



Retirement Plan for Chicago Transit Authority Employees

Actuarial Valuation Report as of January 1, 2022,
including supplementary disclosure information
for GASB Statement Nos. 67 and 68

August 2022



100 Galleria Parkway, SE
Suite 1060
Atlanta, GA 30339

August 24, 2022

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, 2022, prepared in accordance with 40 ILCS 5/22-101(e). In addition, it includes disclosure information as of December 31, 2021, required under Governmental Accounting Standards Board Statement Nos. 67 and 68. The actuarial valuation of the Plan is performed annually and Buck Global, LLC (Buck) was retained to perform the valuation as of January 1, 2022. 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, 2021 actuarial valuation for a number of reasons including market returns of 17.60% compared to the 8.25% assumed rate of return, demographic experience, updated participant data, and salary increases that were greater than expected. However, the Plan is still projected to meet the funding ratio standards set forth in ILCS 5/22-101(e) and, therefore, there is no need to increase authority and employee contribution rates to comply with 40 ILCS 5/22-101(e). The rates will remain as follows:

Annual Contributions to the Plan (Percentage of Compensation)		
Fiscal Year	Authority	Employees
2023 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 2025 and through fiscal year end 2040, if these contributions, expressed as a percentage of compensation, are made to the Plan and the Plan experiences no net actuarial losses in the future.

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

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

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

Under this method, a contribution of approximately 32.54% of payroll (total contribution) is appropriate.

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

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

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

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

Historical valuation results presented in this report represent results taken from prior actuarial reports, and results shown for some years may reflect funding methods and techniques used by the prior

actuary. Our report/certification does not apply to those results, other than to represent that our report has presented accurate information developed by prior actuaries.

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

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

Future actuarial measurements may differ significantly from the current measurement presented in this report due to such factors as: plan experience different from that anticipated by the economic and demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements; and changes in plan provisions or applicable law. An analysis of the potential range of such future measurements is beyond the scope of this report, but a description of future risks to the plan is provided in Section 7.

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.

Actuarial Standards of Practice Nos. 27 and 35 require the actuary to identify the economic and demographic assumptions that have a significant effect on the measurement and, for those that are prescribed by another party, to provide the information and analysis the actuary performed to determine that the assumption does not significantly differ from what the actuary deems reasonable for the purpose of the measurement. The mortality assumption used in this valuation reflects the Society of Actuaries’ most recently published tables of public sector pension plan rates. In the case of the sponsor’s selection of expected return on assets (“EROA”), the signing actuary used economic information provided by Buck’s Investment Consulting and Financial Risk Management practices. Buck’s Capital Market Assumptions provide relevant expected returns, standard deviations, and correlations. Projected returns are then developed for the portfolio using GEMS® Economic Scenario Generator from Conning & Company. GEMS uses a multifactor model to create internally consistent, realistic economic scenarios (paths) that reflect the current economic environment as a starting point. From these scenarios, a probabilistic model of expected returns is created reflecting the time horizon and the asset class allocations of the portfolio. Based on the actuary’s analysis, including consistency with other assumptions used in the valuation, discussions with Buck’s investment consultants, and the percentiles generated by the model, the actuary believes the EROA is reasonable for the purpose of the measurement.

Actuarial Standard of Practice No. 56 provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. Buck uses third-party software in the performance of annual actuarial valuations and projections. The model is intended to calculate the liabilities associated with the provisions of the plan using data and assumptions as of the measurement date under the funding methods specified in this report. The output from the third-party software is used as input for an internally developed model that applies the applicable funding methods to the liabilities derived and other inputs, such as plan assets and contributions, to generate many of the exhibits found in this report. Buck has an extensive review process whereby the results of the liability calculations are checked using detailed sample output, changes from year to year are summarized by source, and significant deviations from expectations are investigated. Other funding outputs are similarly reviewed in detail and at a high level for accuracy, reasonability, and consistency with prior results. Buck also reviews the model when significant changes are made to the third-party software. The review is performed by experts within the company who are familiar with applicable funding methods as well as the manner in which the model generates its output. Significant changes to the internal model that are applicable to multiple clients are generally developed, checked, and reviewed by multiple experts within the company who are familiar with the details of the required changes.

In our opinion the calculations also comply with Illinois law and, where applicable, the Statements of the Governmental Accounting Standards Board. We certify that the information presented herein is accurate and fairly portrays the actuarial position of the Plan as of January 1, 2022.

We completed the valuation in accordance with accepted actuarial procedures as prescribed by the Actuarial Standards Board. We are members of the American Academy of Actuaries and are experienced in performing actuarial valuations of public employee retirement systems. To the best of our knowledge, this report is complete and accurate and has been prepared in accordance with generally accepted actuarial principles and practice. We meet the qualification standards to render the actuarial opinions contained in this report and are available to answer questions about them.

Respectfully submitted,

Buck Global, LLC



David L. Driscoll, FSA, EA, MAAA, FCA
Principal, Consulting Actuary



Kevin S. Spanier, ASA, EA, MAAA, FCA
Principal, Retirement Actuary

Table of Contents

Executive Summary	1
Comparative Summary of Key Actuarial Valuation Results	6
Section 1: Actuarial Funding Results	7
Section 1.1 – Actuarial Liabilities and Normal Cost.....	7
Section 1.2 – Actuarial (Gain) / Loss	8
Section 1.3 – Actuarial Balance Sheet	9
Section 1.4 – Analysis of Financial Experience.....	10
Section 1.5 – History of UAAL and Funded Ratio	11
Section 1.6 – Solvency Test	12
Section 1.7 – Projected Actuarial Results	13
Section 2: Plan Assets	14
Section 2.1 – Statement of Net Plan Assets	14
Section 2.2 – Changes in Net Plan Assets.....	15
Section 2.3 – Actuarial Value of Assets	16
Section 2.4 – Historical Asset Rate of Return	17
Section 2.5 – Forecast of Expected Benefit Payments	18
Section 3: Accounting Information	20
Section 3.1 - Actuarial Methods and Assumptions for GASB 67/68 Disclosure Purposes	20
Section 3.2 – Schedule of Expected Changes in Net Pension Liability	21
Section 3.3 – Net Pension Liability (Asset)	22
Section 3.4 – Sensitivity	23
Section 3.5 – Pension Expense.....	24
Section 3.6 – Supporting Exhibits.....	25
Section 4: Actuarial Funding Projections	29
Section 4.1 – Projection Assumptions and Methods	29
Section 4.2 – Membership Projection.....	30
Section 4.3 – Projection of Funded Status	32
Section 5: Member Data	33
Section 5.1 – Summary of Membership Data as of January 1, 2022.....	33
Section 5.2 – Age and Service Distribution of Active Members as of January 1, 2022	34
Section 5.3 – Retirement Retiree and Beneficiary Data as of January 1, 2022	35
Section 5.4 – Inactive Vested Employee Data as of January 1, 2022	36
Section 6: Basis of the Actuarial Valuation	37
Section 6.1 – Summary of Plan and Contribution Provisions.....	37
Section 6.2 – Description of Actuarial Methods and Valuation Procedures	41
Section 6.3 – Summary of Actuarial Assumptions and Changes in Assumptions	42
Section 7: ASOP51	46
Glossary of Terms	49

Executive Summary

Membership

Actives: As of January 1, 2022, there were 7,725 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, 2022	January 1, 2021
Number of active employees ¹	7,725	8,078
Average age	48.7	48.3
Average years of service	12.7	12.5
Total annual valuation salary ²	\$657,399,211	\$650,048,131
Average annual salary ²	\$86,070	\$81,541
Total accumulated contributions	\$680,411,548	\$634,800,523
Average accumulated contributions ²	\$89,082	\$79,629

1 Active statistics include all participants who are actively employed, which includes 16 participants this year and 18 participants last year who are on leave and 87 participants this year and 106 participants 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 87 participants this year & 106 participants last year who have opted out of participating in the Plan is not included.

The number of active members decreased by 4.4% from the previous valuation date. The average age of the active members increased by 0.8%. The average service increased by 1.6%. The total annual valuation salary increased by 1.1%. The average salary increased by 5.6% 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 146 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, 2022	January 1, 2021
Number of deferred vested members ³	146	160
Average age	57.5	56.5
Average annual benefit	\$26,919	\$27,102

3 Number of deferred vested members includes 6 in 2022 and 6 in 2021 who were pending cashouts after the valuation date. These members are not included in the calculation of the average benefit.

