BUCK

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Retirement Plan for Chicago Transit Authority Employees

Actuarial Valuation Report as of January 1, 2019, including supplementary disclosure information for GASB Statement No. 67

September 2019

September 19, 2019

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, 2019, prepared in accordance with 40 ILCS 5/22-101(e). In addition, it includes disclosure information as of December 31, 2018, required under GASB Statement No. 67. The actuarial valuation of the Plan is performed annually and Buck Global, LLC (Buck) was retained to perform the valuation as of January 1, 2019. 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, 2018 actuarial valuation for a number of reasons including market returns of -3.53% compared to the 8.25% assumed rate of return, demographic experience, updated participant data, payroll and salary increases that were greater than expected. The Board adopted the recommended changes to the demographic, economic assumptions and optional forms of benefit payment elections at retirement effective with the January 1, 2019 actuarial valuation. Overall, these caused the funded ratio not to meet the standards set forth in ILCS 5/22-101(e) and, therefore, there is a need to increase authority and employee contribution rates to comply with 40 ILCS 5/22-101(e) as follows:

Annual Contributions to the Plan (Percentage of Compensation)		
Fiscal Year	Authority	Employees
2020 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 2029 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
- Pay off the unfunded liability over 20 years using layered amortization

Under this method, a contribution of approximately 33.36% 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 Governmental Accounting Standards Board (GASB) Statement No. 67, *Financial Reporting for Defined Benefit Pension Plans and Note Disclosures for Defined Contribution Plans*.

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 my opinion the calculations also comply with Illinois law, and where applicable, the Statements of the Governmental Accounting Standards Board. I certify that the information presented herein is accurate and fairly portrays the actuarial position of the Plan as of January 1, 2019.

I am a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries. I have met the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein and am available to answer questions about them.

Respectfully submitted,

Buck Global, LLC

Aaron Shapiro

Aaron Shapiro, FSA, MAAA, EA

Principal and Consulting Actuary

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Executive Summary

Membership

Actives: As of January 1, 2019, there were 8,159 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, 2019	January 1, 2018
Number of active employees [1]	8,159	8,192
Average age	48.5	48.5
Average years of service	13.4	13.4
Total annual valuation salary [2]	$623,036,951	$595,046,668
Average annual salary [2]	$77,300	$73,327
Total accumulated contributions	$544,522,986	$496,944,601
Average accumulated contributions	$67,559	$61,238

1 Active statistics include all participants who are actively employed, which includes 22 participants this year & 26 participants last year who are on leave and 99 participants this year & 77 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 99 participants this year & 77 particpants last year who have opted out of participating in the Plan is not included.

The number of active members decreased by 0.4% from the previous valuation date. The average age and average service of the active members remained the same. The total annual valuation salary increased by 4.7%. The average salary increased by 5.42% 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 113 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, 2019	January 1, 2018
Number of terminated vested members	113	106
Average age	57.4	57.8
Average annual benefit payments	$27,130	$27,001

The number of terminated vested members increased by 6.6% from the previous valuation. The average age of the terminated vested members decreased by 0.4 years. The Average Monthly Pension Benefit for these members increased by 0.48% 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 8,020 retired members, 1,269 members with disability allowances and 1,193 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, 2019	January 1, 2018
Number of members receiving payments		
➤ Retirees	8,020	8,032
➤ Disability Allowances	1,269	1,222
➤ Beneficiaries	1,193	1,133
➤ Total	10,482	10,387
Average age	70.8	70.5
Annual benefit amounts		
➤ Retirees	$238,623,759	$235,381,155
➤ Disability Allowances	$22,565,732	$21,144,541
➤ Beneficiaries	$14,239,447	$13,299,612
➤ Total	$275,428,938	$269,825,308
Average annual benefit payments	$26,276	$25,977

The number of members receiving payments increased by 0.91% from the previous valuation date. The average age of these members increased by 0.3 years. The total annual benefit payments for these members increased by 2.08% 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 $1,715.2 million as of January 1, 2019. This includes a decrease of $150.7 million over the Net Assets Available for Benefits of $1,865.9 million as of January 1, 2018. During the prior year, the investment return was -3.53% 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 $1,835.8 million as of January 1, 2019. This includes an increase of $33.6 million over the actuarial value of assets of $1,802.2 million as of January 1, 2018. During the prior year, the investment return on the actuarial value assets was 6.99%.

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 $89.4 million during the prior year. This net loss is approximately 2.6% 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 $67.3 million during the year ending December 31, 2018. This loss increased the unfunded actuarial accrued liability by $67.3 million and decreased the funded ratio by 1.03%.

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 loss on a fair value of assets basis. The actual rate of return on the fair value of plan assets was -3.53% for the year ending December 31, 2018 compared to the assumption of 8.25%.

The rate of return on the actuarial value of plan assets for the year ending December 31, 2018 was approximately 6.99% compared to the assumption of 8.25%. The loss on the actuarial value of assets, increased the unfunded actuarial accrued liability by $22.2 million and decreased the funded ratio by 0.63%. 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, 2019, the funded ratio of the Plan is 52.62%. This represents a decrease of 0.03% from the Plan's funded ratio of 52.65% as of January 1, 2018. 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. It is determined as a level percent of pay over each individual career attributable to the respective plan year. The normal cost for 2019 has been determined to be $54.0 million, or 8.66% of pay. This represents a decrease in the normal cost rate of 0.14% of pay from last year's normal cost rate of 8.80%.

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 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, 2019 is $1,756.5 million. This represents an increase of $2.6 million in the unfunded actuarial accrued liability from last year's amount of $1,753.9 million. The annual payment required to amortize the unfunded actuarial accrued liability of $1,756.5 million as of January 1, 2019 is $145.8 million, or 23.40% 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 33.36% of pay (8.66% of pay attributable to the normal cost plus 23.40% of pay attributable to the amortization of the unfunded plus 1.30% 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 No. 67 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 50 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, 2018.

Changes in Actuarial Assumptions, Methods, or Procedures

The actuarial assumptions and methods are outlined in Section 6.3. The valuation was completed based upon the following changes in demographic, economic, and optional forms of benefit payment assumptions at retirement adopted by the Board of Trustees at the April 2019 Board meeting.

Demographic assumptions:

1. Update the rates of withdrawal, disability, and retirement from employment among active members to reflect recent experience.

2. Update the rates of mortality among active members, annuitants, beneficiaries and survivors to reflect the new SOA Public Mortality tables

3. Update the rates of optional form of payment election among retiring active members to reflect recent experience.

4. Update the active participant counts and new entrant profiles used for cost projections to reflect demographic makeup of recent hires.

Economic assumptions:

1. Continued use of the 8.25% interest rate.

2. Reduce the rate of inflation from 3.25% to 3.10%.

3. Increase the rates of compensation increase for participants with less than five years of service and decrease the rates of compensation increase for participants with more than four years of service.

