

**DALHOUSIE UNIVERSITY
STAFF PENSION PLAN**

**REPORT ON THE ACTUARIAL VALUATION
AS AT JANUARY 31, 2023**

(REGISTRATION No. C242297)

OCTOBER 2023

PREPARED BY:

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SUMMARY OF RESULTS

All Figures in (\$000's)	
Going Concern Financial Position	January 31, 2023
Going concern value of assets	\$1,744,736
Going concern actuarial liabilities	(1,611,760)
Provision for adverse deviations ("PfAD")	(109,575)
Going concern excess / (unfunded actuarial liabilities)	\$23,401
Required PfAD	6.8%

Solvency Financial Position	January 31, 2023
Solvency assets	\$1,743,536
Solvency liabilities x 85% for measuring solvency deficiency	(1,400,563)
Solvency excess / (deficiency) excluding present value of special payments	\$342,973
Solvency concerns ratio	105.9%

Wind-up Financial Position	January 31, 2023
Wind-up assets	\$1,743,536
Total wind-up liabilities	(1,647,721)
Wind-up surplus / (deficiency)	\$95,815
Transfer ratio	105.9%

January 31, 2023		
Funding Requirements (annualized)	% of Payroll	\$
Estimated pensionable earnings		323,630
Total annual current service cost	15.99%	51,737
Employee regular contributions	6.07%	19,651
Employee supplementary contributions	2.00%	6,473
Employer matching regular contributions	6.07%	19,651
Balance of cost = employer "overmatching contribution"	1.85%	5,962
Employer contributions as a percentage of employee contributions	98.04%	
Total employer contributions in year following valuation		\$25,613

SECTION I INTRODUCTION AND PURPOSE OF VALUATION

At the request of Dalhousie University, we have completed an actuarial valuation of the *Dalhousie University Staff Pension Plan* (the “Plan”) as of January 31, 2023. The last actuarial valuation was performed as at January 31, 2020.

The purposes of this actuarial valuation are as follows:

- to determine the financial position of the Plan on going concern, solvency, and hypothetical wind-up bases;
- to establish the minimum and maximum contributions to the Plan until the next valuation; and
- to meet the statutory filing requirements under the Nova Scotia *Pension Benefits Act* (the “PBA”) and the *Income Tax Act* (Canada).

In this report, we have first provided the valuation results, along with an actuarial opinion with recommended funding levels for use until the next valuation. The data, actuarial assumptions and methodology used in valuing both the assets and the actuarial liabilities are provided by way of appendices for ease of reference.

The intended users of this report are Dalhousie University, the Nova Scotia Superintendent of Pensions and the Canada Revenue Agency. This report is not intended or necessarily suitable for purposes other than those listed above. Any party reviewing this report for other purposes should have their own actuary or other qualified professional assist in their review to ensure that the party understands the assumptions, results and uncertainties inherent in our estimates.

The next valuation of the Plan must be completed as at a date no later than January 31, 2026.

Terms of Engagement

For the purposes of this actuarial valuation report, the significant terms of engagement with Dalhousie University are:

- For the going concern, hypothetical wind-up and solvency valuations we have been directed to use the market value of assets adjusting for amounts in transit and amounts payable.
- In accordance with the PBA, an explicit Provision for Adverse Deviations (PfAD) has been added to the going concern liabilities. No margin for adverse deviations has been included in the going concern discount rate assumption.
- Plausible adverse scenarios are being applied to the going concern valuation.

The terms of our engagement are in accordance with applicable pension regulations and accepted actuarial practice in Canada.

Reliance

We have relied on the asset information in the financial statements provided by Dalhousie University. We have also relied on the Plan sponsor to provide all relevant data and to confirm the pertinent Plan terms.

SECTION II PLAN CHANGES AND SUBSEQUENT EVENTS

This pension plan is a “best average salary” defined benefit plan. This means that each Member’s retirement pension is calculated as a specified percentage (2% in this case) of his or her average salary during the best three years of membership in the Plan.

The previous valuation was prepared as at January 30, 2020. There have been no amendments or changes to the Plan between the last actuarial valuation and this valuation effective January 31, 2023.

A detailed description of the current provisions of the Plan is contained in Appendix E, at the end of this report.

The Actuarial Standards Board (ASB) published amendments to the CIA Standards of Practice (Section 3500: practice-specific standards for pension commuted values) on January 24, 2020, with an effective date of December 1, 2020. The effect of this new Standard of Practice has been incorporated into this valuation.

Additionally, the Actuarial Standards Board (ASB) published two amendments to the Standards of Practice. Revisions to Section 3500 of the Practice-Specific Standards for Pension Plans – Pension Commuted Values were effective February 1, 2022, and changes to the complete Practice-Specific Standards for Pension Plans (Part 3000) were effective December 1, 2022. The effects, if any, of these revised Standards of Practice have been incorporated into this valuation and were found to have no significant impact on the actuarial liabilities.

Actuarial Assumptions

There have been a number of changes to the going concern assumptions since the last valuation. We have increased the pre-retirement discount rate assumption to 6.60% from 6.30% used at the previous valuation to reflect the current expectation of the long-term rate of return. In respect of the post-retirement period, we have maintained the assumption used in the previous valuation for PTF liabilities and as specified in the Plan Rules, i.e., 4.55% per annum. This post-retirement interest rate incorporates some conservatism in that it includes (in accordance with plan rule 9(b)) a “holdback as a provision against life expectancy variations and other contingencies”. For RTF liabilities, the post-retirement interest rate is unchanged from the 5.05% per annum used for the prior valuation.

For RTF liabilities, size adjustment factors of 0.900 for males and 0.973 for females have been applied to the mortality table. These adjustment factors were updated from the those used in the last valuation (i.e., 0.876 for males and 0.970 for females).

The PfAD has decreased from 7.7% used in the prior valuation to 6.8% for the January 31, 2023 valuation following a change in the asset allocation of the Plan since the previous valuation. See Appendix B for the development of the PfAD.

There has also been a change to the salary scale assumption. The prior valuation used a flat 2.75% per annum assumption plus merit/promotion table. The current valuation is maintaining the 2.75% per annum assumption for the long-term but applying an additional 1.00% per annum for the first two years following the valuation to account for the current inflationary environment and recent salary negotiations. Therefore, the January 31, 2023 salary scale assumption is 3.75% per annum for two years and 2.75% per annum thereafter, plus merit/promotion.

We have updated the retirement age assumption based on a recent experience study completed in February 2023. The most significant change in the retirement age assumption was a decrease in the assumed percentage of members retiring at age 65 from 60% used in the prior valuation, to 35% for the January 31, 2023 valuation. See Appendix B for a complete description of the rates of retirement used in the current valuation.

We have also introduced a commuted value interest rate assumption of 4.5% per annum to be applied to those members assumed to elect a lump sum on termination. In addition, we have decreased the lump sum take-up on retirement from 40% used in the prior valuation to 15% for the January 31, 2023 valuation.

Finally, we have increased the interest credited on employee contribution assumption from 2.50% per annum to 3.00% per annum to reflect current economic expectations.

The impact of these assumption changes on the going concern liabilities can be found in Section III.

All other assumptions used in the going concern valuation are the same as those used in the previous valuation.