The number of terminated vested members decreased by 8.8% from the previous valuation. The average age of the terminated vested members increased by 1.0 years. The average annual pension benefit for these members decreased by 0.7% 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 8,054 retired members, 1,351 members with disability allowances and 1,228 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, 2022	January 1, 2021
Number of members receiving payments		
➤ Retirees	8,054	8,108
➤ Disability Allowances	1,351	1,303
➤ Beneficiaries	1,228	1,205
➤ Total	10,633	10,616
Average age	71.6	71.4
Annual benefit amounts		
➤ Retirees	\$259,411,251	\$254,022,477
➤ Disability Allowances	\$26,185,765	\$24,189,323
➤ Beneficiaries	\$16,120,744	\$15,411,942
➤ Total	\$301,717,760	\$293,623,742
Average annual benefit payments	\$28,376	\$27,659

The number of members receiving payments increased by 0.2% from the previous valuation date. The average age of these members increased by 0.2 years. The total annual benefit payments for these members increased by 2.8% 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 \$2,188.5 million as of January 1, 2022. This includes an increase of \$247.3 million over the Net Assets Available for Benefits of \$1,941.2 million as of January 1, 2021. During the prior year, the investment return was 17.6% 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 \$2,057.1 million as of January 1, 2022. This includes an increase of \$101.8 million over the actuarial value of assets of \$1,955.3 million as of January 1, 2021. During the prior year, the investment return on the actuarial value assets was 9.82%.

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 gain of \$14.0 million during the prior year. This net gain is approximately 0.38% of the Plan's prior year actuarial accrued liability. The net gain 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 \$16.0 million during the year ending December 31, 2021. This loss increased the unfunded actuarial accrued liability by \$16.0 million and decreased the funded ratio by 0.23%.

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

On the asset side, the Plan experienced a gain on a fair value of assets basis. The actual rate of return on the fair value of plan assets was 17.6% for the year ending December 31, 2021 compared to the assumption of 8.25%.

The rate of return on the actuarial value of plan assets for the year ending December 31, 2021 was approximately 9.8% compared to the assumption of 8.25%. The gain on the actuarial value of assets decreased the unfunded actuarial accrued liability by \$29.9 million and increased the funded ratio by 0.80%. 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) a portion or all of its liabilities.

As of January 1, 2022, the funded ratio of the Plan is 54.99%. This represents an increase of 1.72% from the Plan's funded ratio of 53.27% as of January 1, 2021. Unless otherwise noted, the funded status shown in the report is based on the projected unit credit cost method.

A history of the plan's unfunded actuarial accrued liability and funded ratio is shown in Section 1.5.

Statutory Contributions

Actual required contribution rates were determined in accordance with 40 ILCS 5/22-101(e) using the projected unit credit cost method and calculated to produce an expected funded ratio of at least 60 percent no later than ten years after the valuation year through fiscal year end 2039 and 90 percent funding by fiscal year end 2059. Contribution rates reflect the issuance of bond or notes by the Authority, as defined in 70 ILCS 3605/12c. Authority contribution rates are adjusted by a debt service credit, for debt service paid in the prior year, of up to six percent of compensation per year from 2009 to 2040, as defined in 40 ILCS 5/22-101(e)(2).

Actuarial Math Contributions

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

Under Actuarial Math, the normal cost represents the cost of the benefits that accrue during the year for active members under the Entry Age Normal Cost Method, plus a load for the expected administrative expenses to be paid during the fiscal year. The Entry Age Normal Cost is determined as a level percent of pay over each individual career attributable to the respective plan year. The normal cost for 2022 has been determined to be \$55.1 million, or 8.38% of pay. This represents an increase in the normal cost rate of 0.08% of pay from last year's normal cost rate of 8.30%.

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

The UAAL under the entry age normal cost method as of January 1, 2022 is \$1,814.0 million. This represents a decrease of \$36.7 million in the unfunded actuarial accrued liability from last year's amount of \$1,850.7 million. The annual payment required to amortize the unfunded actuarial accrued liability of \$1,814.0 million as of January 1, 2022 is \$150.6 million, or 22.90% 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 32.54% of pay (8.38% of pay attributable to the normal cost plus 22.90% of pay attributable to the amortization of the unfunded plus 1.26% of pay for the mid-year interest adjustment).

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

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

Accounting Information

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

Projections

As part of the annual actuarial valuation, a forecast of expected future valuation results is performed over a 30-year period beginning on the valuation date. This analysis provides a dynamic look into the future to identify trends in future employer contributions and funded status. The forecast replaces active members who are assumed to decrement (terminate, retire, etc.) during the period with new members resulting in a stable active membership. The forecast assumes all actuarial assumptions are exactly realized each year during the forecast period. The results of these forecasts can be found in Section 4.

Changes in Plan Provisions

There have been no changes in the Plan provisions since the last actuarial valuation performed as of January 1, 2021. A summary of Plan and contribution provisions are outlined in Section 6.1.

Changes in Actuarial Assumptions, Methods, or Procedures

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

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

Comparative Summary of Key Actuarial Valuation Results

	January 1, 2022	January 1, 2021
1. Investment Return Assumption	8.25 %	8.25 %
2. Membership Data		
a. Active Employees		
Number	7,725	8,078
Annualized Salaries (in thousands)	657,399	650,048
Average Pay	86,070	81,541
b. Terminated Participants with Vested Benefits		
Number	146	160
Total Monthly Accrued Benefit	314,056	299,926
Average Monthly Accrued Benefit	2,243	2,258
c. Retirees and Beneficiaries		
Number	9,282	9,313
Total Monthly Pension	22,961,000	22,452,868
Average Monthly Pension	2,474	2,411
d. Disability Allowances		
Number	1,351	1,303
Total Monthly Pension	2,182,147	2,015,777
Average Monthly Pension	1,615	1,547
3. Statutory Minimum Contribution Rates (as a percentage of Payroll)*		
a. Employer Contribution Rate		
Gross Employer Rate	26.647 %	26.647 %
Credit for Debt Repayment	6.000 %	6.000 %
Net Employer Rate	20.647 %	20.647 %
b. Employee Contribution Rate	13.324 %	13.324 %
4. Actuarial Math Contribution		
a. Amortization Payment for UAAL		
i. Amount	150,564,951	153,616,190
ii. As a % of pay	22.90 %	23.63 %
b. Normal Cost		
i. Entry age normal cost amount	52,757,421	51,675,474
ii. Administrative expenses	2,300,000	2,300,000
iii. Normal cost	55,057,421	53,975,474
iv. As a % of pay	8.38 %	8.30 %
c. Interest Adjustment to Mid-Year		
i. Amount	8,313,848	8,393,471
ii. As a % of pay	1.26 %	1.29 %
d. Actuarial Contribution		
i. Amount	213,936,220	215,985,135
ii. As a % of pay	32.54 %	33.23 %
5. Actuarial Funded Status (\$ in thousands)		
a. Actuarial Accrued Liability	3,740,656	3,670,670
b. Actuarial Value of Assets (AVA)	2,057,053	1,955,264
c. Unfunded Accrued Liability	1,683,603	1,715,406
d. Funded Ratio	55.0 %	53.3 %
e. Market Value of Assets (MVA)	2,188,484	1,941,166
f. Return on MVA (prior year)	17.6 %	7.6 %
g. Return on AVA (prior year)	9.8 %	7.8 %

* 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, 2022	January 1, 2021
1. Active Members		
a. Retirement Benefits	1,017,280,305	1,008,491,976
b. Withdrawal Benefits	36,484,985	36,047,039
c. Disability Benefits	93,795,724	93,728,998
d. Death Benefits	12,080,519	11,773,685
Total	1,159,641,533	1,150,041,698
2. Inactive Members with Deferred Benefits	23,881,923	24,928,255
3. Retired Members and Beneficiaries Receiving Benefits	2,557,132,992	2,495,700,217
4. Total Actuarial Accrued Liability (1. + 2. + 3.)	3,740,656,448	3,670,670,170

Normal Cost	January 1, 2022	January 1, 2021
1. Active Members		
a. Retirement Benefits	54,543,767	53,979,871
b. Withdrawal Benefits	4,994,040	4,855,893
c. Disability Benefits	7,312,189	7,181,125
d. Death Benefits	934,346	903,722
2. Normal Cost	67,784,342	66,920,611
3. Total Normal Cost (As a % of pay)	10.31%	10.29%

Section 1.2 Actuarial (Gain) / Loss

Development of Actuarial (Gain) / Loss	Amount
1. Expected Actuarial Accrued Liability	
a. Actuarial Accrued Liability at January 1, 2021	3,670,670,170
b. Normal Cost at January 1, 2021	66,920,611
c. Interest on a. + b. to End of Year	308,351,239
d. Benefit Payments for 2021, with Interest to End of Year	<u>320,933,110</u>
e. Expected Actuarial Accrued Liability Before Changes (a. + b. + c. - d.)	3,725,008,910
2. Actuarial Accrued Liability at January 1, 2022	3,740,656,448
3. Liability (Gain) / Loss (2. - 1.e.)	15,647,538
4. Expected Actuarial Value of Assets	
a. Actuarial Value of Assets at January 1, 2021	1,955,264,394
b. Interest on a. to End of Year	161,309,314
c. Contributions Made for 2021	224,804,562
d. Interest on c. to End of Year	9,089,433
e. Benefit Payments and Administrative Expenses for 2021, with Interest to End of Year	323,354,835
f. Expected Actuarial Value of Assets at January 1, 2022	
(a. + b. + c. + d. - e.)	2,027,112,868
5. Actuarial Value of Assets as of January 1, 2022	2,057,052,824
6. Actuarial Value Asset (Gain) / Loss (4.f. - 5.)	(29,939,956)
7. Total Actuarial (Gain) / Loss (3. + 6.)	(14,292,418)