The net effect of the changes in assumptions decreased the Plan’s actuarial accrued liability by $58,807,306.

There have been no other changes in the demographic or economic assumptions from those used in the prior valuation.

Comparative Summary of Key Actuarial Valuation Results

	January 1, 2019	January 1, 2018
1. Investment Return Assumption	8.25 %	8.25 %
2. Membership Data		
a. Active Employees		
Number	8,159	8,192
Annualized Salaries (in thousands)	623,037	595,047
Average Pay	77,300	73,327
b. Terminated Participants with Vested Benefits		
Number	113	106
Total Monthly Accrued Benefit	255,474	238,509
Average Monthly Accrued Benefit	2,261	2,250
c. Retirees and Beneficiaries		
Number	9,213	9,165
Total Monthly Pension	21,071,934	20,723,397
Average Monthly Pension	2,287	2,261
d. Disability Allowances		
Number	1,269	1,222
Total Monthly Pension	1,880,478	1,762,045
Average Monthly Pension	1,482	1,442
3. Statutory Minimum Contribution Rates (as a percentage of Payroll)*		
a. Employer Contribution Rate		
Gross Employer Rate	26.647 %	24.019 %
Credit for Debt Repayment	6.000 %	6.000 %
Net Employer Rate	20.647 %	18.019 %
b. Employee Contribution Rate	13.324 %	12.010 %
4. Actuarial Math Contribution		
a. Amortization Payment for UAAL		
i. Amount	145,798,099	145,575,279
ii. As a % of pay	23.40 %	24.46 %
b. Normal Cost		
i. Amount	53,967,282	52,383,996
ii. As a % of pay	8.66 %	8.8 %
c. Interest Adjustment to Mid-Year		
i. Amount	8,077,034	8,004,009
ii. As a % of pay	1.30 %	1.35 %
d. Actuarial Contribution		
i. Amount	207,842,415	205,963,284
ii. As a % of pay	33.36 %	34.61 %
5. Actuarial Funded Status ($ in thousands)		
a. Actuarial Accrued Liability	3,488,955	3,423,218
b. Actuarial Value of Assets (AVA)	1,835,792	1,802,216
c. Unfunded Accrued Liability	1,653,163	1,621,002
d. Funded Ratio	52.6 %	52.6 %
e. Market Value of Assets (MVA)	1,715,227	1,865,900
f. Return on MVA (prior year)	(3.5) %	14.4 %
g. Return on AVA (prior year)	7.0 %	9.1 %

* 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, 2019	January 1, 2018
1. Active Members		
a. Retirement Benefits	982,207,608	1,012,883,863
b. Withdrawal Benefits	32,679,062	23,821,883
c. Disability Benefits	92,705,332	36,019,692
d. Death Benefits	11,231,000	16,028,511
Total	1,118,823,002	1,088,753,949
2. Inactive Members with Deferred Benefits	18,314,002	16,276,524
3. Retired Members, Disabled Members and Beneficiaries Receiving Benefits	2,351,817,783	2,318,187,954
4. Total Actuarial Accrued Liability (1. + 2. + 3.)	**3,488,954,787**	**3,423,218,427**

Normal Cost	January 1, 2019	January 1, 2018
1. Active Members		
a. Retirement Benefits	52,136,585	55,642,091
b. Withdrawal Benefits	4,143,614	2,978,101
c. Disability Benefits	6,841,387	3,090,048
d. Death Benefits	826,310	1,215,528
2. Normal Cost (Dollar amount)	**63,947,896**	**62,925,768**
3. Total Normal Cost (As a % of pay)	**10.26%**	**10.57%**

Section 1.2
Actuarial (Gain) / Loss

Development of Actuarial (Gain) / Loss	Amount
1. Expected Actuarial Accrued Liability	
a. Actuarial Accrued Liability at January 1, 2018	3,423,218,427
b. Normal Cost at January 1, 2018	62,925,768
c. Interest on a. + b. to End of Year	287,606,896
d. Benefit Payments for 2018, with Interest to End of Year	293,264,288
e. Expected Actuarial Accrued Liability Before Changes (a. + b. + c. - d.)	3,480,486,803
f. Change in Actuarial Accrued Liability at January 1, 2019 due to	
Board adopted change in actuarial assumptions	(58,807,306)
g. Expected Actuarial Accrued Liability at January 1, 2019 (e. + f.)	3,421,679,497
2. Actuarial Accrued Liability at January 1, 2019	3,488,954,787
3. Liability (Gain) / Loss (2. – 1.g.)	67,275,290
4. Expected Actuarial Value of Assets	
a. Actuarial Value of Assets at January 1, 2018	1,802,216,284
b. Interest on a. to End of Year	148,682,843
c. Contributions Made for 2018	195,454,682
d. Interest on c. to End of Year	7,902,741
e. Benefit Payments and Administrative Expenses for 2018, with Interest to End of Year	296,299,987
f. Expected Actuarial Value of Assets at January 1, 2019 (a. + b. + c. + d. – e.)	1,857,956,563
5. Actuarial Value of Assets as of January 1, 2019	1,835,791,586
6. Actuarial Value Asset (Gain) / Loss (4.f. - 5.)	22,164,977
7. Total Actuarial (Gain) / Loss (3. + 6.)	89,440,267

Section 1.3
Actuarial Balance Sheet

Financial Resources	January 1, 2019	January 1, 2018
1. Actuarial Value of Assets	1,835,791,586	1,802,216,284
2. Present Value of Future Contributions	494,249,791	523,363,689
3. Unfunded Actuarial Accrued Liability/(Reserve)	1,653,163,201	1,621,002,142
4. Total Assets (1 + 2 + 3)	3,983,204,578	3,946,582,115

Benefit Obligations	January 1, 2019	January 1, 2018
1. Present Value of Future Benefits		
a. Active Members	1,613,072,793	1,612,117,637
b. Inactive Members	18,314,002	16,276,524
c. Retirees, disabilities and beneficiaries	2,351,817,783	2,318,187,954
d. Total	3,983,204,578	3,946,582,115

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, 2018	As a % of Last Year's AAL
(1) COLA Experience	0	0.00%
(2) Salary Experience	8,234,511	0.24%
(3) Retiree Mortality Experience	2,508,891	0.07%
(4) Other (turnover, retirement ages, service purchase, etc.)		
(a) Unexpected Participant Pick Up	2,574,394	0.08%
(b) Unexpected Data Change for Decrementing Actives	1,660,528	0.05%
(c) Unexpected Data Change for Continuing Actives	2,746,498	0.08%
(d) Unexpected Data Change for Continuing Inactives	4,197,852	0.12%
(e) Unexpected Rehires	(769,151)	-0.02%
(f) Difference between actual and expected benefit payments	2,989,987	0.09%
(g) Miscellaneous	103,241	0.00%
(h) Total	13,503,349	0.40%
(5) Active Decrements	6,958,048	0.20%
(6) New Entrants	3,021,707	0.09%
(7) Programming Refinement	13,470,612	0.39%
(8) Data Updates	19,578,172	0.57%
(9) Liability (Gain) or Loss During Year,		
(1) + (2) + (3) + (4)(h) + (5) + (6) + (7) + (8)	67,275,290	1.96%
(10) Investment Experience	22,164,977	0.65%
(11) Total (Gain) or Loss During Year before Change,		
(9) + (10)	89,440,267	2.61%
(12) Assumption and Method Changes	(58,807,306)	-1.72%