The solvency assumptions have been updated to reflect market conditions as at the valuation date in accordance with the Canadian Institute of Actuaries' (CIA's) Standards of Practice and the CIA's Educational Note: Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates on or after December 31, 2022, and No Later Than June 29, 2024.

The actuarial assumptions used in the valuation are provided in Appendix B.

Subsequent Events

The valuation reflects the financial position of the Plan on the valuation date and does not reflect any experience (investment, demographic, etc.) after that date.

We are not aware of events that occurred between the valuation date and the date this report was completed that would have a material impact on the results of this valuation.

SECTION III FINANCIAL POSITION OF THE PLAN

A. Going Concern Basis: Financial Position as at January 31, 2023

The tables below set out the going concern valuation balance sheet as of January 31, 2023 for the Pension Trust Fund (PTF), the Retirees Trust Fund (RTF), and the Plan as a whole, respectively. The results as at January 31, 2020 are also shown for comparative purposes.

PENSION TRUST FUND - GOING CONCERN ACTUARIAL BALANCE SHEET
(ALL FIGURES IN \$000'S)

	January 31, 2020	January 31, 2023
Going concern assets		
Market value of assets	\$769,240	\$861,792
Financial statement (payables) / receivables	(16,585)	(21,253)
Present value of special payments*	893	0
Total going concern assets	\$753,548	\$840,539
Going concern actuarial liabilities		
Active members	\$694,084	\$754,544
Additional voluntary contributions (AVCs)	332	358
Deferred pensioners and pending transfers	60,056	53,132
Termination solvency holdbacks	377	131
Total going concern actuarial liabilities	\$754,849	\$808,165
PfAD = 7.7% 6.8%% of actuarial liabilities (excluding AVCs)	58,098	54,931
Total going concern liabilities including PfAD	\$812,947	\$863,096
Going concern excess / (unfunded liability)	(\$59,399)	(\$22,557)

* Equal to the present value of one year of special payments from the March 31, 2019 actuarial valuation (i.e., the present value of an annual payment of \$918,000 to be made in the year ending January 31, 2021). No special payments are required in the year ending January 31, 2024.

RETIREES TRUST FUND - GOING CONCERN ACTUARIAL BALANCE SHEET
(ALL FIGURES IN \$000'S)

	January 31, 2020	January 31, 2023
Going concern assets		
Market value of assets	\$718,785	\$887,724
Financial statement (payables) / receivables	14,090	16,473
Total going concern assets	<u>\$732,875</u>	<u>\$904,197</u>
Going concern actuarial liabilities		
Pensioners and beneficiaries	\$653,489	\$784,364
Deferred members	17,417	19,231
Total going concern actuarial liabilities	<u>\$670,906</u>	<u>\$803,595</u>
PfAD = 7.7% 6.8% of actuarial liabilities	51,660	54,644
Total going concern liabilities including PfAD	<u>\$722,566</u>	<u>\$858,239</u>
Going concern excess / (unfunded liability)	\$10,309	\$45,958

TOTAL PLAN - GOING CONCERN ACTUARIAL BALANCE SHEET
(ALL FIGURES IN \$000'S)

	January 31, 2020	January 31, 2023
Going concern assets		
Market value of PTF assets*	\$752,655	\$840,539
Market value of RTF assets*	732,875	904,197
Present value of special payments	893	0
Total going concern assets	<u>\$1,486,423</u>	<u>\$1,744,736</u>
Going concern actuarial liabilities		
PTF actuarial liabilities	\$754,849	\$808,165
RTF actuarial liabilities	670,906	803,595
Total going concern actuarial liabilities	<u>\$1,425,755</u>	<u>\$1,611,760</u>
PfAD = 7.7% 6.8% of actuarial liabilities (excluding AVCs)	109,758	109,575
Total going concern liabilities including PfAD	<u>\$1,535,513</u>	<u>\$1,721,335</u>
Going concern excess / (unfunded liability)	(\$49,090)	\$23,401

* Net of (Payables)/Receivables

As shown above, the January 31, 2023 actuarial valuation has revealed a going concern excess in the amount of \$23,401,000. This compares to a going concern unfunded actuarial liability at the previous valuation of \$49,090,000.

Sensitivity Analysis

Below we show the impact on the going concern actuarial liability as at January 31, 2023 of a one percentage point drop in the discount rate assumption. All other assumptions were kept unchanged.

	Impact of 1% Drop
Total Going Concern Actuarial Liability (excluding PfAD)	\$1,835,739,000

The change would have the impact of increasing the going concern liabilities by \$223,979,000, or 13.9%.

Reconciliation of Going Concern Financial Position

The reconciliation provides an independent cross-check of the calculations performed, and also determines the chief reasons leading to the changes in the going concern financial position that have occurred since the previous valuation date.

Although a complete analysis down to the final dollar can be made, such an analysis requires the processing of a considerable amount of detailed data relating to the Plan, the expense of which would not normally be justified unless there were special circumstances. However, it is possible to make an approximate analysis along broader lines and under normal circumstances, this type of analysis will produce meaningful results.

The table below summarizes the results of our reconciliation of change in financial position over the period under consideration.

**ANALYSIS OF SOURCES OF GAIN AND LOSS BETWEEN JANUARY 31, 2020 AND JANUARY 31, 2023
(GOING CONCERN VALUATION)**

	PTF	RTF	Total
Going concern excess / (unfunded liability) at January 31, 2020	(59,399)	10,309	(49,090)
Interest on market value surplus / (deficit)	(261)	9,870	9,609
Investment income greater / (less) than expected	21,617	38,765	60,382
Special payments plus interest	6,138	0	6,138
Salary increases (greater) / less than expected	(15,694)	0	(15,694)
Change in maximum pension greater than expected	(6,496)	0	(6,496)
Retirement, termination, active death experience	4,808	0	4,808
Change in prescribed interest rates for pending terminations	11,543	0	11,543
Cost of pension indexing	0	(25,959)	(25,959)
PTF-to-RTF transfer greater than RTF best estimate liability	0	7,700	7,700
Pensioner mortality experience	0	4,878	4,878
Net impact of assumption changes	14,679	2,228	16,907
Change in Provision for Adverse Deviation	3,167	(2,984)	183
Miscellaneous experience gains / (losses) ¹	(2,659)	1,151	(1,508)
Going concern excess / (unfunded liability) at January 31, 2023	(22,557)	45,958	23,401

¹ Miscellaneous experience includes all items not specifically traced, and imprecision imposed by valuation and measurement methodologies in some of the items that are traced. Included are experience gains and losses associated with data refinements, and the interplay among assumptions in dealing with actual versus expected results.

B. Solvency Basis: Financial Position as at January 31, 2023

The tables below set out the solvency valuation balance sheet as of January 31, 2023 for the Pension Trust Fund (PTF), the Retirees Trust Fund (RTF), and the Plan as a whole, respectively. The results as at January 31, 2020 are also shown for comparative purposes.