Section 1.3
Actuarial Balance Sheet

Financial Resources	January 1, 2022	January 1, 2021
1. Actuarial Value of Assets	2,057,052,824	1,955,264,394
2. Present Value of Future Contributions	516,495,378	512,499,852
3. Unfunded Actuarial Accrued Liability/(Reserve)	<u>1,683,603,624</u>	<u>1,715,405,776</u>
4. Total Assets (1 + 2 + 3)	4,257,151,826	4,183,170,022

Benefit Obligations	January 1, 2022	January 1, 2021
1. Present Value of Future Benefits		
a. Active Members	1,676,136,911	1,662,541,550
b. Inactive Members	23,881,923	24,928,255
c. Retirees, disabilities and beneficiaries	<u>2,557,132,992</u>	<u>2,495,700,217</u>
d. Total	4,257,151,826	4,183,170,022

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, 2021	As a % of Last Year's AAL
(1) COLA Experience	0	0.00%
(2) Salary Experience	6,726,131	0.18%
(3) Retiree Mortality Experience	(5,828,035)	-0.16%
(4) Other (turnover, retirement ages, service purchase, etc.)		0.00%
(a) Unexpected Participant Pick Up	1,315,998	0.04%
(b) Unexpected Data Change for Decrementing Actives	3,295,675	0.09%
(c) Unexpected Data Change for Continuing Actives	1,179,646	0.03%
(d) Unexpected Data Change for Continuing Inactives	1,096,337	0.03%
(e) Unexpected Rehires	(109,918)	0.00%
(f) Difference between actual and expected benefit payments	(1,722,237)	-0.05%
(g) Miscellaneous	<u>106,978</u>	0.00%
(h) Total	5,162,479	0.14%
(5) Active Decrements	7,263,073	0.20%
(6) New Entrants	<u>2,323,890</u>	<u>0.06%</u>
(7) Liability (Gain) or Loss During Year, (1) + (2) + (3) + (4)(h) + (5) + (6)	15,647,538	0.43%
(8) Investment Experience	<u>(29,939,956)</u>	<u>-0.82%</u>
(9) Total (Gain) or Loss During Year before Change, (7) + (8)	(14,292,418)	-0.39%

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, 2022	3,740,656	2,057,053	54.99%	1,683,603
January 1, 2021	3,670,670	1,955,264	53.27%	1,715,406
January 1, 2020	3,583,859	1,883,411	52.55%	1,700,448
January 1, 2019	3,488,955	1,835,792	52.62%	1,653,163
January 1, 2018	3,423,218	1,802,216	52.65%	1,621,002
January 1, 2017	3,338,641	1,752,473	52.49%	1,586,168
January 1, 2016 *	3,267,121	1,743,216	53.36%	1,523,904
January 1, 2015 *	3,186,187	1,855,912	58.25%	1,330,275
January 1, 2014 *	3,105,567	1,892,714	60.95%	1,212,853
January 1, 2013 *	2,867,335	1,702,788	59.39%	1,164,547
January 1, 2012 *	2,808,184	1,662,196	59.19%	1,145,988
January 1, 2011	2,724,191	1,909,967	70.11%	814,224

* Actuarial Value of Assets is Fair Market Value

Section 1.6 Solvency Test

Comparative Summary of Accrued Liability and Actuarial Value of Assets

Valuation as of January 1	Accrued Liability for:			Actuarial Value of Assets ¹	Portion of Accrued Liability Covered by Actuarial Value of Assets		
	(1) Active Member Contributions	(2) Retirees, Beneficiaries, TVRs and Disabled	(3) Active Member (Employer Financed Portion)		(1)	(2)	(3)
2022	680,411,548	2,581,014,915	479,229,985	2,057,052,824	100.00 %	53.34 %	0.00 %
2021	634,800,523	2,520,628,472	515,241,175	1,955,264,394	100.00 %	52.39 %	0.00 %
2020	588,433,604	2,442,447,997	552,977,413	1,883,410,704	100.00 %	53.02 %	0.00 %
2019	544,522,986	2,370,131,785	574,300,017	1,835,791,586	100.00 %	54.48 %	0.00 %
2018	496,944,601	2,334,464,478	591,809,348	1,802,216,284	100.00 %	55.91 %	0.00 %

¹ Excludes health care assets.

Section 1.7
 Projected Actuarial Results

Projection of Funded Status based on Board Approved Contribution Rates

Year	Board Adopted Contribution Rates			Board Adopted Contributions			Actuarial Accrued Liability	Actuarial Value of Assets	Funded Ratio
	Employee Contribution Percent	Employer Contribution Percent	Total Percent	Employee Contribution	Employer Contribution	Total Contribution			
2022	13.324%	20.647%	33.971%	87,590,147	135,736,341	223,326,488	3,740,656,448	2,057,052,824	54.99%
2023	13.324%	20.647%	33.971%	88,513,502	137,167,242	225,680,744	3,792,872,509	2,149,963,820	56.68%
2024	13.324%	20.647%	33.971%	89,610,475	138,867,195	228,477,670	3,842,984,000	2,286,281,157	59.49%
2025	13.324%	20.647%	33.971%	90,992,474	141,008,846	232,001,320	3,888,628,202	2,398,384,204	61.68%
2026	13.324%	20.647%	33.971%	92,974,777	144,080,772	237,055,549	3,929,629,859	2,518,154,315	64.08%
2027	13.324%	20.647%	33.971%	95,225,534	147,568,717	242,794,251	3,965,808,723	2,606,215,016	65.72%
2028	13.324%	20.647%	33.971%	97,686,110	151,381,811	249,067,921	3,997,244,974	2,699,254,284	67.53%
2029	13.324%	20.647%	33.971%	100,295,965	155,426,242	255,722,207	4,024,257,522	2,799,085,628	69.56%
2030	13.324%	20.647%	33.971%	102,995,612	159,609,819	262,605,431	4,047,339,012	2,907,385,237	71.83%
2031	13.324%	20.647%	33.971%	105,952,270	164,191,680	270,143,950	4,067,451,784	3,025,831,241	74.39%
2032	13.324%	20.647%	33.971%	109,080,310	169,039,130	278,119,440	4,085,484,595	3,156,944,083	77.27%
2033	13.324%	20.647%	33.971%	112,312,498	174,047,973	286,360,471	4,103,036,134	3,303,739,294	80.52%
2034	13.324%	20.647%	33.971%	115,764,830	179,397,968	295,162,798	4,120,914,589	3,468,385,634	84.17%
2035	13.324%	20.647%	33.971%	119,440,618	185,094,248	304,534,866	4,140,520,589	3,653,982,011	88.25%
2036	13.324%	20.647%	33.971%	123,335,022	191,129,313	314,464,335	4,163,752,300	3,864,059,085	92.80%
2037	13.324%	20.647%	33.971%	127,416,970	197,455,009	324,871,979	4,192,795,216	4,102,496,174	97.85%
2038	13.324%	20.647%	33.971%	131,624,632	203,975,522	335,600,154	4,229,710,369	4,373,187,275	103.39%
2039	13.324%	20.647%	33.971%	135,938,261	210,660,249	346,598,510	4,276,126,064	4,679,620,640	109.44%
2040	13.324%	20.647%	33.971%	140,382,429	217,547,270	357,929,699	4,333,713,456	5,025,532,173	115.96%
2041	13.324%	26.647%	39.971%	144,859,127	289,718,254	434,577,381	4,401,516,810	5,414,461,655	123.01%
2042	13.324%	26.647%	39.971%	149,412,907	298,825,813	448,238,720	4,481,782,766	5,917,384,524	132.03%

Section 2 - Plan Assets

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

	As of December 31	
	2021	2020
ASSETS		
1. Total investments, at fair value	2,171,036	1,933,214
2. Invested securities lending cash collateral	71,002	46,060
3. Receivables:		
a. Employer contributions	13,926	13,693
b. Employee contributions	8,612	8,863
c. Securities sold, but not received	8,140	3,507
d. Accrued interest and dividends	1,684	1,113
e. Other	<u>1,745</u>	<u>1,384</u>
4. Total assets	2,276,145	2,007,834
LIABILITIES		
1. Payable upon return of securities	71,002	46,061
2. Accounts payable	2,651	2,886
3. Other payables	96	94
4. Securities purchased, but not paid	<u>13,912</u>	<u>17,627</u>
5. Total liabilities	87,661	66,668
Net assets held in trust for Plan benefits	2,188,484	1,941,166