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, 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		
	(1)	(2)	(3)		(1)	(2)	(3)
Valuation as of January 1	Active Member Contributions	Retirees, Beneficiaries, TVRs and Disabled	Active Member (Employer Financed Portion)	Actuarial Value of Assets[1]			
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 %
2015[2]	379,907,286	2,166,525,560	639,753,826	1,855,912,051	100.00 %	68.13 %	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
2019	12.010%	18.019%	30.029%	74,824,778	112,267,339	187,092,117	3,488,954,787	1,835,791,586	52.62%
2020	13.324%	20.647%	33.971%	84,001,463	130,175,044	214,176,507	3,547,344,618	1,845,863,086	52.04%
2021	13.324%	20.647%	33.971%	85,094,957	131,869,606	216,964,563	3,603,849,313	1,878,572,953	52.13%
2022	13.324%	20.647%	33.971%	86,463,236	133,989,995	220,453,231	3,656,006,468	1,913,624,265	52.34%
2023	13.324%	20.647%	33.971%	88,510,140	137,162,032	225,672,172	3,703,937,466	1,929,165,286	52.08%
2024	13.324%	20.647%	33.971%	90,860,705	140,804,646	231,665,351	3,748,641,945	1,989,298,435	53.07%
2025	13.324%	20.647%	33.971%	93,231,576	144,478,727	237,710,303	3,790,133,606	2,052,854,801	54.16%
2026	13.324%	20.647%	33.971%	95,685,985	148,282,266	243,968,251	3,828,366,797	2,120,248,104	55.38%
2027	13.324%	20.647%	33.971%	98,179,822	152,146,906	250,326,728	3,863,110,086	2,192,122,164	56.75%
2028	13.324%	20.647%	33.971%	100,870,333	156,316,326	257,186,659	3,894,822,425	2,269,800,118	58.28%
2029	13.324%	20.647%	33.971%	103,831,018	160,904,427	264,735,445	3,922,469,493	2,353,481,699	**60.00%**
2030	13.324%	20.647%	33.971%	106,989,278	165,798,707	272,787,985	3,947,755,976	2,446,364,309	61.97%
2031	13.324%	20.647%	33.971%	110,413,549	171,105,218	281,518,767	3,972,128,954	2,550,769,469	64.22%
2032	13.324%	20.647%	33.971%	114,030,435	176,710,219	290,740,654	3,997,131,252	2,669,661,776	66.79%
2033	13.324%	20.647%	33.971%	117,699,667	182,396,339	300,096,006	4,024,011,499	2,805,563,701	69.72%
2034	13.324%	20.647%	33.971%	121,513,419	188,306,419	309,819,838	4,053,812,716	2,960,611,435	73.03%
2035	13.324%	20.647%	33.971%	125,504,756	194,491,698	319,996,454	4,087,940,557	3,137,626,968	76.75%
2036	13.324%	20.647%	33.971%	129,705,592	201,001,632	330,707,224	4,128,332,087	3,339,939,226	80.90%
2037	13.324%	20.647%	33.971%	134,054,104	207,740,416	341,794,520	4,176,837,947	3,571,067,300	85.50%
2038	13.324%	20.647%	33.971%	138,439,257	214,535,983	352,975,240	4,234,652,482	3,833,976,037	90.54%
2039	13.324%	20.647%	33.971%	142,887,699	221,429,625	364,317,324	4,302,648,039	4,131,188,543	96.02%
2040	13.324%	20.647%	33.971%	147,430,780	228,469,929	375,900,709	4,381,340,781	4,465,327,814	101.92%

Section 2 - Plan Assets

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

	As of December 31	
	2018	2017
ASSETS		
1. Total investments, at fair value	1,699,863	1,849,264
2. Invested securities lending cash collateral	73,566	122,896
3. Receivables:		
a. Employer contributions	8,974	8,349
b. Employee contributions	5,944	5,645
c. Securities sold, but not received	13,340	8,400
d. Accrued interest and dividends	2,685	1,977
e. Other	992	772
4. Total assets	1,805,364	1,997,303
LIABILITIES		
1. Payable upon return of securities	73,566	122,896
2. Accounts payable	3,212	3,383
3. Other payables	106	108
4. Securities purchased, but not paid	13,253	5,016
5. Total liabilities	90,137	131,403
Net assets held in trust for Plan benefits	**1,715,227**	**1,865,900**

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

	As of December 31	
	2018	**2017**
ADDITIONS		
1. Net investment (loss) income	$ (61,343)	$ 233,738
2. Employer contributions	117,115	104,523
3. Employee contributions	78,340	70,286
4. Other income	-	-
Total additions	$ 134,112	$ 408,547
DEDUCTIONS		
1. Benefit payments	$ 274,465	$ 269,141
2. Contribution refunds, including interest	7,402	7,344
3. Administrative expenses	2,918	2,531
Total liabilities	$ 284,785	$ 279,016
NET ASSETS HELD IN TRUST FOR PLAN BENEFITS		
1. Beginning of year	$ 1,865,900	$ 1,736,369
2. Net (decrease) increase	(150,673)	129,531
End of year	**$ 1,715,227**	**$ 1,865,900**

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, 2018	$	1,802,216,284
2. Unrecognized Return as of January 1, 2018		63,684,357
3. Fair Value of Assets as of January 1, 2018	$	1,865,900,641
4. Contributions		
a. Member (includes purchased service)	$	78,339,932
b. Employer		117,114,749
c. Miscellaneous contributions		-
d. Total	$	195,454,681
5. Distributions		
a. Benefit payments	$	274,465,664
b. Refund of contributions		7,401,982
c. Administrative expenses		2,917,728
d. Total	$	284,785,374
6. Expected Return at 8.25% on		
a. Item 1.	$	148,682,843
b. Item 2.		5,253,959
c. Item 4.d.		7,902,741
d. Item 5.d.		11,514,614
e. Total [a. + b. + c. – d.]	$	150,324,929
7. Actual Return on Fair Value for Fiscal Year, Net of Investment Expenses	$	(61,342,883)
8. Return to be Spread for Fiscal Year (7. – 6.e) *	$	(211,667,812)
9. Total Fair Value of Assets as of January 1, 2019	$	1,715,227,065
10. Return to be Spread		