PENSION TRUST FUND – SOLVENCY BALANCE SHEET (ALL FIGURES IN \$000'S)

	January 31, 2020	January 31, 2023
Solvency assets		
Market value of assets	\$737,213	\$861,792
Financial statement (payables) / receivables	(16,585)	(21,253)
Estimated wind-up expenses	(1,200)	(1,200)
Total solvency assets	\$751,455	\$839,339
Solvency liabilities		
Active members	\$978,138	\$774,304
Additional voluntary contributions	332	358
Deferred Pensioners and Pending transfers	60,056	53,132
Termination solvency holdbacks	377	131
Total solvency liabilities	\$1,038,903	\$827,925
85% of solvency liabilities for purposes of measuring solvency deficiency	\$883,068	\$703,736
Solvency excess / (deficiency) excluding present value of special payments	(\$131,613)	\$135,603
Present value of 5 years' worth of unfunded liability special payments (i.e., the solvency asset adjustment)	26,730	n/a
Solvency excess / (deficiency)	(\$104,883)	\$135,603

RETIREES TRUST FUND – SOLVENCY BALANCE SHEET
(ALL FIGURES IN \$000'S)

	January 31, 2020	January 31, 2023
Solvency assets		
Market value of assets	\$718,785	\$887,724
Financial statement (payables) / receivables	14,090	16,473
Total solvency assets	<u>\$732,875</u>	<u>\$904,197</u>
Solvency liabilities		
Pensioners and beneficiaries	\$801,719	\$800,421
Deferred members	18,760	19,375
Total solvency liabilities	<u>\$820,479</u>	<u>\$819,796</u>
85% of solvency liabilities for purposes of measuring solvency deficiency	<u>\$697,407</u>	<u>\$696,827</u>
Solvency excess / (deficiency)	\$35,468	\$207,370

TOTAL PLAN – SOLVENCY BALANCE SHEET
(ALL FIGURES IN \$000'S)

	January 31, 2020	January 31, 2023
Solvency assets		
Market value of PTF assets ¹	\$752,655	\$840,539
Estimated wind-up expenses	(1,200)	(1,200)
Market value of RTF assets ¹	732,875	904,197
Total solvency assets	<u>\$1,484,330</u>	<u>\$1,743,536</u>
Solvency liabilities		
PTF solvency liabilities	\$1,038,903	\$827,925
RTF solvency liabilities	820,479	819,796
Total solvency liabilities	<u>\$1,859,382</u>	<u>\$1,647,721</u>
85% of solvency liabilities for purposes of measuring solvency deficiency	\$1,580,475	\$1,400,563
Solvency excess / (deficiency) excluding present value of special payments	(\$96,145)	\$342,973
Present value of 5 years' worth of unfunded liability special payments (i.e., the solvency asset adjustment)	26,730	n/a
Solvency excess / (deficiency)	(\$69,415)	\$342,973

¹ Net of (payables) / receivables

As shown above, the solvency valuation has revealed a solvency excess of \$342,973,000 as at January 31, 2023.

Sensitivity Analysis

Below we show the impact on the solvency liability as at January 31, 2023 of a one percentage point drop in the discount rate assumption. All other assumptions were kept unchanged.

SOLVENCY SENSITIVITY (FIGURES IN \$000'S)

	Impact of 1% Drop
Total Solvency Actuarial Liability	\$1,850,252,000

A 1% decline in the solvency discount rate would increase the solvency liability by \$202,531,000 or 12.3%.

Incremental Cost

The incremental cost is the present value, at the valuation date, of the expected aggregate change in the hypothetical wind-up or solvency liability between the valuation date and the next valuation date. It also reflects expected benefit payments between the valuation date and the next calculation date.

In our report, we have determined the incremental cost on a solvency basis. The incremental cost was determined as the sum of (a) and (b) minus (c):

- (a) the projected solvency liability at the next valuation date for those members at the current valuation date, allowing for expected decrements, change in membership status and service accrual between the current valuation date and the next valuation date. No adjustment was made for new entrants between the two valuation dates. The resulting projected solvency liability was then discounted to the current valuation date;
- (b) the present value of the benefit payments expected to be paid between current valuation date and the next valuation date, discounted to the current valuation date; and
- (c) the solvency liability as at the current valuation date.

For purposes of calculating the solvency incremental cost, the expected decrements, as well as the expected benefit payments between the current valuation date and the next valuation date, were determined using the going concern demographic assumptions. The projected solvency liability at the next valuation date was determined using the same methods and assumptions as disclosed in Appendix B of this report. In particular, we have assumed that the discount rates will remain the same throughout the projection period and the Standards of Practice for determining Pension Commuted Values in effect at the valuation date will remain unchanged, as will the current educational guidance on the estimation of annuity purchase costs.

The estimated incremental cost from January 31, 2023 to January 31, 2026 is \$198,396,000. The estimated incremental cost does not impact the funding requirements of the Plan under the Nova Scotia *Pension Benefits Act* and is for information purposes only.

C. Transfer Ratio as at January 31, 2023

The Regulations under the PBA require the determination of a “transfer ratio”. This transfer ratio is used to determine whether transfers of commuted values to terminating members can be made in full, immediately. The transfer ratio is the ratio of:

- (i) the solvency assets (at market value), minus the lesser of the previous year credit balance and the sum of the minimum employer contributions required under the Regulations until the next valuation date (\$1,744,736,000 – \$0), to
- (ii) the sum of the solvency liabilities and the liabilities for benefits that were excluded in calculating the solvency liabilities (note that there were no such benefits excluded for the solvency valuation).

As at January 31, 2023 the transfer ratio was 105.9% (i.e., \$1,744,736,000 divided by \$1,647,721,000). Therefore, transfer of commuted values to terminating members can be made in full.

Next Valuation Date

The ratio of solvency assets to solvency liabilities is 105.9% at January 31, 2023. Because this ratio is greater than 85%, the Plan does not have “solvency concerns” as defined by the Regulations under the PBA. The next full actuarial valuation of the Plan must be at a date no later than January 31, 2026 (i.e., within 3 years following the valuation).

D. Hypothetical Wind-up Basis: Financial Position as at January 31, 2023

The financial position of the Plan on a wind-up basis as of January 31, 2023 is as follows:

TOTAL PLAN – WIND-UP BALANCE SHEET (ALL FIGURES IN \$000'S)

	January 31, 2020	January 31, 2023
Wind-up assets		
Market value of PTF assets*	\$752,655	\$840,539
Estimated wind-up expenses	(1,200)	(1,200)
Market value of RTF assets*	732,875	904,197
Total wind-up assets	\$1,484,330	\$1,743,536
Wind-up liabilities		
PTF wind-up liabilities	\$1,038,903	\$827,925
RTF wind-up liabilities	820,479	819,796
Total wind-up liabilities	\$1,859,382	\$1,647,721
Wind-up excess / (deficiency)	(\$375,052)	\$95,815

* Net of (payables) / receivables

As shown above, on a wind-up basis there is an excess of \$95,815,000 in the Plan after providing for settlement of all accrued benefit entitlements as at January 31, 2023.

SECTION IV FUNDING REQUIREMENTS

A. Current Service Cost

The Plan's current service cost (also referred to as the "normal cost") is the value of the benefits accruing to members in the year following the valuation, determined on a going concern basis.

The table below summarizes the results of the Plan's current service cost for the 12-month period following January 31, 2023.