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

	As of December 31	
	2021	2020
ADDITIONS		
1. Net investment (loss) income	\$ 333,302	\$ 123,612
2. Employer contributions	136,908	135,832
3. Employee contributions	87,897	87,926
4. Other income	-	-
Total additions	\$ 558,107	\$ 347,370
DEDUCTIONS		
1. Benefit payments	\$ 299,596	\$ 289,202
2. Contribution refunds, including interest	8,865	5,151
3. Administrative expenses	2,328	2,317
Total liabilities	\$ 310,789	\$ 296,670
NET ASSETS HELD IN TRUST FOR PLAN BENEFITS		
1. Beginning of year	\$ 1,941,166	\$ 1,890,466
2. Net (decrease) increase	247,318	50,700
End of year	\$ 2,188,484	\$ 1,941,166

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, 2021			\$ 1,955,264,394	
2. Unrecognized Return as of January 1, 2021			(14,097,973)	
3. Fair Value of Assets as of January 1, 2021			\$ 1,941,166,421	
4. Contributions				
a. Member (includes purchased service)			\$ 87,896,658	
b. Employer			136,907,904	
c. Miscellaneous contributions			-	
d. Total			\$ 224,804,562	
5. Distributions				
a. Benefit payments			\$ 299,595,694	
b. Refund of contributions			8,865,526	
c. Administrative expenses			2,327,614	
d. Total			\$ 310,788,834	
6. Expected Return at 8.25% on				
a. Item 1.			\$ 161,309,313	
b. Item 2.			(1,163,083)	
c. Item 4.d.			9,089,433	
d. Item 5.d.			12,566,001	
e. Total [a. + b. + c. - d.]			\$ 156,669,662	
7. Actual Return on Fair Value for Fiscal Year, Net of Investment Expenses			\$ 333,301,626	
8. Return to be Spread for Fiscal Year (7. - 6.e) *			\$ 176,631,964	
9. Total Fair Value of Assets as of January 1, 2022			\$ 2,188,483,775	
10. Return to be Spread				
	Fiscal Year	Return to be Spread	Unrecognized Percent	Unrecognized Return
	2021	\$ 176,631,964	80%	\$ 141,305,571
	2020	(29,402,641)	60%	(17,641,584)
	2019	125,251,315	40%	50,100,526
	2018	(211,667,812)	20%	(42,333,562)
	2017	94,702,377	0%	-
			Total	\$ 131,430,951
11. Actuarial Value of Assets as of January 1, 2022 (9. - 10.)			\$ 2,057,052,824	
12. Recognized Rate of Return for the Year on Actuarial Value of Assets			9.82%	
13. Rate of Return for the Year on Fair Value of Assets (reported by investment consultant-net of inv. exp.)			17.60%	

* Annual Return to be Spread calculation based on 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
2021	17.60%	9.82%
2020	7.60%	7.84%
2019	15.70%	7.57%
2018	-3.53%	6.99%
2017	14.40%	9.10%
2016	6.80%	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
2022	15,512,098	301,437,453	316,949,551
2023	31,422,960	293,013,311	324,436,272
2024	46,831,089	285,709,921	332,541,010
2025	62,371,365	278,014,175	340,385,540
2026	78,032,035	269,966,670	347,998,705
2027	93,417,316	261,678,637	355,095,952
2028	108,155,599	253,091,788	361,247,387
2029	122,319,235	244,227,215	366,546,450
2030	135,768,401	235,222,867	370,991,268
2031	148,404,793	225,938,057	374,342,849
2032	160,854,357	216,441,293	377,295,650
2033	172,821,039	206,791,762	379,612,801
2034	183,758,817	197,031,489	380,790,306
2035	193,398,202	187,233,257	380,631,460
2036	201,715,077	177,369,429	379,084,506
2037	208,743,111	167,506,457	376,249,568
2038	214,861,367	157,740,293	372,601,660
2039	220,117,794	147,954,340	368,072,134
2040	224,727,038	138,318,831	363,045,869
2041	228,707,407	128,832,546	357,539,952
2042	232,232,159	119,560,004	351,792,162
2043	235,156,730	110,556,598	345,713,328
2044	237,809,898	101,835,433	339,645,331
2045	240,063,753	93,434,259	333,498,011
2046	241,995,494	85,345,402	327,340,895
2047	243,385,453	77,618,664	321,004,118
2048	244,314,620	70,281,115	314,595,735
2049	244,754,608	63,364,744	308,119,353
2050	245,018,417	56,862,245	301,880,662
2051	244,830,860	50,788,333	295,619,193
2052	244,005,707	45,135,482	289,141,189
2053	242,551,882	39,902,112	282,453,994
2054	240,309,233	35,089,625	275,398,858
2055	237,609,510	30,689,581	268,299,091
2056	233,737,668	26,690,668	260,428,336
2057	228,860,588	23,078,891	251,939,479
2058	222,867,840	19,838,010	242,705,851
2059	215,981,523	16,949,176	232,930,699
2060	208,396,016	14,391,390	222,787,405
2061	200,200,460	12,141,829	212,342,289
2062	191,483,668	10,176,614	201,660,281
2063	182,337,070	8,471,899	190,808,969
2064	173,007,705	7,004,011	180,011,716
2065	163,592,807	5,749,793	169,342,599
2066	154,145,501	4,686,826	158,832,327
2067	144,769,122	3,793,391	148,562,513
2068	135,512,683	3,048,723	138,561,406
2069	126,434,829	2,433,358	128,868,187
2070	117,578,740	1,929,247	119,507,986
2071	108,974,679	1,519,871	110,494,549
2072	100,647,097	1,190,308	101,837,405
2073	92,618,421	927,179	93,545,601
2074	84,912,670	718,745	85,631,415

Section 2.5
Forecast of Expected Benefit Payments, continued

Year Ending December 31	Active Members	Inactive Members	Total Payments
2075	77,540,224	554,857	78,095,081
2076	70,511,862	426,873	70,938,735
2077	63,835,260	327,486	64,162,746
2078	57,516,268	250,646	57,766,914
2079	51,560,497	191,446	51,751,943
2080	45,972,624	145,967	46,118,590
2081	40,755,860	111,103	40,866,964
2082	35,911,058	84,434	35,995,492
2083	31,437,203	64,066	31,501,269
2084	27,330,829	48,549	27,379,379
2085	23,586,217	36,763	23,622,981
2086	20,194,058	27,846	20,221,904
2087	17,142,419	21,124	17,163,544
2088	14,417,726	16,078	14,433,804
2089	12,005,128	12,292	12,017,420
2090	9,888,886	9,447	9,898,332
2091	8,051,538	7,291	8,058,830
2092	6,474,021	5,644	6,479,664
2093	5,136,076	4,371	5,140,447
2094	4,016,729	3,377	4,020,105
2095	3,094,046	2,589	3,096,635
2096	2,345,451	1,961	2,347,412
2097	1,748,238	1,461	1,749,699
2098	1,280,247	1,067	1,281,314
2099	920,388	759	921,146
2100	649,132	524	649,655
2101	448,815	350	449,165
2102	303,996	225	304,221
2103	201,597	140	201,737
2104	130,835	83	130,918
2105	83,047	47	83,094
2106	51,525	26	51,551
2107	31,244	14	31,258
2108	18,522	7	18,529
2109	10,732	4	10,736
2110	6,072	2	6,074
2111	3,352	1	3,353
2112	1,805	0	1,806
2113	947	0	948
2114	484	0	484
2115	239	0	239
2116	114	0	114
2117	52	0	52
2118	23	0	23
2119	9	0	9

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, 2021 was determined by rolling forward the total pension liability as of January 1, 2021 to December 31, 2021 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, 2021
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:	<p>Active members and <i>Healthy pensioners</i>, including beneficiaries prior to their associated member's death: The SOA Public Mortality General Below Median generational with Improvement Scale MP-2018 with an adjustment for female participants.</p> <p><i>Disabled pensioners</i>: The SOA Public Disability Mortality General Below Median generational with Improvement Scale MP-2018.</p> <p>Survivors: The SOA Public Survivor Mortality General Below Median generational with Improvement Scale MP-2018.</p>
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, 2021

The GASB Statement No. 67 Change in Net Pension Liability

Schedule of Changes in Net Pension Liability		
Fiscal Year Ending	December 31, 2021	December 31, 2020
Total Pension Liability		
Service Cost	\$ 51,675,474	\$ 54,560,054
Interest	303,111,459	294,244,949
Changes of Benefit Terms	-	-
Difference between Expected and Actual Experience	38,032,686	62,819,793
Change of Assumptions	-	-
Benefit Payments, including Refund of Member Contributions	(308,461,220)	(294,353,073)
Net Change in Total Pension Liability	84,358,399	117,271,723
Total Pension Liability - Beginning of Year	\$ 3,773,577,241	\$ 3,656,305,518
Total Pension Liability - End of Year	\$ 3,857,935,640	\$ 3,773,577,241
Plan Fiduciary Net Position		
Employer Contributions	\$ 136,907,904	\$ 135,831,883
Member Contributions	87,896,658	87,925,661
Net Investment Income	333,301,626	123,612,775
Benefit Payments, including Refund of Member Contributions	(308,461,220)	(294,353,073)
Administrative Expenses	(2,327,614)	(2,316,997)
Other	-	-
Net Change in Plan Fiduciary Net Position	247,317,354	50,700,249
Plan Fiduciary Net Position - Beginning of Year	\$ 1,941,166,421	\$ 1,890,466,172
Plan Fiduciary Net Position - End of Year	\$ 2,188,483,775	\$ 1,941,166,421