Fiscal Year	Return to be Spread	Unrecognized Percent	Unrecognized Return
2018	$ (211,667,812)	80%	$ (169,334,250)
2017	94,702,377	60%	56,821,426
2016	(20,129,242)	40%	(8,051,697)
2015		20%	-
2014		0%	-
		Total	$ (120,564,521)

11. Actuarial Value of Assets as of January 1, 2019 (9. – 10.)	**$**	**1,835,791,586**
12. Recognized Rate of Return for the Year on Actuarial Value of Assets		**6.99%**
13. Rate of Return for the Year on Fair Value of Assets (reported by investment consultan-net of inv. exp.)		**-3.53%**

* 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
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
2019	11,931,006	275,117,632	287,048,638
2020	27,256,240	267,921,773	295,178,013
2021	42,654,683	261,398,170	304,052,853
2022	57,609,168	254,682,628	312,291,796
2023	71,773,147	247,590,768	319,363,915
2024	85,630,507	240,476,947	326,107,454
2025	99,643,452	233,009,004	332,652,456
2026	113,738,547	225,202,606	338,941,153
2027	127,207,479	217,067,333	344,274,812
2028	141,497,061	208,743,763	350,240,824
2029	155,129,891	200,177,991	355,307,882
2030	167,855,230	191,439,859	359,295,089
2031	179,325,021	182,548,815	361,873,836
2032	190,004,391	173,453,980	363,458,371
2033	200,008,467	164,272,218	364,280,685
2034	209,022,694	155,027,815	364,050,509
2035	216,662,066	145,854,108	362,516,174
2036	223,060,938	136,737,136	359,798,074
2037	228,464,772	127,681,245	356,146,017
2038	232,786,238	118,754,831	351,541,069
2039	236,049,617	109,983,044	346,032,661
2040	238,482,539	101,437,537	339,920,076
2041	240,101,564	93,158,709	333,260,273
2042	241,109,055	85,183,704	326,292,759
2043	241,364,378	77,577,722	318,942,100
2044	241,240,480	70,302,358	311,542,838
2045	240,510,912	63,413,240	303,924,152
2046	239,406,815	56,927,896	296,334,711
2047	237,748,150	50,859,035	288,607,185
2048	235,592,114	45,214,215	280,806,329
2049	232,896,346	39,995,496	272,891,842
2050	229,999,666	35,199,607	265,199,273
2051	226,521,421	30,818,564	257,339,985
2052	222,281,850	26,840,163	249,122,013
2053	217,308,387	23,248,856	240,557,243
2054	211,640,624	20,026,717	231,667,341
2055	205,317,330	17,153,570	222,470,900
2056	198,237,027	14,607,506	212,844,533
2057	190,657,930	12,365,383	203,023,313
2058	182,530,861	10,403,551	192,934,412
2059	174,038,218	8,698,042	182,736,260
2060	165,244,773	7,225,164	172,469,937
2061	156,260,266	5,961,758	162,222,024
2062	147,236,307	4,885,366	152,121,673
2063	138,227,758	3,974,771	142,202,529
2064	129,327,239	3,210,091	132,537,330
2065	120,604,285	2,572,844	123,177,129
2066	112,077,798	2,046,121	114,123,919
2067	103,803,238	1,614,482	105,417,720
2068	95,800,869	1,263,882	97,064,751
2069	88,100,294	981,734	89,082,028
2070	80,718,256	756,876	81,475,132
2071	73,672,465	579,453	74,251,918

Section 2.5
Forecast of Expected Benefit Payments, continued

Year Ending December 31	Active Members	Inactive Members	Total Payments
2072	66,976,704	440,863	67,417,567
2073	60,636,842	333,649	60,970,491
2074	54,658,424	251,449	54,909,873
2075	49,043,500	188,940	49,232,440
2076	43,790,370	141,765	43,932,135
2077	38,896,941	106,375	39,003,316
2078	34,359,123	79,946	34,439,069
2079	30,171,926	60,266	30,232,192
2080	26,329,245	45,636	26,374,881
2081	22,822,984	34,765	22,857,749
2082	19,643,048	26,680	19,669,728
2083	16,777,960	20,646	16,798,606
2084	14,214,769	16,123	14,230,892
2085	11,939,156	12,710	11,951,866
2086	9,935,243	10,115	9,945,358
2087	8,186,031	8,121	8,194,152
2088	6,673,445	6,573	6,680,018
2089	5,378,809	5,348	5,384,157
2090	4,282,985	4,355	4,287,340
2091	3,366,468	3,535	3,370,003
2092	2,609,841	2,848	2,612,689
2093	1,993,980	2,269	1,996,249
2094	1,500,246	1,782	1,502,028
2095	1,110,739	1,373	1,112,112
2096	808,636	1,034	809,670
2097	578,495	761	579,256
2098	406,444	545	406,989
2099	280,289	379	280,668
2100	189,630	255	189,885
2101	125,818	166	125,984
2102	81,844	104	81,948
2103	52,191	63	52,254
2104	32,631	36	32,667
2105	20,005	21	20,026
2106	12,028	11	12,039
2107	7,089	6	7,095
2108	4,096	3	4,099
2109	2,319	2	2,321
2110	1,285	1	1,286
2111	697	0	697
2112	370	0	370
2113	192	0	192
2114	96	0	96
2115	47	0	47
2116	22	0	22

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, 2018 was determined by rolling forward the total pension liability as of January 1, 2018 to December 31, 2018 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, 2018
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:* 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, 2018

The GASB Statement No. 67 Change in Net Pension Liability

Schedule of Changes in Net Pension Liability		
Fiscal Year Ending	**Dec. 31, 2018**	**Dec. 31, 2017**
Total Pension Liability		
Service Cost	$ 54,814,019	$ 50,432,791
Interest	283,756,721	278,183,536
Changes of Benefit Terms	-	-
Difference between Expected and Actual Experience	7,455,309	13,679,323
Change of Assumptions	(24,726,963)	-
Benefit Payments, including Refund of Member Contributions	(281,867,646)	(276,485,263)
Net Change in Total Pension Liability	39,431,440	65,810,387
Total Pension Liability - Beginning of Year	$ 3,522,802,506	$ 3,456,992,119
Total Pension Liability - End of Year	$ 3,562,233,946	$ 3,522,802,506
Plan Fiduciary Net Position		
Employer Contributions	$ 117,114,749	$ 104,523,053
Member Contributions	78,339,932	70,285,731
Net Investment Income	(61,342,883)	233,739,435
Benefit Payments, including Refund of Member Contributions	(281,867,646)	(276,485,263)
Administrative Expenses	(2,917,728)	(2,531,493)
Other	-	-
Net Change in Plan Fiduciary Net Position	(150,673,576)	129,531,463
Plan Fiduciary Net Position - Beginning of Year	$ 1,865,900,641	$ 1,736,369,178
Plan Fiduciary Net Position - End of Year	$ 1,715,227,065	$ 1,865,900,641