CURRENT SERVICE COST

	% of Payroll	(\$000's)
Estimated pensionable earnings		323,630
Total annual current service cost	15.99%	51,737
Employee regular contributions	6.07%	19,651
Employee supplementary contributions	2.00%	6,473
Employer matching regular contributions	6.07%	19,651
Balance of cost = employer "overmatching contribution"	1.85%	5,962
Employer contributions as a percentage of employee contributions	98.04%	

The cost of benefits accruing in respect of the year following the valuation date is \$51,737,000. This amounts to 15.99% of active contributory payroll. The employee regular and employer matching contributions in the year amount to \$19,651,000 (i.e., 6.07% of contributory payroll) each. Employees are also required to contribute supplementary contributions in the amount of \$6,473,000 (i.e., 2.00% of contributory payroll). The balance remaining (i.e., \$5,962,000 or 1.85% of payroll) represents employer "overmatching contributions". Total employer contributions (i.e., 19,651,000 + 5,962,000 = 25,613,000, or 6.07% + 1.85% = 7.92% of payroll) amount to 98.04% of employee contributions.

The total current service cost has decreased from 16.71% of payroll to 15.99% of payroll, as a result of the net impact of demographic changes and assumption changes. The following sets out an approximate reconciliation of the change in the total current service cost as a percentage of payroll:

CURRENT SERVICE COST RECONCILIATION

	% of Payroll
Total current service cost as at the previous valuation	16.71%
Demographic changes	(0.33%)
Assumption changes	(0.39%)
Total current service cost as at the current valuation	15.99%

Sensitivity Analysis

Below we show the impact on the 2023/24 current service cost as at January 31, 2023 of a one percentage point drop in the discount rate assumption. All other assumptions were kept unchanged.

	Impact of 1% Drop
Total Current Service Cost	\$63,986,000

The change would have the impact of increasing the current service cost by \$12,249,000 or 23.7% as at January 31, 2023. With employee regular and supplementary contributions remaining at a total 8.07% of pay, the employer contribution requirement (i.e., matching and overmatching) would rise to 11.70% of pay (i.e., a total cost of 19.77% of pay).

B. Special Payments

The valuation as at January 31, 2023 revealed both a going concern and solvency excess. Therefore, in accordance with the Regulations under the PBA, no special payments are required.

C. Timing of Contributions

Employer contributions for current service must be paid in monthly installments, no later than 30 days after the month for which contributions are payable.

SECTION V SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The following represents our primary conclusions as a result of our actuarial valuation of the Dalhousie University Staff Pension Plan as at January 31, 2023:

1. As at the valuation date, there exists a going concern excess of \$23,401,000.
2. As at the valuation date, the Plan has a solvency excess of \$342,973,000.
3. The cost of benefits accruing in respect of the year following the valuation date is \$51,737,000, which amounts to 15.99% of active contributory payroll. Employee regular contributions (6.07% of payroll) and supplementary contributions (2.00% of payroll) are expected to generate contributions of 8.07% of payroll. In addition to the University's matching regular contribution (6.07% of payroll), employer overmatching contributions of 1.85% of payroll are required.
4. The adequacy and appropriateness of this funding level should be reviewed at the next actuarial valuation of this Plan, which should take place as of January 31, 2026 at the latest.
5. For purposes of paragraph 147.2(2)(d) of the *Income Tax Act* (Canada), the excess surplus based on the going concern valuation was nil as of January 31, 2023.
6. If the Plan were to be wound up on the valuation date, the value of Plan assets would be greater than the Plan's wind-up liabilities by an amount of \$95,815,000.
7. The transfer ratio of the Plan is 105.9%.
8. The previous year credit balance as at January 31, 2023 is \$0.
9. We are not aware of any events, other than those outlined in Section II, that occurred between the valuation date and the date this report was completed that would have a material impact on the results of this valuation.

We shall be pleased to provide any additional details or explanations you may require regarding any of the matters dealt with in this report.

SECTION VI ACTUARIAL OPINION

We hereby certify that in our opinion,

- (i) the data on which the valuation is based are sufficient and reliable for the purposes of the valuation as described in Section I;
- (ii) the assumptions described herein are appropriate for the purposes of the valuation; and
- (iii) the methods employed in the valuation are appropriate for the purposes of the valuation.

This report has been prepared, and our opinions given, in accordance with accepted actuarial practice in Canada. It has also been prepared in accordance with the funding and solvency standards set by the Nova Scotia *Pension Benefits Act*.

Nonetheless, emerging experience, differing from the assumptions, will result in gains or losses which will be revealed in future valuations.

Respectfully submitted,



Jeff Turnbull, FSA, FCIA

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APPENDIX A PLAN ASSETS

The Plan's assets are currently managed in such a way as to allow for a mix of equity and fixed income investments. Several independent fund managers, who deal at arm's length with the University, manage the assets, which are segregated into two trusts: the Pension Trust Fund (PTF) invests the accumulated contributions in respect of active Members and supports benefits payable during the period of active membership, and the Retirees' Trust Fund (RTF) supports pension payments after retirement. The two trusts, together and in aggregate, form the portfolio of assets supporting the Plan.

Reconciliation of Plan Assets

Financial statements of the Plan's holdings, in aggregate by asset class, were provided to us by the University for this valuation. The tables below contain summaries of the revenue accounts for the PTF and the RTF, respectively, based on the information supplied in respect of the period covered by this valuation (i.e., February 1, 2020 through January 31, 2023).

RECONCILIATION OF ASSETS IN THE PENSION TRUST FUND (ALL FIGURES IN \$000'S)

For the 12 months ending	January 31, 2021	January 31, 2022	January 31, 2023
Market value at beginning of period	\$769,240	\$791,056	\$886,876
Employee regular contributions	15,851	17,042	17,654
Employee supplementary	5,129	5,453	5,672
Employee other contributions*	88	966	1,930
Employer contributions	23,773	26,773	28,563
Investment income	52,317	122,001	7,387
Plan expenses	(4,011)	(4,480)	(4,640)
Net change in payables	(540)	3,140	(508)
Transfer to RTF	(65,084)	(62,489)	(70,892)
Benefit withdrawals	(5,707)	(12,586)	(10,250)
Market value at end of period	\$791,056	\$886,876	\$861,792

* Employee other contributions include additional voluntary contributions, past service purchases, and transfers from other plans.

RECONCILIATION OF ASSETS IN THE RETIREES' TRUST FUND
(ALL FIGURES IN \$000'S)

For the 12 months ending	January 31, 2021	January 31, 2022	January 31, 2023
Market value at beginning of period	\$718,785	\$770,538	\$869,956
Transfers in from PTF	65,084	62,489	70,892
Investment income	47,321	101,875	17,528
Plan expenses	(3,636)	(4,468)	(4,244)
Net change in payables	(96)	352	(188)
Pension payments	(56,920)	(60,830)	(66,220)
Market value at end of period	\$770,538	\$869,956	\$887,724

Performance of Plan Assets

The following table summarizes the net rate of return on the Plan's assets over the past 3 years.

PENSION FUND RATES OF RETURN
(NET OF EXPENSES)

12 Months Ending Jan. 31	Pension Trust Fund	Retirees Trust Fund	Total Plan (i.e., Combined PTF and RTF)
2021	6.4%	6.0%	6.2%
2022	15.1%	12.6%	13.9%
2023	0.3%	1.5%	0.9%
3 Year Average	7.1%	6.6%	6.9%

APPENDIX B ACTUARIAL METHODS AND ASSUMPTIONS

A. Valuation of Assets

For the valuation as at January 31, 2023, the market value of assets, plus any net payables / receivables was used as the actuarial value of assets. This is the same asset valuation method as was used in the previous valuation.