Section 3.3
 Net Pension Liability (Asset)

The GASB Statement No. 67 Net Pension Liability

Net Pension Liability (Asset)		
Valuation Date	Dec. 31, 2021	Dec. 31, 2020
Total Pension Liability	\$ 3,857,935,640	\$ 3,773,577,241
Plan Fiduciary Net Position	<u>2,188,483,775</u>	<u>1,941,166,421</u>
Net Pension Liability (Asset)	\$ 1,669,451,865	\$ 1,832,410,820
Plan Fiduciary Net Position as a Percentage of the Total Pension Liability (Asset)	56.73%	51.44%

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, 2021	1% Decrease	Current	1% Increase
Discount Rate	7.25%	8.25%	9.25%
Net Pension Liability (Asset)	\$ 2,034,866,396	\$ 1,669,451,865	\$ 1,356,066,211

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 2.25% would be used to discount the benefit payments not covered by the Plan's fiduciary net position. The 2.25% rate equals the S&P Municipal Bond 20-Year High Grade Index at December 31, 2021. The rate was 1.93% as of December 31, 2020. Please see the supporting exhibits for additional detail.

Long-term expected rate of return. The long-term expected rate of return on system investments was determined using a building-block method in which best-estimate ranges of expected future real rates of return (expected returns, net of system investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and by adding expected inflation. Best estimates of long-term geometric rates of return for each major asset class included in the system's target asset allocation as of December 31, 2021 are summarized below:

Asset Class	Long-Term Expected Rate of Return
Inflation	2.58%
Fixed Income	3.85%
Domestic Equity	8.35%
International Equity	6.90%
Private Equity	8.48%
Real Estate	6.16%
Infrastructure	4.87%

Section 3.5 Pension Expense

The GASB Statement No. 68 Pension Expense

Pension Expense		
Measurement Year Ending	December 31, 2021	December 31, 2020
Service Cost	\$ 51,675,474	\$ 54,560,054
Interest	303,111,459	294,244,949
Projected Earnings on Plan Investments	(156,669,662)	(153,015,416)
Member Contributions	(87,896,658)	(87,925,661)
Administrative Expense	2,327,614	2,316,997
Current Period:		
Changes of Benefit Terms	-	-
Changes of Assumptions	-	-
Difference between Expected and Actual Experience	9,120,549	15,321,901
Difference between Expected and Actual Investment Earnings	(35,326,393)	5,880,528
Recognition of Prior Years:		
Deferred Inflows	(49,547,361)	(49,547,359)
Deferred Outflows	76,566,956	66,807,589
Others	-	-
Total Pension Expense	\$ 113,361,978	\$ 148,643,582

Section 3.6 Supporting Exhibits

Schedule of Deferred Inflows and Outflows

Amortization of the Difference Between Expected and Actual Experience

Measurement Date	2016	2017	2018	2019	2020	2021	Outflows	Inflows	Total
Amount Established	\$ 51,517,655	\$ 13,679,323	\$ 7,455,309	\$ 41,530,311	\$ 62,819,793	\$ 38,032,686			
Recognition Period	4.49	4.42	4.45	4.13	4.10	4.17			
Amount Recognized in FY									
2016	\$ 11,473,865						\$ 11,473,865	\$ -	\$ 11,473,865
2017	11,473,865	\$ 3,094,869					14,568,734	-	14,568,734
2018	11,473,865	3,094,869	\$ 1,675,350				16,244,084	-	16,244,084
2019	11,473,865	3,094,869	1,675,350	\$ 10,055,766			26,299,850	-	26,299,850
2020	5,622,195	3,094,869	1,675,350	10,055,766	\$ 15,321,901		35,770,081	-	35,770,081
2021	-	1,299,847	1,675,350	10,055,766	15,321,901	\$ 9,120,549	37,473,413	-	37,473,413
2022	-	-	753,909	10,055,766	15,321,901	9,120,549	35,252,125	-	35,252,125
2023	-	-	-	1,307,247	15,321,901	9,120,549	25,749,697	-	25,749,697
2024	-	-	-	-	1,532,189	9,120,549	10,652,738	-	10,652,738
2025	-	-	-	-	-	1,550,490	1,550,490	-	1,550,490
Deferred Balance at 12/31									
2016	\$ 40,043,790						\$ 40,043,790	\$ -	\$ 40,043,790
2017	28,569,925	\$ 10,584,454					39,154,379	-	39,154,379
2018	17,096,060	7,489,585	\$ 5,779,959				30,365,604	-	30,365,604
2019	5,622,195	4,394,716	4,104,609	\$ 31,474,545			45,596,065	-	45,596,065
2020	-	1,299,847	2,429,259	21,418,779	\$ 47,497,892		72,645,777	-	72,645,777
2021	-	-	753,909	11,363,013	32,175,991	\$ 28,912,137	73,205,050	-	73,205,050
2022	-	-	-	1,307,247	16,854,090	19,791,588	37,952,925	-	37,952,925
2023	-	-	-	-	1,532,189	10,671,039	12,203,228	-	12,203,228
2024	-	-	-	-	-	1,550,490	1,550,490	-	1,550,490

Amortization of Changes in Assumptions

Measurement Date	2016	2017	2018	2019	2020	2021	Outflows	Inflows	Total
Amount Established	\$ -	\$ -	\$ (24,726,963)	\$ -	\$ -	\$ -			
Recognition Period			4.45						
Amount Recognized in FY									
2016	\$ -						\$ -	\$ -	\$ -
2017	-	\$ -					-	-	-
2018	-	-	\$ (5,556,621)				-	(5,556,621)	(5,556,621)
2019	-	-	(5,556,621)	\$ -			-	(5,556,621)	(5,556,621)
2020	-	-	(5,556,621)	-	\$ -		-	(5,556,621)	(5,556,621)
2021	-	-	(5,556,621)	-	-	\$ -	-	(5,556,621)	(5,556,621)
2022	-	-	(2,500,479)	-	-	-	-	(2,500,479)	(2,500,479)
2023	-	-	-	-	-	-	-	-	-
2024	-	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-	-
Deferred Balance at 12/31									
2016	\$ -						\$ -	\$ -	\$ -
2017	-	\$ -					-	-	-
2018	-	-	\$ (19,170,342)				-	(19,170,342)	(19,170,342)
2019	-	-	(13,613,721)	\$ -			-	(13,613,721)	(13,613,721)
2020	-	-	(8,057,100)	-	\$ -		-	(8,057,100)	(8,057,100)
2021	-	-	(2,500,479)	-	-	\$ -	-	(2,500,479)	(2,500,479)
2022	-	-	-	-	-	-	-	-	-
2023	-	-	-	-	-	-	-	-	-
2024	-	-	-	-	-	-	-	-	-

Amortization of the Difference Between Projected and Actual Earnings

Measurement Date	2016	2017	2018	2019	2020	2021	Outflows	Inflows	Total
Amount Established	\$ 20,129,242	\$ (94,702,377)	\$211,667,813	\$ (125,251,315)	\$ 29,402,641	\$ (176,631,965)			
Recognition Period	5.00	5.00	5.00	5.00	5.00	5.00			
Amount Recognized in FY									
2016	\$ 4,025,849						\$ 4,025,849	\$ -	\$ 4,025,849
2017	4,025,849	\$ (18,940,475)					4,025,849	(18,940,475)	(14,914,626)
2018	4,025,849	(18,940,475)	\$ 42,333,563				46,359,412	(18,940,475)	27,418,937
2019	4,025,849	(18,940,475)	42,333,563	\$ (25,050,263)			46,359,412	(43,990,738)	2,368,674
2020	4,025,846	(18,940,475)	42,333,563	(25,050,263)	\$ 5,880,528		52,239,937	(43,990,738)	8,249,199
2021	-	(18,940,477)	42,333,563	(25,050,263)	5,880,528	\$ (35,326,393)	48,214,091	(79,317,133)	(31,103,042)
2022	-	-	42,333,561	(25,050,263)	5,880,528	(35,326,393)	48,214,089	(60,376,656)	(12,162,567)
2023	-	-	-	(25,050,263)	5,880,528	(35,326,393)	5,880,528	(60,376,656)	(54,496,128)
2024	-	-	-	-	5,880,529	(35,326,393)	5,880,529	(35,326,393)	(29,445,864)
2025	-	-	-	-	-	(35,326,393)	-	(35,326,393)	(35,326,393)
Deferred Balance at 12/31									
2016	\$ 16,103,393						\$ 16,103,393	\$ -	\$ 16,103,393
2017	12,077,544	\$ (75,761,902)					12,077,544	(75,761,902)	(63,684,358)
2018	8,051,695	(56,821,427)	\$169,334,250				177,385,945	(56,821,427)	120,564,518
2019	4,025,846	(37,880,952)	127,000,687	\$ (100,201,052)			131,026,533	(138,082,004)	(7,055,471)
2020	-	(18,940,477)	84,667,124	(75,150,789)	\$ 23,522,113		108,189,237	(94,091,266)	14,097,971
2021	-	-	42,333,561	(50,100,526)	17,641,585	\$ (141,305,572)	59,975,146	(191,406,098)	(131,430,952)
2022	-	-	-	(25,050,263)	11,761,057	(105,979,179)	11,761,057	(131,029,442)	(119,268,385)
2023	-	-	-	-	5,880,529	(70,652,786)	5,880,529	(70,652,786)	(64,772,257)
2024	-	-	-	-	-	(35,326,393)	-	(35,326,393)	(35,326,393)