Section 3.3
Net Pension Liability (Asset)

The GASB Statement No. 67 Net Pension Liability

Net Pension Liability (Asset)		
Valuation Date	**Dec. 31, 2018**	**Dec. 31, 2017**
Total Pension Liability	$ 3,562,233,946	$ 3,522,802,506
Plan Fiduciary Net Position	1,715,227,065	1,865,900,641
Net Pension Liability (Asset)	$ 1,847,006,881	$ 1,656,901,865
Plan Fiduciary Net Position as a Percentage of the Total Pension Liability (Asset)	48.15%	52.97%

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, 2018	**1% Decrease**	**Current**	**1% Increase**
Discount Rate	7.25%	8.25%	9.25%
Net Pension Liability (Asset)	$ 2,184,641,257	$ 1,847,006,881	$ 1,557,001,965

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 3.64% would be used to discount the benefit payments not covered by the Plan's fiduciary net position. The 3.64% rate equals the S&P Municipal Bond 20-Year High Grade Index at December 31, 2018. The rate was 3.20% as of December 31, 2017.Please see the supporting exhibits for additional detail.

Section 3.5
Pension Expense

The GASB Statement No. 68 Pension Expense

Pension Expense		
Measurement Year Ending	**Dec. 31, 2018**	**Dec. 31, 2017**
Service Cost	$ 54,814,019	$ 50,432,791
Interest	283,756,721	278,183,536
Difference between Expected and Actual Experience	19,138,422	17,463,073
Change of Assumptions	(5,556,621)	-
Member Contributions	(78,339,932)	(70,285,731)
Projected Earnings on Plan Investments	(150,324,930)	(139,037,058)
Difference between Expected and Actual Earnings	71,448,884	29,115,320
Administrative Expense	2,917,728	2,531,493
Other	-	-
Changes of Benefit Terms	-	-
Total Pension Expense	$ 197,854,290	$ 168,403,425

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				
Recognition Period	-	4.52	4.49	4.42	4.45				
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		17,749,140	-	17,749,140
2020	-	-	5,622,195	3,094,869	1,675,350		10,392,414	-	10,392,414
2021	-	-	-	1,299,847	1,675,350		2,975,197	-	2,975,197
2022					753,909		753,909	-	753,909
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		14,121,520	-	14,121,520
2020	-	-	-	1,299,847	2,429,259		3,729,106	-	3,729,106
2021	-	-	-	-	753,909		753,909	-	753,909

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)				
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)

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				
Recognition Period	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		74,358,092	(18,940,475)	55,417,617
2020	-	-	4,025,846	(18,940,475)	42,333,563		46,359,409	(18,940,475)	27,418,934
2021	-	-	-	(18,940,477)	42,333,563		42,333,563	(18,940,477)	23,393,086
2022					42,333,561				
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		131,026,534	(37,880,952)	93,145,582
2020			-	(18,940,477)	84,667,124		84,667,124	(18,940,477)	65,726,647
2021	-	-	-	-	42,333,561		42,333,561	-	42,333,561

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

	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
Employer Portion of Required Contribution on a statutory basis	$ 112,265	$ 106,662	$ 82,001	$ 81,731	$ 80,488	$ 102,800	$ 61,982	$ 55,976	$ 56,474	$ 34,030
Actual Employer Contributions	$ 117,115	$ 104,523	$ 83,855	$ 82,800	$ 82,268	$ 79,518	$ 62,788	$ 60,318	$ 56,216	$ 41,448
Contribution deficiency (excess)	$ (4,850)	$ 2,139	$ (1,854)	$ (1,069)	$ (1,780)	$ 23,282	$ (806)	$ (4,342)	$ 258	$ (7,418)
Covered payroll	$ 623,037	$ 595,047	$ 575,444	$ 573,548	$ 564,827	$ 550,616	$ 548,515	$ 541,354	$ 528,288	$ 567,173
Contributions as a percentage of covered payroll	18.02%	17.93%	14.25%	14.25%	14.25%	18.67%	11.30%	10.34%	10.69%	6.00%

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 2014 to bring the assumptions more in line with actual plan experience.

Section 3.6
Supporting Exhibits, continued

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)
12/31/2018	1,715,227,065	187,091,766	287,065,722	2,400,000	137,366,987	1,750,220,096
12/31/2019	1,750,220,096	186,280,935	295,194,914	2,448,000	139,890,503	1,778,748,620
12/31/2020	1,778,748,620	185,435,614	304,069,680	2,496,960	141,849,118	1,799,466,712
12/31/2021	1,799,466,712	184,896,676	312,307,862	2,546,899	143,201,460	1,812,710,087
12/31/2022	1,812,710,087	185,510,502	319,380,156	2,597,837	144,030,846	1,820,273,442
12/31/2023	1,820,273,442	186,510,311	326,124,074	2,649,794	144,420,473	1,822,430,358
12/31/2024	1,822,430,358	187,385,546	332,669,277	2,702,790	144,367,025	1,818,810,862
12/31/2025	1,818,810,862	188,325,760	338,958,367	2,756,846	143,849,962	1,809,271,371
12/31/2026	1,809,271,371	189,123,044	344,291,840	2,811,983	142,877,314	1,794,167,906
12/31/2027	1,794,167,906	190,177,777	350,257,304	2,868,222	141,430,451	1,772,650,608
12/31/2028	1,772,650,608	191,845,469	355,323,729	2,925,587	139,515,534	1,745,762,296
12/31/2029	1,745,762,296	193,938,855	359,310,038	2,984,098	137,218,347	1,714,625,362
12/31/2030	1,714,625,362	196,702,818	361,887,882	3,043,780	134,654,662	1,681,051,180
12/31/2031	1,681,051,180	199,997,330	363,472,153	3,104,656	131,951,481	1,646,423,182
12/31/2032	1,646,423,182	203,406,100	364,293,750	3,166,749	129,196,766	1,611,565,549
12/31/2033	1,611,565,549	207,215,936	364,062,601	3,230,084	126,481,838	1,577,970,638
12/31/2034	1,577,970,638	211,535,929	362,527,107	3,294,686	123,944,399	1,547,629,173
12/31/2035	1,547,629,173	216,461,820	359,808,199	3,360,579	121,747,663	1,522,669,877
12/31/2036	1,522,669,877	221,803,235	356,155,413	3,427,791	120,049,463	1,504,939,371
12/31/2037	1,504,939,371	227,403,052	351,549,834	3,496,347	118,996,554	1,496,292,797
12/31/2038	1,496,292,797	233,270,829	346,040,643	3,566,274	118,740,385	1,498,697,095
12/31/2039	1,498,697,095	239,523,825	339,927,476	3,637,599	119,435,852	1,514,091,697
12/31/2040	1,514,091,697	246,071,436	333,267,145	3,710,351	121,236,997	1,544,422,634
12/31/2041	1,544,422,634	252,958,066	326,299,255	3,784,558	124,296,472	1,591,593,359
12/31/2042	1,591,593,359	260,162,705	318,948,237	3,860,249	128,773,520	1,657,721,098
12/31/2043	1,657,721,098	267,704,112	311,548,641	3,937,454	134,830,041	1,744,769,155
12/31/2044	1,744,769,155	275,561,039	303,929,761	4,016,203	142,634,048	1,855,018,278
12/31/2045	1,855,018,278	283,706,187	296,340,027	4,096,528	152,362,556	1,990,650,466
12/31/2046	1,990,650,466	292,142,065	288,612,351	4,178,458	164,202,433	2,154,204,155
12/31/2047	2,154,204,155	300,752,653	280,811,381	4,262,027	178,355,796	2,348,239,195
12/31/2048	2,348,239,195	309,591,047	272,896,781	4,347,268	195,037,607	2,575,623,800
12/31/2049	2,575,623,800	318,704,307	265,204,059	4,434,213	214,472,831	2,839,162,666
12/31/2050	2,839,162,666	327,980,543	257,344,532	4,522,897	236,904,045	3,142,179,825
12/31/2051	3,142,179,825	337,572,679	249,126,254	4,613,355	262,619,425	3,488,632,320
12/31/2052	3,488,632,320	347,533,976	240,561,126	4,705,622	291,947,096	3,882,846,644
12/31/2053	3,882,846,644	357,915,203	231,670,787	4,799,735	325,245,173	4,329,536,498
12/31/2054	4,329,536,498	368,706,685	222,473,948	4,895,730	362,901,384	4,833,774,890

