
Normal Cost	That portion of the actuarial present value of benefits assigned to a particular year in respect to an individual participant or the plan as a whole.
Unfunded Actuarial Accrued Liability (UAAL)	The portion of the actuarial accrued liability not offset by plan assets.