Section 3.6
Supporting Exhibits, continued

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

	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
Employer Portion of Required Contribution on a statutory basis	\$ 131,630	\$ 132,232	\$ 116,367	\$ 112,265	\$ 106,662	\$ 82,001	\$ 81,731	\$ 80,488	\$ 76,899	\$ 61,982
Actual Employer Contributions	\$ 136,908	\$ 135,832	\$ 121,668	\$ 117,115	\$ 104,523	\$ 83,855	\$ 82,800	\$ 82,268	\$ 79,518	\$ 62,788
Contribution deficiency (excess)	\$ (5,278)	\$ (3,600)	\$ (5,301)	\$ (4,850)	\$ 2,139	\$ (1,854)	\$ (1,069)	\$ (1,780)	\$ (2,619)	\$ (806)
Covered payroll	\$ 637,524	\$ 640,442	\$ 645,799	\$ 623,037	\$ 595,047	\$ 575,444	\$ 573,548	\$ 564,827	\$ 550,616	\$ 548,515
Contributions as a percentage of covered payroll	20.65%	20.65%	18.02%	18.02%	17.93%	14.25%	14.25%	14.25%	13.97%	11.30%

Notes to Schedule -

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

Other information:

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

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)
2022	2,188,483,775	223,325,086	316,949,551	2,300,000	176,671,436	2,269,230,746
2023	2,269,230,746	222,737,725	324,453,938	2,346,000	183,004,030	2,348,172,563
2024	2,348,172,563	222,290,174	332,574,679	2,392,920	189,168,395	2,424,663,533
2025	2,424,663,533	222,239,609	340,433,404	2,440,778	195,157,171	2,499,186,131
2026	2,499,186,131	223,259,892	348,058,669	2,489,594	201,036,255	2,572,934,015
2027	2,572,934,015	224,584,221	355,166,039	2,539,386	206,884,620	2,646,697,431
2028	2,646,697,431	226,377,397	361,325,863	2,590,174	212,791,492	2,721,950,284
2029	2,721,950,284	228,493,726	366,631,514	2,641,977	218,868,807	2,800,039,326
2030	2,800,039,326	230,706,041	371,081,112	2,694,817	225,218,557	2,882,187,995
2031	2,882,187,995	233,588,503	374,435,760	2,748,713	231,974,551	2,970,566,576
2032	2,970,566,576	236,924,442	377,390,025	2,803,687	239,278,993	3,066,576,299
2033	3,066,576,299	240,492,448	379,707,136	2,859,761	247,248,105	3,171,749,955
2034	3,171,749,955	244,690,695	380,883,281	2,916,956	256,044,810	3,288,685,223
2035	3,288,685,223	249,541,250	380,721,935	2,975,295	265,892,255	3,420,421,498
2036	3,420,421,498	255,070,825	379,171,507	3,034,801	277,044,355	3,570,330,370
2037	3,570,330,370	261,210,096	376,332,396	3,095,497	289,772,402	3,741,884,975
2038	3,741,884,975	267,764,454	372,679,563	3,157,407	304,335,858	3,938,148,316
2039	3,938,148,316	274,639,274	368,144,656	3,220,555	320,986,355	4,162,408,734
2040	4,162,408,734	281,938,473	363,112,694	3,284,966	339,983,816	4,417,933,363
2041	4,417,933,363	289,438,458	357,600,895	3,350,666	361,588,041	4,708,008,302
2042	4,708,008,302	297,212,331	351,847,182	3,417,679	386,063,470	5,036,019,242
2043	5,036,019,242	305,221,863	345,762,517	3,486,033	413,691,474	5,405,684,030
2044	5,405,684,030	313,449,615	339,688,879	3,555,753	444,764,242	5,820,653,255
2045	5,820,653,255	321,994,290	333,536,193	3,626,868	479,590,581	6,285,075,064
2046	6,285,075,064	330,900,557	327,374,052	3,699,406	518,511,702	6,803,413,866
2047	6,803,413,866	340,192,779	321,032,649	3,773,394	561,903,770	7,380,704,372
2048	7,380,704,372	349,871,074	314,620,078	3,848,862	610,177,781	8,022,284,287
2049	8,022,284,287	359,914,924	308,139,963	3,925,839	663,773,118	8,733,906,527
2050	8,733,906,527	370,322,097	301,897,998	4,004,356	723,151,946	9,521,478,217
2051	9,521,478,217	380,985,436	295,633,709	4,084,443	788,807,801	10,391,553,302
2052	10,391,553,302	391,967,892	289,153,311	4,166,132	861,291,761	11,351,493,512
2053	11,351,493,512	403,278,588	282,464,117	4,249,454	941,211,242	12,409,269,770
2054	12,409,269,770	414,872,841	275,407,336	4,334,443	1,029,228,457	13,573,629,289
2055	13,573,629,289	426,892,068	268,306,234	4,421,132	1,126,057,697	14,853,851,687
2056	14,853,851,687	439,398,618	260,434,409	4,509,555	1,232,496,420	16,260,802,761
2057	16,260,802,761	452,459,663	251,944,707	4,599,746	1,349,437,589	17,806,155,560
2058	17,806,155,560	466,063,296	242,710,414	4,691,741	1,477,848,873	19,502,665,574
2059	19,502,665,574	480,206,232	232,934,740	4,785,576	1,618,774,247	21,363,925,737

*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	Unfunded Portion of	8.25%	2.25%	8.25%
			Projected Benefit Payments	Projected Benefit Payments	Present Value of Funded Benefit Payments	Present Value of Unfunded Benefit Payments	Present Value of Benefit Payments Using Single Discount Rate
2022	2,188,483,775	316,949,551	316,949,551	-	292,794,042	-	292,794,042
2023	2,269,230,746	324,453,938	324,453,938	-	276,883,604	-	276,883,604
2024	2,348,172,563	332,574,679	332,574,679	-	262,183,566	-	262,183,566
2025	2,424,663,533	340,433,404	340,433,404	-	247,925,129	-	247,925,129
2026	2,499,186,131	348,058,669	348,058,669	-	234,160,119	-	234,160,119
2027	2,572,934,015	355,166,039	355,166,039	-	220,731,341	-	220,731,341
2028	2,646,697,431	361,325,863	361,325,863	-	207,445,354	-	207,445,354
2029	2,721,950,284	366,631,514	366,631,514	-	194,449,375	-	194,449,375
2030	2,800,039,326	371,081,112	371,081,112	-	181,809,974	-	181,809,974
2031	2,882,187,995	374,435,760	374,435,760	-	169,472,122	-	169,472,122
2032	2,970,566,576	377,390,025	377,390,025	-	157,791,448	-	157,791,448
2033	3,066,576,299	379,707,136	379,707,136	-	146,660,749	-	146,660,749
2034	3,171,749,955	380,883,281	380,883,281	-	135,903,031	-	135,903,031
2035	3,288,685,223	380,721,935	380,721,935	-	125,492,343	-	125,492,343
2036	3,420,421,498	379,171,507	379,171,507	-	115,456,163	-	115,456,163
2037	3,570,330,370	376,332,396	376,332,396	-	105,858,351	-	105,858,351
2038	3,741,884,975	372,679,563	372,679,563	-	96,841,430	-	96,841,430
2039	3,938,148,316	368,144,656	368,144,656	-	88,372,311	-	88,372,311
2040	4,162,408,734	363,112,694	363,112,694	-	80,521,385	-	80,521,385
2041	4,417,933,363	357,600,895	357,600,895	-	73,255,544	-	73,255,544
2042	4,708,008,302	351,847,182	351,847,182	-	66,583,722	-	66,583,722
2043	5,036,019,242	345,762,517	345,762,517	-	60,445,504	-	60,445,504
2044	5,405,684,030	339,688,879	339,688,879	-	54,857,942	-	54,857,942
2045	5,820,653,255	333,536,193	333,536,193	-	49,759,184	-	49,759,184
2046	6,285,075,064	327,374,052	327,374,052	-	45,117,666	-	45,117,666
2047	6,803,413,866	321,032,649	321,032,649	-	40,871,791	-	40,871,791
2048	7,380,704,372	314,620,078	314,620,078	-	37,002,665	-	37,002,665
2049	8,022,284,287	308,139,963	308,139,963	-	33,478,554	-	33,478,554
2050	8,733,906,527	301,897,998	301,897,998	-	30,300,583	-	30,300,583
2051	9,521,478,217	295,633,709	295,633,709	-	27,410,490	-	27,410,490
2052	10,391,553,302	289,153,311	289,153,311	-	24,766,413	-	24,766,413
2053	11,351,493,512	282,464,117	282,464,117	-	22,349,629	-	22,349,629
2054	12,409,269,770	275,407,336	275,407,336	-	20,130,504	-	20,130,504
2055	13,573,629,289	268,306,234	268,306,234	-	18,116,821	-	18,116,821
2056	14,853,851,687	260,434,409	260,434,409	-	16,245,074	-	16,245,074
2057	16,260,802,761	251,944,707	251,944,707	-	14,517,795	-	14,517,795
2058	17,806,155,560	242,710,414	242,710,414	-	12,919,804	-	12,919,804
2059	19,502,665,574	232,934,740	232,934,740	-	11,454,440	-	11,454,440