The table below summarizes the calculation of the going concern asset value as at January 31, 2023, rounded to the nearest \$1,000.

ACTUARIAL VALUE OF ASSETS (ALL FIGURES IN \$000'S)

	January 31, 2023
Market value of assets	\$1,749,516
Benefits Payable	(4,729)
Expenses Payable	(51)
Actuarial value of assets	\$1,744,736

B. Going Concern Valuation

For the purposes of a going concern valuation, we select actuarial assumptions with a long-term focus. That is, we anticipate that the pension plan will continue indefinitely into the future. Actuarial assumptions are selected giving consideration to historical trends, future expectations and pension plan specific experience, where possible. The assumptions chosen are expected to produce a stable pattern of funding and meet the Plan sponsor's desire to minimize potential for significant shortfalls or deficits in the future.

The purpose of this part of our analysis is to determine an appropriate method and series of assumptions to make proper allowance for the Plan's future liabilities by way of payment of pensions and other benefits. In making these calculations, assumptions must be made as to:

- the probability that a particular payment will be made at a certain time (for example, depending upon whether or not the individual concerned survives to that date); and
- the expected amount of each such payment.

In order to do this, we make a series of assumptions in connection with the many factors which will have a bearing upon the future financial operation of the Plan. These include the following:

- future rates of mortality (and the corresponding life expectancies of the Plan members and their spouses);
- future rates of salary increase for members of the Plan;
- the rate of increase in the maximum pension (as mandated by the *Income Tax Act*) that the Plan is allowed to pay;
- future rates of employee turnover (withdrawal from the Plan);
- the age at which retirement occurs; and
- the propensity for members who are eligible for an immediate pension, but who may choose between the receipt of such pension and a lump-sum termination benefit, to choose the latter.

Finally, we consider the rate of interest that will be earned on the assets of the pension funds in future years.

As part of our process of analysis, all of these factors have received consideration. Where applicable, we have taken into account the actual experience of this pension plan. However, it should be noted that, from a statistical point of view, actual experience data developed from a single pension plan has limited validity unless the number of plan members is very large. Therefore, it becomes necessary to take into account statistics developed from many other larger pension plans.

The assumptions we have adopted, as well as a brief commentary where appropriate, are described below.

Going Concern Discount Rate Assumption

We have increased the pre-retirement discount rate assumption from 6.30% (used in the January 31, 2020 actuarial valuation) to 6.60% per annum for the January 31, 2023 actuarial valuation. The economic assumptions (i.e., those related to interest rates and inflation) for this valuation are based on reasonable expectations with respect to the relationships among key economic variables over the long term, as well as the expected impact of those economic variables on the investment performance of the pension fund given the fund's investment policy.

We have taken a "best estimate" approach to the determination of the discount rate, based on the expected future investment return on the assets of the pension plan. In particular, our approach consists of:

- determining the best estimate of long-term, expected future investment returns for the various asset classes in which the Plan invests;
- combining these best estimate, long-term expected future investment returns to reflect the Plan's investment policy, thereby creating an "expected" fund return that is a weighted average of the asset class returns;
- including an allowance for additional return due to active versus passive management, and the impact of rebalancing and diversification, which we have considered appropriate in the circumstance as a result of stochastic modelling specific to the Plan's target asset mix; and
- making appropriate provision for expenses.

The result of our analysis is depicted in the following table:

DISCOUNT RATE

	Discount Rate
Unadjusted “best estimate” return	6.40%
Less fees	(0.60%)
Plus value added return from active management	0.40%
Plus “rebalancing and diversification effect”	0.40%
Best estimate discount rate	6.60%

The unadjusted best estimate asset return assumption was determined using the Plan’s target investment mix and the expected return for each asset class. Expected returns are developed each year through a rigorous stochastic modelling process. This model is designed to simulate all key economic and market variables over thousands of different paths that are path-wise consistent. Key variables include bond yields (nominal and real), inflation, equity market returns, and alternative asset class returns. Adjustments for specific approaches to investment implementation are applied to asset class expected returns where appropriate. The details are depicted in the following table:

Asset Class	Target Weight	Expected Return
Universe bonds	7.00%	3.70%
Corporate bonds	5.50%	4.20%
Core Plus bonds	12.50%	4.40%
Private debt	10.00%	6.90%
Canadian equity	8.75%	6.80%
Global equity	18.75%	7.20%
Emerging market equity	5.00%	8.40%
Real estate	10.00%	5.80%
Infrastructure	10.00%	6.50%
Private equity	12.50%	8.80%
Total portfolio	100.00%	6.40%

In respect of the post-retirement period, we have maintained the assumption used in the last valuation for PTF liabilities and as specified in the Plan Rules, i.e., 4.55% per annum. This post-retirement interest rate incorporates some conservatism in that it includes (in accordance with plan rule 9(b)) a “holdback as a provision against life expectancy variations and other contingencies”. For RTF liabilities, we have maintained the post-retirement interest rate of 5.05% per annum for the January 31, 2023 valuation.

Salary Scale

Pensions from the Plan are based on the average of an employee's best 3 years of earnings. Since wage levels typically increase over time, an employee's best 3 years of earnings usually occur towards the end of their career. In conducting our valuation, it is prudent to project each employee's accrued pension to the time of their retirement by projecting their earnings level, and this is accomplished through the use of a salary scale assumption.

In respect of the salary scale assumption, the assumption used in the January 31, 2020 actuarial valuation was a flat 2.75% per annum assumption combined with the following merit/promotion table:

- 1.75% for ages below 45;
- 1.00% for ages between 45 and 55; and
- 0.00% for ages after 55.

This assumption has been adjusted with the January 31, 2023 actuarial valuation to reflect the current inflationary environment and recent salary negotiations. The revised assumption uses a salary scale assumption of 3.75% per annum for the two years following the valuation and then 2.75% per annum thereafter. The merit/promotion table remains the same as it was in the previous valuation.

Maximum Pension

Pensions are capped by regulation at \$3,506.67 per year of service for retirements occurring in 2023. It is expected that this maximum will be increased in accordance with an average wage index from 2023 onward. For purposes of the valuation, we have assumed that the maximum pension will increase after 2023 by 2.75% per annum (i.e., equal to the base salary scale rate). This is the same assumed rate of increase as in the January 31, 2020 valuation.

Going Concern Mortality Assumption

For the measurement of PTF liabilities, we have retained the mortality assumption used in the previous valuation, i.e., the 2014 Canadian Pensioners' Mortality (Public Sector) Table (CPM 2014 Public) projected generationally with improvement scale CPM-B. The CPM 2014 Public table represents the best available information to date on the mortality patterns of Canadians participating in, or retired from, defined benefit pension plans in the public sector, and as such was considered to offer the most appropriate estimate of mortality patterns for participants in this plan.