*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.

Section 3.6
Supporting Exhibits, continued

Actuarial Present Value of Projected Benefit Payments

Year	Projected Beginning Fiduciary Net Position	Projected Benefit Payments	Funded Portion of Projected Benefit Payments	Unfunded Portion of Projected Benefit Payments	8.25% Present Value of Funded Benefit Payments	3.64% Present Value of Unfunded Benefit Payments	8.25% Present Value of Benefit Payments Using Single Discount Rate
12/31/2018	1,715,227,065	287,065,722	287,065,722	-	265,187,734	-	265,187,734
12/31/2019	1,750,220,096	295,194,914	295,194,914	-	251,914,439	-	251,914,439
12/31/2020	1,778,748,620	304,069,680	304,069,680	-	239,711,794	-	239,711,794
12/31/2021	1,799,466,712	312,307,862	312,307,862	-	227,442,331	-	227,442,331
12/31/2022	1,812,710,087	319,380,156	319,380,156	-	214,866,349	-	214,866,349
12/31/2023	1,820,273,442	326,124,074	326,124,074	-	202,682,116	-	202,682,116
12/31/2024	1,822,430,358	332,669,277	332,669,277	-	190,992,960	-	190,992,960
12/31/2025	1,818,810,862	338,958,367	338,958,367	-	179,772,442	-	179,772,442
12/31/2026	1,809,271,371	344,291,840	344,291,840	-	168,684,658	-	168,684,658
12/31/2027	1,794,167,906	350,257,304	350,257,304	-	158,528,792	-	158,528,792
12/31/2028	1,772,650,608	355,323,729	355,323,729	-	148,565,256	-	148,565,256
12/31/2029	1,745,762,296	359,310,038	359,310,038	-	138,782,431	-	138,782,431
12/31/2030	1,714,625,362	361,887,882	361,887,882	-	129,125,280	-	129,125,280
12/31/2031	1,681,051,180	363,472,153	363,472,153	-	119,806,525	-	119,806,525
12/31/2032	1,646,423,182	364,293,750	364,293,750	-	110,925,947	-	110,925,947
12/31/2033	1,611,565,549	364,062,601	364,062,601	-	102,406,987	-	102,406,987
12/31/2034	1,577,970,638	362,527,107	362,527,107	-	94,203,296	-	94,203,296
12/31/2035	1,547,629,173	359,808,199	359,808,199	-	86,371,163	-	86,371,163
12/31/2036	1,522,669,877	356,155,413	356,155,413	-	78,978,586	-	78,978,586
12/31/2037	1,504,939,371	351,549,834	351,549,834	-	72,015,967	-	72,015,967
12/31/2038	1,496,292,797	346,040,643	346,040,643	-	65,484,890	-	65,484,890
12/31/2039	1,498,697,095	339,927,476	339,927,476	-	59,425,434	-	59,425,434
12/31/2040	1,514,091,697	333,267,145	333,267,145	-	53,820,866	-	53,820,866
12/31/2041	1,544,422,634	326,299,255	326,299,255	-	48,679,528	-	48,679,528
12/31/2042	1,591,593,359	318,948,237	318,948,237	-	43,956,447	-	43,956,447
12/31/2043	1,657,721,098	311,548,641	311,548,641	-	39,664,349	-	39,664,349
12/31/2044	1,744,769,155	303,929,761	303,929,761	-	35,745,370	-	35,745,370
12/31/2045	1,855,018,278	296,340,027	296,340,027	-	32,196,523	-	32,196,523
12/31/2046	1,990,650,466	288,612,351	288,612,351	-	28,967,143	-	28,967,143
12/31/2047	2,154,204,155	280,811,381	280,811,381	-	26,036,197	-	26,036,197
12/31/2048	2,348,239,195	272,896,781	272,896,781	-	23,374,017	-	23,374,017
12/31/2049	2,575,623,800	265,204,059	265,204,059	-	20,983,948	-	20,983,948
12/31/2050	2,839,162,666	257,344,532	257,344,532	-	18,810,229	-	18,810,229
12/31/2051	3,142,179,825	249,126,254	249,126,254	-	16,821,733	-	16,821,733
12/31/2052	3,488,632,320	240,561,126	240,561,126	-	15,005,441	-	15,005,441
12/31/2053	3,882,846,644	231,670,787	231,670,787	-	13,349,552	-	13,349,552
12/31/2054	4,329,536,498	222,473,948	222,473,948	-	11,842,590	-	11,842,590