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

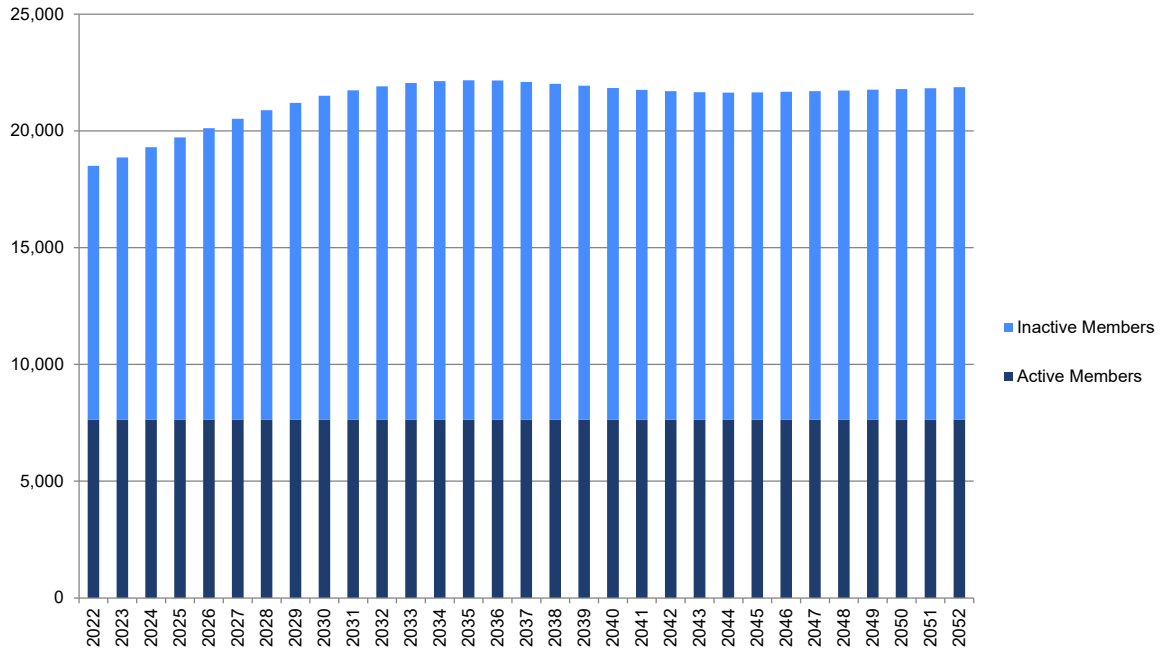
Projection Assumptions and Methods

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.

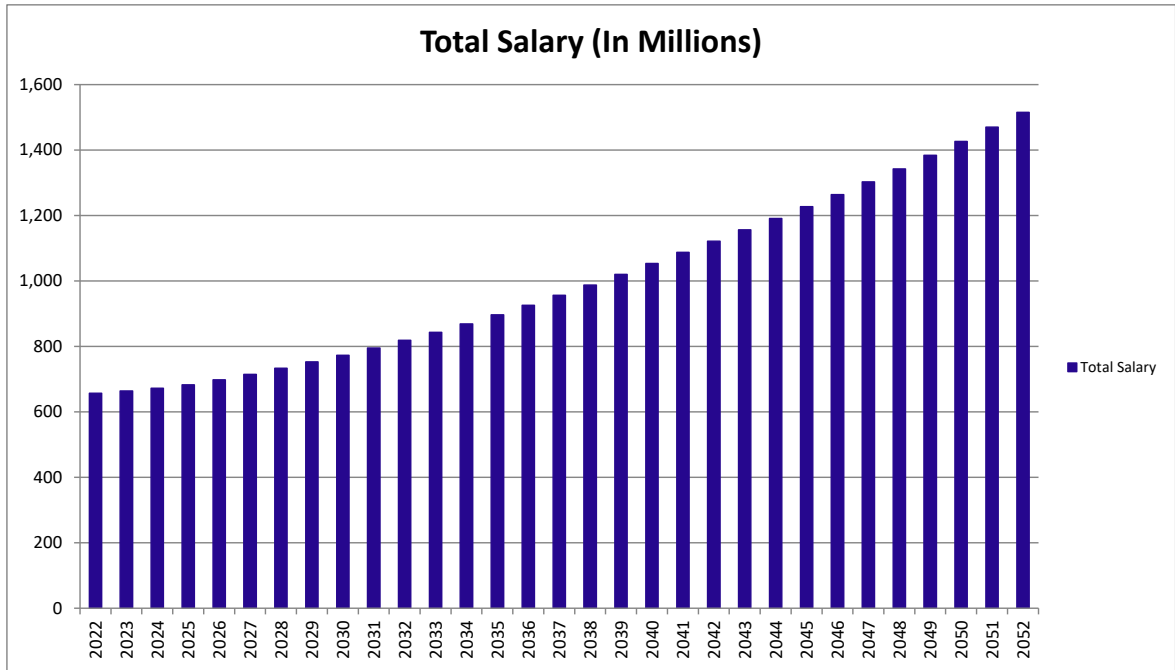
Section 4.2 Membership Projection

Projected Member Count

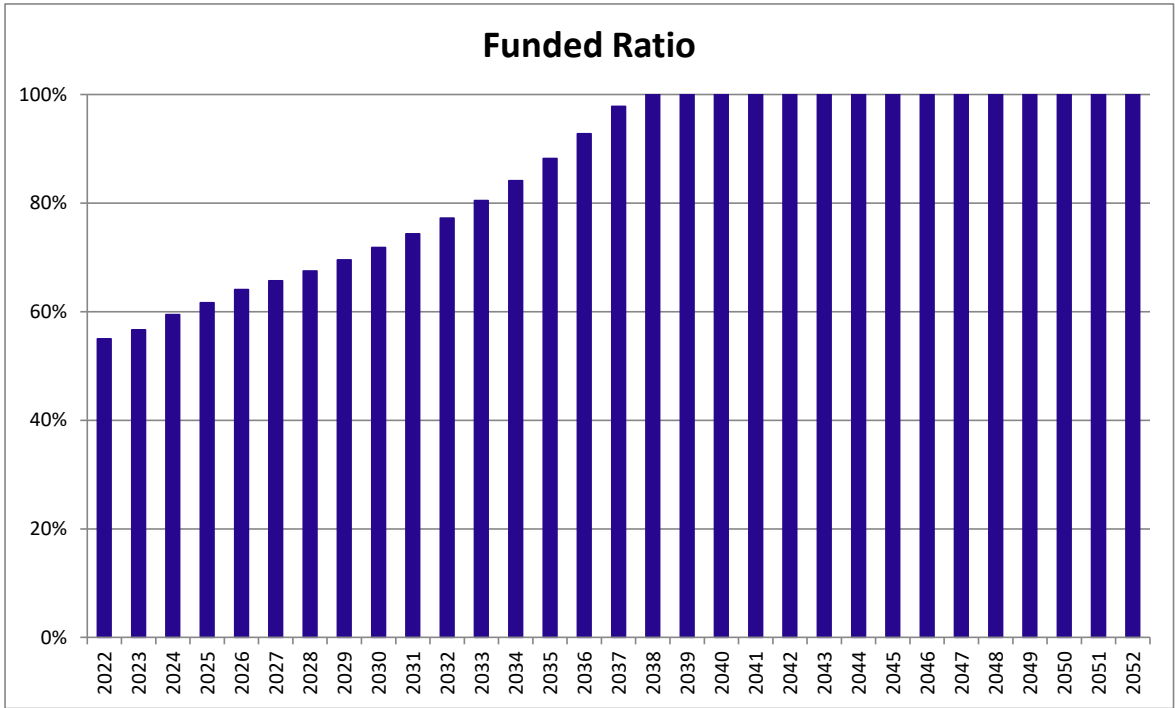


Section 4.2 Membership Projection, continued

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, 2022
(Annual Salaries and Annual Benefits \$ in 000's)