For the RTF liabilities, we have used the 2014 Canadian Pensioners' Mortality (Public Sector) Table (CPM 2014 Public) with 90.0% adjustment for males, and 97.3% adjustment for females projected generationally with improvement scale CPM-B. This is a change from the previous valuation (i.e., 87.6% for males and 97.0% for females) to reflect the demographics of the current retirees of the Plan. These size adjustments result in an increase in predicted life expectancy for RTF pensioners.

We expect to review the mortality assumption from time to time, both to reflect continued societal improvements in mortality, as well as the development of new actuarial tables and standards.

Retirement Age

There has been a change to the retirement age assumption. Rates of retirement have been updated based on an experience study completed in February 2023. Detail on the retirement age assumption is provided in the table below.

Age of Member	Probability of Retirement
55	3%
56	3%
57	3%
58	3%
59	6%
60	7%
61	7%
62	12%
63	12%
64	15%
65	35%
66	25%
67	25%
68	25%
69	25%
70	25%
71	*100%

* Note the 100% reflects the fact that, under the Income Tax Act, all Members, whether or not they retire from active employment, must commence their pension by no later than the end of the year in which they turn age 71

SOCC/CV Take-up Rate

Upon termination of employment, a Member is offered the choice between a lump sum transfer from the Plan and a deferred pension. The value of the lump sum transfer is the greater of (i) the Member's "Sum of Contributions Compounded", or "SOCC", which generally represents the Member's required contributions, times two, plus interest, and (ii) the commuted value ("CV") of the deferred pension.

For each Member of the Plan, we have projected the Member's SOCC/CV to the assumed points of early and normal retirement, and, at each point, compared the SOCC/CV to the amount that would be transferred from the Pension Trust Fund to the Retirees Trust Fund were the Member to retire at that point.

We have decreased the SOCC/CV Take-up Rate from 40% used in the previous valuation to 15% for the January 31, 2023 valuation to reflect recent experience. We assume that 15% of members (where their projected SOCC/CV is greater than the projected PTF-to-RTF-transfer) at all ages up to and including age 65 would take their SOCC/CV rather than receive an immediate pension.

Withdrawal Rates

The scale of “termination of membership” rates remains unchanged from rates used in the previous valuation. The following table details the rates used in the current valuation.

Service of Member	Termination Rates
1 year	12.0%
2 years	10.2%
3 years	8.7%
4 years	8.4%
5 years	8.4%
6-10 years	6.5%
11-15 years	2.7%
16-20 years	2.7%
21-25 years	0.8%
More than 25 years	0.0%

Termination benefits are projected to each service date, and the liability determined using a commuted value discount rate of 4.50% per annum. Projected liabilities take into consideration the minimum withdrawal benefit of twice contributions, plus interest.

Proportion Married and Spouse’s Age

We have continued to assume that seventy percent of active members have a spouse at the time of their retirement or death.

We have continued to assume that male spouses are 2 years older than their female counterparts.

Going Concern Actuarial Methods

The actuarial cost method used in conducting this valuation is the projected unit credit method. This is the same method as was used in the previous valuation.

In using this method, as a first step, a calculation is made of the liability in respect of all benefits that have accrued to members on account of service up to and including the valuation date. This represents the "accrued liability". It should be noted that this calculation takes into account projected future pay increases for each member up to and including expected retirement date.

As a completely separate process, the current year cost has been calculated (using the same actuarial assumptions). This represents the cost of providing the benefits that will accrue in respect of the 12-month period following the valuation date. This is compared with the amount of required employee contributions, supplementary contributions, and regular matching employer contributions over that period. The difference represents the additional minimum required employer contribution (referred to as the “overmatching contribution”) necessary in order for these benefits to be properly funded.

For an individual member, the funding pattern produced by the projected unit credit cost method is one that increases (both in dollar terms and as a percentage of salary) over time. However, for the group as a whole, if the average age remains constant (which can occur through the retirement of older members and the addition of new, younger members) and salary levels increase in accordance with the salary scale, the contribution rate recommended under this method will remain relatively constant. If the Plan's average age increases, on the other hand, the current year cost will also increase. Such increases would be revealed in future valuations.

Provision for Adverse Deviations (PfAD)

For actuarial valuations with an effective date on or after December 31, 2019, the Regulations under the PBA require a PfAD when determining the going concern financial position of the plan. The PfAD is derived from the target investment portfolio of the Plan and Section 12B of the Regulations under the PBA. There are two components when determining the PfAD:

- A) A flat 5%; plus
- B) A value determined under Section 12D of the Regulations, based on the Plan's combined target asset allocation for non-fixed income assets as determined under Section 12C of the Regulations.

As per Section 12B(2) of the Regulations, the value of "A" in the formula above is zero for a pension plan that is exempt from solvency funding. The following table details the calculation of the PfAD as at January 31, 2023:

DETERMINATION OF PFAD AS PER THE REGULATIONS UNDER THE NOVA SCOTIA PENSION BENEFITS ACT

Asset Class	Target Asset Allocation Per Plan's Statement of Investment Policies and Procedures	Per Regulation 12C, Percentage of Asset Class Deemed Fixed Income Assets	Adjustment for Portion of Asset Class Deemed Non-Fixed Income	"Product" Used to Determine Value of "C" under Regulation 12C
Formula	M	N	O	P= M x N x (100% - O)
Universe bonds	7.0%	100%		7.0%
Corporate bonds	5.5%	100%		5.5%
Core plus bonds	12.5%	100%	15% ¹	10.6%
Private debt	10.0%	50%		5.0%
CND equity	8.8%	0%		0.0%
Global equity	18.8%	0%		0.0%
EM equity	5.0%	0%		0.0%
Real estate	10.0%	50%	40% ²	3.0%
Infrastructure	10.0%	50%	40% ²	3.0%
Private Equity	12.5%	0%		0.0%
Total	100.0%			
Value of "C" under Regulation 12C				34%
100% - C = "Non-fixed Income Assets" under Regulation 12C(1)				66%
Determine Provision for Adverse Deviations (Regulation 12B)				
Per Regulation 12D(1), table amount for 60% non-fixed income assets				5.0%
Per Regulation 12D(1), table amount for 70% non-fixed income assets				8.0%
Per Regulation 12D(2), linear Interpolation = 0.4 X 5.00% + 0.6 X 8.00%				6.8%

¹ Adjustment to reflect the fact that within Core Plus strategies a portion of the investments can be allocated to fixed income instruments that would be deemed to be "non-fixed income" under the Regulations.

² Long term expectations for the Real Estate and Infrastructure asset classes are that approximately 40% of the indicated allocations will be achieved through the purchase of public equities listed on public stock exchanges. Because these allocations are subject to the potential increased volatility of public stock markets, this 40% is deemed to be fully non-fixed income (i.e., similar to other equities in the Plan's portfolio).

Therefore, the total PfAD for the Plan is equal to "A" + "B" = 0% + 6.8% = 6.8%.