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

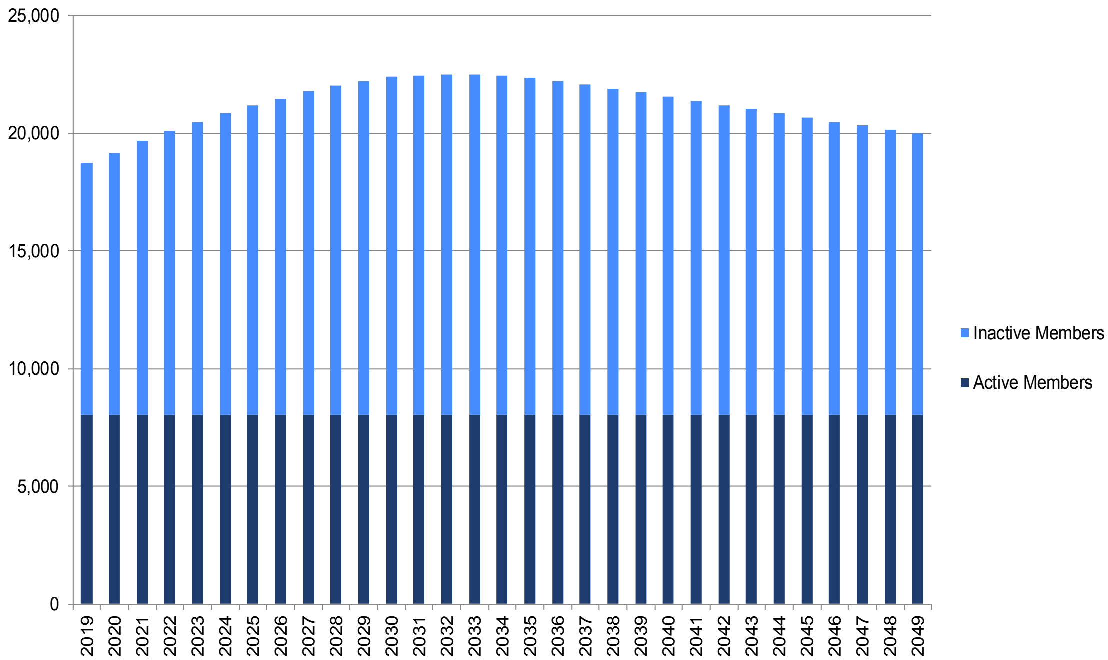
Section 4.1
Projection Assumptions and Methods

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.

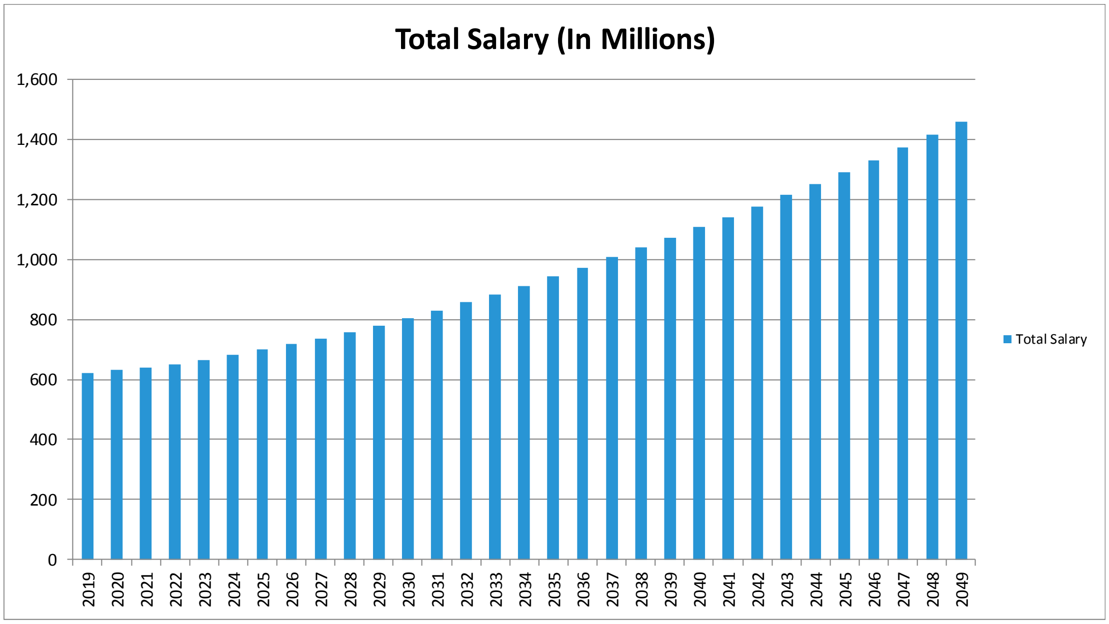
Section 4.2
Membership Projection

Projected Member Count

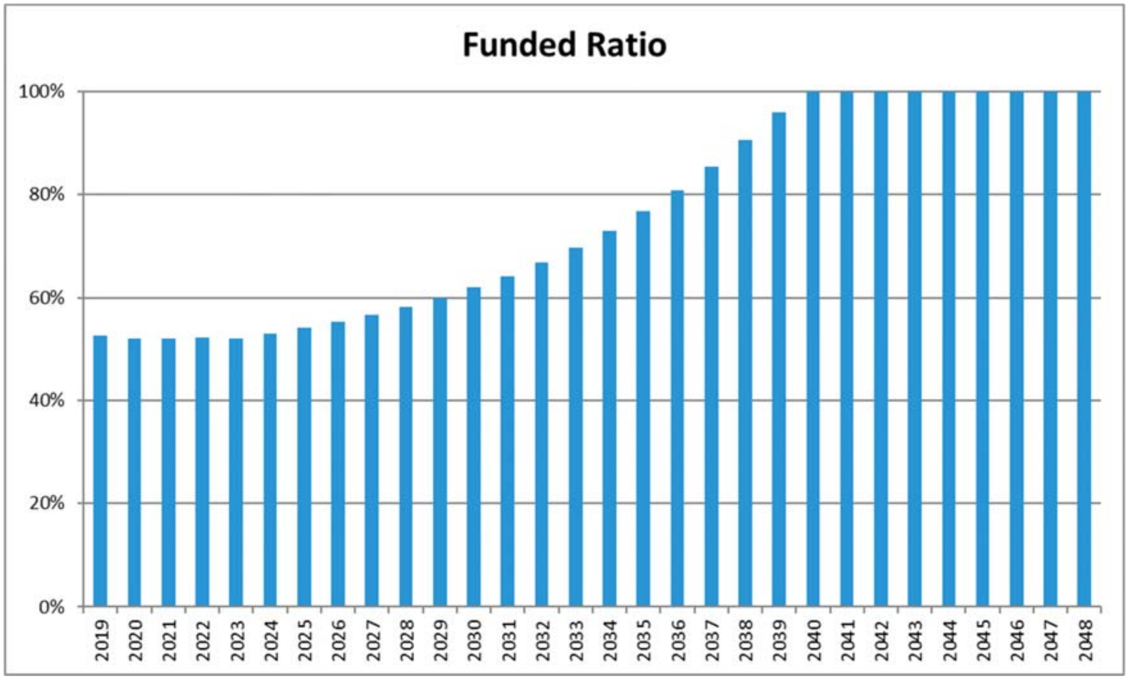


Section 4.2
Membership Projection, continued

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, 2019
(Annual Salaries and Annual Benefits $ in 000’s)