Active Employees

Item	Male	Female	Total
Number of Members ¹	5,263	2,462	7,725
Annual Salaries ²	\$479,369	\$178,030	\$657,399
Average Age ¹	49.18	47.59	48.67
Average Service ¹	13.26	11.49	12.69

Terminated Vested Employees

Item	Male	Female	Total
Number of Members	101	45	146
Annual Accrued Benefit	\$2,702	\$1,067	\$3,769
Average Age	57.24	58.13	57.51

Retirees and Beneficiaries

Item	Male	Female	Total
Number of Members	6,492	2,790	9,282
Annual Retirement Benefit	\$213,124	\$62,408	\$275,532
Average Age	72.76	72.37	72.64

Disability Allowances

Item	Male	Female	Total
Number of Members	721	630	1,351
Annual Disability Benefit	\$14,981	\$11,205	\$26,186
Average Age	65.32	63.22	64.34

1 Active statistics include all participants who are actively employed, 16 participants who are on leave and 87 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 87 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, 2022

Number of Participants

Age	Years of Service									Total
	Under 5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	Over 40	
Under 25	15	1	-	-	-	-	-	-	-	16
25-29	206	32	1	-	-	-	-	-	-	239
30-34	399	235	16	1	-	-	-	-	-	651
35-39	293	314	115	71	5	-	-	-	-	798
40-44	279	323	126	240	110	2	-	-	-	1,080
45-49	232	292	111	217	256	73	-	-	-	1,181
50-54	175	283	125	265	364	177	41	-	-	1,430
55-59	127	234	77	199	337	171	72	7	-	1,224
60-64	67	174	79	126	253	104	54	6	5	868
Over 65	15	56	32	31	48	25	13	5	13	238
Total	1,808	1,944	682	1,150	1,373	552	180	18	18	7,725

Section 5.3

Retirement Retiree and Beneficiary Data as of January 1, 2022

Number and Average Annual Allowance

Age Last Birthday	Number	Annual Allowance	Average Allowance
Retired Annuitants			
Under 50	14	\$805,345	\$57,525
50-54	143	\$7,110,868	\$49,726
55-59	512	\$23,712,515	\$46,314
60-64	892	\$37,840,424	\$42,422
65-69	1,571	\$56,310,207	\$35,844
70-74	1,904	\$57,574,677	\$30,239
75-79	1,592	\$43,804,912	\$27,516
Over 79	1,426	\$32,252,303	\$22,617
Total	8,054	\$259,411,251	\$32,209
Surviving Spouses			
Under 50	8	\$131,346	\$16,418
50-54	19	\$255,219	\$13,433
55-59	72	\$999,045	\$13,876
60-64	135	\$1,797,535	\$13,315
65-69	156	\$2,456,675	\$15,748
70-74	232	\$3,401,140	\$14,660
75-79	219	\$2,976,502	\$13,591
Over 79	387	\$4,103,282	\$10,603
Total	1,228	\$16,120,744	\$13,128
Disability Allowances			
Under 50	96	\$1,797,836	\$18,727
50-54	180	\$3,864,026	\$21,467
55-59	210	\$4,771,223	\$22,720
60-64	259	\$5,776,734	\$22,304
65-69	198	\$4,110,144	\$20,758
70-74	180	\$2,744,549	\$15,247
75-79	124	\$1,823,595	\$14,706
Over 79	104	\$1,297,658	\$12,477
Total	1,351	\$26,185,765	\$19,383

Section 5.4
Inactive Vested Employee Data as of January 1, 2022

Number and Average Accrued Benefit

Age Last Birthday	Number	Annual Accrued Benefit	Average Accrued Benefit
Terminated Vested ¹			
Under 35	1	-	-
35-39	3	\$46,573	\$23,287
40-44	6	\$120,205	\$24,041
45-49	11	\$252,612	\$25,261
50-54	23	\$530,080	\$25,242
55-59	39	\$1,124,582	\$28,835
60-64	55	\$1,578,091	\$28,693
65-69	6	\$83,678	\$13,946
Over 70	<u>2</u>	<u>\$32,854</u>	\$16,427
Total	146	\$3,768,675	\$26,919

¹ Number of deferred vested members includes 6 in 2022 who were pending cashouts after the valuation date. These members are not included in the calculation of the average benefit.

Section 6 - Basis of the Actuarial Valuation

Section 6.1

Summary of Plan and Contribution Provisions

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

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

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

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

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

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

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

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

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

Early Retirement:

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

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.

Section 6.1 Summary of Plan and Contribution Provisions, continued

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, had to elect to participate during the period March 1, 1997, to June 30, 1997. Employees eligible during the period July 1, 1997, to December 31, 1999, must elect to participate between July 1, 1997, and February 28, 1998. All eligible employees who elect to participate must retire no later than December 31, 1999. The benefit is determined based on a formula multiplier of 2.40% of average annual compensation with the benefit cap at 70.0% of such average annual compensation.

Ad hoc increases in retiree benefits:

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

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

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

Contribution Requirements Under P.A. 95-0708

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

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

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

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

Section 6.2 Description of Actuarial Methods and Valuation Procedures

A. Actuarial Cost Method

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

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

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

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

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

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

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

B. Asset Valuation Method

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

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

C. Valuation Procedures

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

The compensation amounts used in the projection of benefits and liabilities were January 1, 2022 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 \$657,399,211 for 2022. The following adjustments were made to the actual covered earnings for 2021 supplied by the Authority:

- (a) No earnings or a fractional year of earnings were submitted for employees with a work status date in 2021 who were hired during 2020. We have annualized the 2021 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, 2022 salary was assumed to increase 1.50% from 2021.

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

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

Salary Inflation: 3.10% per annum

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

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

Mortality:

- (a) *Active Members & Healthy Retirees* — The SOA Public Mortality General Below Median generational with Improvement Scale MP-2018 with a 13% increase adjustment for female participants.
- (b) *Survivors* — The SOA Public Survivor Mortality General Below Median generational with Improvement Scale MP-2018. Beneficiaries of current retirees are assumed to have the same mortality as active members & healthy retirees prior to the death of the member retiree.
- (c) *Disabled Retirees* — The SOA Public Disability Mortality General Below Median generational with Improvement Scale MP-2018.

Section 6.3

Summary of Actuarial Assumptions and Changes in Assumptions, continued

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

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

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

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

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

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

Section 6.3

Summary of Actuarial Assumptions and Changes in Assumptions, continued

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		Post 1/18/2008 Hires	
	Probability of Retirement	Probability of Retirement	Probability of Retirement	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.
Actuarial Math Contribution Expense Load:	Prior year expenses rounded to the nearest \$100,000

Summary of changes since January 1, 2021 Valuation

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

Section 7 - ASOP 51

Actuarial Standard of Practice No. 51 Disclosures

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

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

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

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

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

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

Note that ASOP 51 does not require the actuary to evaluate the ability or willingness of the Plan sponsor to make contributions to the Plan. In addition, this valuation report is 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 10% 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 9.58%.

- 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	1/1/2018	1/1/2019	1/1/2020	1/1/2021	1/1/2022
Actuarial Value of Assets (Billion)	1.80	1.84	1.88	1.96	2.06
Asset Return in Prior Year	14.40%	-3.53%	15.70%	7.60%	17.60%
Investment gain/(loss) - AVA basis (Million)	13.6	(22.2)	(12.3)	(7.7)	29.9
Actuarial Accrued Liability (Billion)	3.42	3.49	3.58	3.67	3.74
Liability duration	9.66	9.48	9.50	9.66	9.58
The ratio of retired life* actuarial accrued liability to total actuarial accrued liability	67.7%	67.4%	67.5%	68.0%	68.4%
The ratio of cashflow to actuarial value of assets	-5.8%	-4.9%	-4.7%	-3.7%	-4.2%
The ratio of actuarial value of assets to participant payroll	302.9%	294.7%	298.3%	300.8%	312.9%
Normal cost (Million)	62.9	64.0	64.9	66.9	67.8
Discount rate	8.25%	8.25%	8.25%	8.25%	8.25%
Non-Investment gain/(loss) (Million)	(31.1)	(67.3)	(37.6)	(27.1)	(15.7)
Funding Policy contribution (Million)	107.1	112.3	130.4	134.2	135.7

* Retired members and beneficiaries

Commentary on Plan Maturity Measures

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

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

The ratio of cashflow to actuarial value of assets

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

The ratio of actuarial value of assets to participant payroll

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

Glossary of Terms

Actuarial Accrued Liability	Total accumulated cost to fund pension benefits arising from service in all prior years.
Actuarial Cost Method	Technique used to assign or allocate, in a systematic and consistent manner, the expected cost of a pension plan for a group of plan members to the years of service that give rise to that cost.
Actuarial Present Value of Future Benefits	Amount which, together with future interest, is expected to be sufficient to pay all future benefits.
Actuarial Valuation	Study of probable amounts of future pension benefits and the contributions needed 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.