The following table details the actuarial assumptions that have been used in the going concern valuation:

GOING CONCERN VALUATION ACTUARIAL ASSUMPTIONS

January 31, 2023	
Interest	
▪ Pre-retirement:	6.60% p.a.
▪ Post-retirement:	PTF: 4.55% p.a. RTF: 5.05% p.a.
Salary scale:	3.75% p.a. for 2 years; 2.75% p.a. thereafter; Plus merit/promotion scale of 1.75% p.a. for ages below 45, 1.00% p.a. for ages between 45 and 55, and 0.00% for ages after 55
Maximum pension:	\$3,506.67 in 2023, increasing at 2.75% p.a. thereafter
Mortality:	PTF: 2014 Canadian Pensioner Mortality tables (Public Sector) projected generationally with mortality improvement at Scale CPM-B RTF: 2014 Canadian Pensioner Mortality tables (Public Sector) projected generationally with mortality improvement at Scale CPM-B (with adjustment factors of 90.0% for males, 97.3% for females)
Retirement age:	In accordance with the retirement rates described previously in this section
Withdrawals:	In accordance with the termination rates described previously in this section Commutated value discount rate: 4.50% per annum
Percentage married:	70% of active members
Spouse's age:	Actives: Males spouses are assumed to be 2 years older than their female counterparts Pensioners: Actual spouse's age
Interest credited on employee contributions:	3.00% p.a.
SOCC/CV take-up assumption:	15% at all ages up to and including age 65
Funding method:	Projected Unit Credit

C. Solvency Valuation

The PBA prescribes a solvency valuation. A solvency valuation permits the regulator to assess the solvency of the Plan should it terminate or wind-up effective on the valuation date. That is, an assessment is made as to whether the assets of the pension fund would be sufficient if no further benefits were provided and all members were paid their entitlements.

For active members not eligible for immediate retirement (i.e., those under age 55), the interest rate used for calculating solvency liabilities was 4.30% p.a. for 10 years and 4.70% p.a. thereafter. These rates were determined in accordance with Section 3500 of the Canadian Institute of Actuaries (“CIA”) Standards of Practice – Pension Commuted Values with rates in effect for January 2023. The mortality assumption used was the CPM-2014 (Combined) mortality table projected with Scale CPM-B.

For retired lives and active members 55 or older, the solvency liabilities were calculated using an interest rate of 4.60% per annum and the Canadian Pensioner Mortality (CPM2014 Combined) tables projected generationally with mortality improvement at Scale CPM-B. These assumptions represent the estimated basis for settlement of the Plan’s obligations for retired lives by the purchase of insured annuities on the valuation date and were determined in accordance with the Canadian Institute of Actuaries’ (CIA’s) Standards of Practice and the CIA’s Educational Note: Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates on or after December 31, 2022, and No Later Than June 29, 2024.

Note that the solvency valuation does not make any assumptions about future pay increases or future termination of employment, since all members are assumed to terminate on the valuation date. The actuarial assumptions for the solvency valuation are described in the following table:

SOLVENCY VALUATION ACTUARIAL ASSUMPTIONS

January 31, 2023	
Interest:	For actives < 55, 4.30% p.a. for 10 years, 4.70% p.a. thereafter For pensioners and actives > 55, 4.60% p.a.
Mortality:	2014 Canadian Pensioner Mortality tables (Combined) projected generationally with mortality improvement at Scale CPM-B
Salary scale:	None
ITA maximum pension:	\$3,506.67 per year of service
Retirement age (Transfer value basis):	50% at age that maximizes the lump sum value, 50% at age that maximizes the pension amount
Retirement age (Annuity purchase basis):	Age that maximizes the value of the benefits
SOCC take-up assumption:	100% for Active Members less than Age 55; 0% for Active Members greater than Age 55
Withdrawals:	None
Percentage married:	70% of active members
Spouse’s age:	Actives: Males spouses are assumed to be 2 years older than their female counterparts Pensioners: Actual spouse’s age
Cost method:	Termination method

D. Hypothetical Wind-up Valuation

The only difference between solvency and wind-up assumptions for the Dalhousie Plan is that the wind-up valuation assumptions must account for indexation. However, at the time of this valuation there is no difference in wind-up and solvency assumptions because interest rates are at levels low enough that there is no expectation of excess interest indexing. Therefore, the wind-up valuation liability assumptions are the same as those used in the solvency valuation.

APPENDIX C PLAUSIBLE ADVERSE SCENARIOS

A plausible adverse scenario is considered to be one that will occur in the short term (immediately to one year) with a likelihood of occurring between 1 in 10 and 1 in 20 based on the opinion of the actuary. The purpose of the following scenarios is to illustrate the impact on the Plan's financial position of the following adverse but plausible assumptions relative to the best estimate assumptions selected for the Plan's going concern valuation. The purpose of disclosing these results is to demonstrate the sensitivity of the funded status and annual current service cost between January 31, 2023 and January 31, 2026 to certain key risk factors affecting the Plan. The results of the scenarios selected are shown in the table below, with a description of each scenario following.

	Going Concern Results at January 31, 2023 (\$000's)	Plausible Adverse Scenario Results at January 31, 2023		
		Interest rate risk* (\$000's)	Deterioration of Asset Values* (\$000's)	Longevity Risk (\$000's)
Going concern assets	1,744,736	1,779,521	1,524,899	1,744,736
Going concern liabilities	1,611,760	1,628,711	1,611,760	1,645,595
PfAD on going concern liabilities	109,575	110,730	109,575	111,878
Total going concern liabilities plus PfAD	1,721,335	1,739,441	1,721,335	1,757,473
Going concern excess / (unfunded liability)	23,401	40,080	(196,436)	(12,737)
Current service cost	51,737	53,274	51,737	52,614
Deficit funding requirement (starting Feb. 1, 2024)	nil	nil	28,265	1,833
Change in going concern liabilities plus PfAD		18,106	-	36,138
% change in going concern liabilities plus PfAD		1.05%	-	2.10%
Change in current service cost		1,537	-	877
% change in current service cost		2.97%	-	1.70%
Change in deficit funding requirement		0	28,265	1,833
Discount rate	6.60%	6.30%	6.60%	6.60%
PfAD	6.8%	6.8%	6.8%	6.8%
Life expectancy (in years) for a retiree age 65	25	25	25	26

* Scenario shown represents the median of the worst 10% of stochastic simulations.

Interest Rate Risk

This scenario illustrates the sensitivity of the funded status of the Plan and current service cost to an immediate change in the market interest rates underlying fixed income investments.

In order to assess the impact of a decrease in interest rates of a magnitude consistent with a 1 in 10 likelihood of occurring, we have used the same stochastic model that is used to determine the going concern discount rate (see Appendix B). The stochastic model is based on 5,000 simulations of projected financial variables, including long-term yields on fixed income investments and asset class returns. Our long-term best estimates for these variables, and the going concern discount rate are based on the median values of these 5,000 simulations.

To determine the sensitivity to interest rate risk, and the resulting impact on Plan assets and liabilities, we have:

- considered the hypothetical going concern discount rate over the 500 trials where fixed income yields are lowest at the one-year horizon, and
- determined the decrease in median long-term fixed income yields over the 500 trials where fixed income yields are the lowest at the one-year horizon.

Based on the above analysis, we have determined that the going concern discount rate would decrease by 30 basis points as of January 31, 2023, and long-term yields on fixed income investments would decrease by 78 basis points.

Based on the estimated duration of the Plan assets, liabilities and current service cost, we have then determined the estimated change to the Plan's funded status under the interest rate risk scenario.