Item	Male	Female	Total
Number of Members [1]	5,699	2,460	8,159
Annual Salaries [2]	$459,073	$163,964	$623,037
Average Age [1]	48.90	47.65	48.53
Average Service [1]	13.76	12.42	13.36

Terminated Vested Employees

Item	Male	Female	Total
Number of Members	79	34	113
Annual Accrued Benefit	$2,218	$847	$3,065
Average Age	57.45	57.21	57.38

Retirees and Beneficiaries

Item	Male	Female	Total
Number of Members	6,590	2,623	9,213
Annual Retirement Benefit	$199,206	$53,657	$252,863
Average Age	71.92	71.64	71.84

Disability Allowances

Item	Male	Female	Total
Number of Members	690	579	1,269
Annual Disability Benefit	$13,248	$9,318	$22,566
Average Age	64.38	62.42	63.49

1 Active statistics include all participants who are actively employed, 22 participants who are on leave and 99 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 99 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, 2019

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	23	-	-	-	-	-	-	-	-	23
25-29	255	29	2	-	-	-	-	-	-	286
30-34	378	151	76	1	-	-	-	-	-	606
35-39	318	203	222	112	4	-	-	-	-	859
40-44	298	169	219	287	88	3	-	-	-	1,064
45-49	269	220	223	370	320	39	-	-	-	1,441
50-54	218	165	191	355	347	200	48	1	-	1,525
55-59	154	141	166	323	289	156	101	6	-	1,336
60-64	75	98	97	174	166	116	52	19	7	804
Over 65	19	24	27	51	41	24	14	4	11	215
Total	2,007	1,200	1,223	1,673	1,255	538	215	30	18	8,159

Section 5.3
Retirement Retiree and Beneficiary Data as of January 1, 2019

Number and Average Annual Allowance

Age Last Birthday	Number	Annual Allowance	Average Allowance
Retired Annuitants			
Under 50	19	$884,472	$46,551
50-54	190	$8,174,827	$43,025
55-59	491	$20,359,404	$41,465
60-64	967	$36,380,218	$37,622
65-69	1,730	$54,556,597	$31,536
70-74	2,049	$58,757,106	$28,676
75-79	1,411	$35,845,137	$25,404
Over 79	1,163	$23,665,998	$20,349
Total	8,020	$238,623,759	$29,754
Surviving Spouses			
Under 50	9	$104,999	$11,667
50-54	30	$305,712	$10,190
55-59	78	$982,831	$12,600
60-64	127	$1,700,161	$13,387
65-69	171	$2,498,050	$14,608
70-74	219	$2,964,405	$13,536
75-79	189	$2,262,984	$11,973
Over 79	370	$3,420,305	$9,244
Total	1,193	$14,239,447	$11,936
Disability Allowances			
Under 50	132	$2,231,747	$16,907
50-54	144	$2,989,569	$20,761
55-59	213	$4,349,975	$20,422
60-64	217	$4,414,715	$20,344
65-69	198	$3,484,813	$17,600
70-74	196	$2,943,900	$15,020
75-79	95	$1,226,275	$12,908
Over 79	74	$924,738	$12,496
Total	1,269	$22,565,732	$17,782

Section 5.4
Inactive Vested Employee Data as of January 1, 2019

Number and Average Accrued Benefit

Age Last Birthday	Number	Annual Accrued Benefit	Average Accrued Benefit
Terminated Vested			
Under 35	2	$7,200	$3,600
35-39	1	$3,600	$3,600
40-44	1	$34,991	$34,991
45-49	10	$212,187	$21,219
50-54	16	$451,221	$28,201
55-59	41	$1,200,393	$29,278
60-64	40	$1,134,149	$28,354
65-69	1	$9,368	$9,368
Over 70	1	$12,574	$12,574
Total	113	$3,065,683	$27,130

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.

Section 6.1
Summary of Plan and Contribution Provisions, continued

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.

Section 6.1
Summary of Plan and Contribution Provisions, continued

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 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, 2019 rates of pay provided by staff of the Retirement Board of Trustees.

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 $623,036,951 for 2019. The following adjustments were made to the actual covered earnings for 2018 supplied by the Authority:

(a) No earnings or a fractional year of earnings were submitted for employees with a work status date in 2018 who were hired during 2017. We have annualized the 2017 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, 2019 salary was assumed to increase 1.50% from 2018.

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.

Salary Inflation: 3.10%

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.

(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	0.412%	0.461%
35	0.406%	0.447%
40	0.382%	0.422%
45	0.326%	0.393%
50	0.216%	0.343%
55	0.013%	0.248%
60	0.000%	0.012%
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.

Section 6.3
Summary of Actuarial Assumptions and Changes in Assumptions, continued

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.

Summary of changes since January 1, 2018 Valuation

Demographic assumptions:

1. Update the rates of withdrawal, disability, and retirement from employment among active members to reflect recent experience.
2. Update the rates of mortality among active members, annuitants, beneficiaries and survivors to reflect the new SOA Public Mortality tables
3. Update the rates of optional form of payment election among retiring active members to reflect recent experience.
4. Update the active participant counts and new entrant profiles used for cost projections to reflect demographic makeup of recent hires.

Economic assumptions:

1. Reduce the rate of inflation from 3.25% to 3.10%.
2. Increase the rates of compensation increase for participants with less than five years of service and decrease the rates of compensation for participants with more than four years of service.

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 (ASOP) 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
- 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 9.50%.

- 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	1/1/2015	1/1/2016	1/1/2017	1/1/2018	1/1/2019
Actuarial Value of Assets (Billion)	1.86 *	1.74 *	1.75	1.80	1.84
Asset Return in Prior Year	4.80%	-0.20%	6.80%	14.40%	-3.53%
Investment gain/(loss) - AVA basis (Million)	(80.2)	(146.6)	(20.1)	13.6	(22.2)
Actuarial Accrued Liability (Billion)	3.19	3.27	3.34	3.42	3.49
Liability duration	9.90	9.81	9.76	9.66	9.50
The ratio of retired life** actuarial accrued liability to total actuarial accrued liability	67.6%	67.4%	68.0%	67.7%	67.4%
The ratio of cashflow to actuarial value of assets	-6.2%	-6.9%	-7.2%	-5.8%	-4.9%
The ratio of actuarial value of assets to participant payroll	328.6%	303.9%	304.5%	302.9%	294.7%
Normal cost (Million)	59.1	60.5	60.7	62.9	64.0
Discount rate	8.25%	8.25%	8.25%	8.25%	8.25%
Non-Investment gain/(loss) (Million)	(21.9)	(20.9)	(16.3)	(31.1)	(67.3)
Funding Policy contribution (Million)	82.7	81.6	103.0	107.1	112.3

* Actuarial Value of Assets is Fair Market Value

** Retired members, former 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 upward 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.