Deterioration of Asset Values

This scenario illustrates the sensitivity of the funded status of the Plan to short-term shock which causes a reduction in the market value of assets, with no change to the liabilities of the Plan. This scenario is assumed not to impact the current expectation of the long-term rate of return, and consequently, the going concern discount rate.

In order to assess the impact of a decrease in asset values of a magnitude consistent with a 1 in 10 likelihood of occurring, we have used the same stochastic model that is used to determine the going concern discount rate (see Appendix B). The stochastic model is based on 5,000 simulations of projected financial returns, including long-term yields on fixed income investments and asset class returns.

To determine the sensitivity to a deterioration in asset values based on the Plan's target asset mix, we have reviewed the 500 trials where investment returns are lowest at the one-year horizon and determined that at the median scenario, the market value of assets would decrease by 12.6% as of January 31, 2023.

Longevity Risk

This scenario illustrates the sensitivity of the funded status of the Plan to pension plan members living longer than expected. The impact of this scenario was determined using a one-year age setback to the mortality table used for the going concern valuation as of January 31, 2023. This is a more conservative mortality assumption than currently employed.

APPENDIX D MEMBERSHIP DATA

The data in respect of active membership (including members on disability or leave of absence), and in respect of all pensioners and deferred pensioners are maintained on a computerized pension administration system called Ariel. The system is updated by Retirement Services, a unit of Dalhousie University's Human Resources Department. The information was extracted by Morneau Shepell (the Ariel vendor) and submitted to us in electronic format. A summary of the data is shown in this Appendix.

We subjected this data to a number of tests of reasonableness and consistency, including the following:

- a member's (and partner's as applicable) age is within a reasonable range;
- all dates remained unchanged from the data used in the previous actuarial valuation of the Plan;
- salaries increased at a reasonable rate;
- credited service increased by a reasonable amount;
- pensions in pay changed by a reasonable amount (e.g., by the amount of indexing applied for retired members, etc.);
- a member's gender did not change;
- the form of pension payment did not change (other than resulting from the death of a retired member);
- the pension amounts on the pensioner file was compared with the payments reported in the financial statements for the Plan; and
- we examined the additions to and deletions from each of the data files (i.e., the files for active employees, pensioners and terminated members entitled to a deferred vested pension) since the previous valuation to determine whether all Plan members were accounted for in this valuation, to check for duplicate records and to confirm pension amounts.

For some employee groups, the raw data did not reflect outstanding salary increases that were effective prior to the valuation date. In these cases, Dalhousie provided us with the retroactive salary increase amounts.

Where there was data missing, we made the following assumptions for pensioners:

- Forms of pension were assumed to be the same as in the previous valuation.
- Male spouses are assumed to be 2 years older than their female counterparts.

All of our tests had satisfactory results, or the data was corrected. However, the tests may not have captured all deficiencies in the data. We have also relied on the Plan administrator's certification on the quality of the data.

RECONCILIATION OF MEMBERSHIP

	Active	Terminated non-vested members	Deferred (via PTF)	Deferred (via RTF)	Pensioners and survivors	Total
Number as at January 31, 2020	3,150	315	545	113	1,440	5,563
New entrants	989	-	-	-	-	989
Returned to active	1	-	(1)	-	-	-
Retirements	(288)	-	(23)	(21)	332	-
Terminations						
▪ Deferred or pending (via PTF)	(196)	-	196	-	-	-
▪ Deferred (via RTF)	(18)	-	-	18	-	-
▪ Fully settled	(185)	(9)	(62)	(1)	-	(257)
Deaths paid out	(17)	-	-	-	(125)	(142)
New survivors	-	-	-	-	37	37
New limited member pensions	-	-	-	-	7	7
Consolidation of records	-	-	(1)	-	(1)	(2)
Number as at January 31, 2023	3,436	306	654	109	1,690	6,195

STATISTICAL PROFILE OF ACTIVE MEMBERS

	Number*	Average Age	Average Credited Service	Expected Salary, Year Following January 31, 2023	Average Accumulated Contributions**
Males	1,369	48.6	11.5	\$105,688	\$81,230
Females	2,004	46.9	9.9	\$89,646	\$55,774
Total	3,373	47.6	10.5	\$96,157	\$66,106

* These figures do not include 63 individuals who have reached 35 years pensionable service and are therefore no longer accruing benefits for future service.

** Includes past service contributions and transfers into the Plan

JANUARY 31, 2020 TABLES FOR COMPARISON

Total	3,085	48.3	11.4	\$87,375	\$75,044
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STATISTICAL PROFILE OF DEFERRED PENSIONERS (UNDER DEFERRAL VIA THE PTF*)

	Number	Average Age	Average Annual Lifetime Pension
Males	271	47.8	\$7,631
Females	383	47.5	\$6,938
Total	654	47.6	\$7,225

* Under "deferral via the PTF", the individual is entitled to a deferred pension, or the commuted value of the pension (determined in accordance with CIA standards).

JANUARY 31, 2020 TABLES FOR COMPARISON

Total	545	47.7	\$7,482
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STATISTICAL PROFILE OF DEFERRED PENSIONERS (UNDER DEFERRAL VIA THE RTF*)

	Number	Average Age	Average Deferred Account Balance
Males	13	62.1	\$490,406
Females	17	62.0	\$559,355
Total	30	62.1	\$529,477

* Under "deferral via the RTF", the individual is entitled to a pension that can be provided by their deferred account balance (determined on an actuarial equivalent basis).

JANUARY 31, 2020 TABLES FOR COMPARISON

Total	24	61.9	\$576,541
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STATISTICAL PROFILE OF PENSIONERS (INCLUDING SURVIVORS)

	Number	Average Age	Average Annual Lifetime Pension
Males	712	74.4	\$49,857
Females	978	72.1	\$32,472
Total	1,690	73.1	\$39,796

JANUARY 31, 2020 TABLES FOR COMPARISON

Total	1,440	72.7	\$38,634
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SALARY/ AGE/ SERVICE DISTRIBUTION FOR ALL ACTIVE MEMBERS

Age	Service (years)							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
	23							23
20-24	1,163,374							1,163,374
	50,581							50,581
	129	6						135
25-29	7,630,888	409,689						8,040,577
	59,154	68,282						59,560
	227	48	8					283
30-34	17,110,857	3,439,325	507,778					21,057,959
	75,378	71,653	63,472					74,410
	279	121	51	4				455
35-39	23,977,770	10,854,991	4,002,106	313,827				39,148,694
	85,942	89,711	78,473	78,457				86,041
	213	132	109	41	5			500
40-44	19,595,364	13,204,540	11,212,506	3,510,168	392,941			47,915,519
	91,997	100,034	102,867	85,614	78,588			95,831
	147	111	107	96	27	7		495
45-49	12,632,287	11,425,097	10,963,701	11,278,202	2,376,511	554,238		49,230,035
	85,934	102,929	102,464	117,481	88,019	79,177		99,455
	111	84	103	127	85	34	7	551
50-54	10,078,747	8,194,163	10,707,453	15,770,149	10,398,891	2,787,367	520,242	58,457,013
	90,800	97,550	103,956	124,174	122,340	81,981	74,320	106,093
	72	73	66	92	88	41	48	480
55-59	6,299,082	8,111,511	5,779,782	9,946,483	11,148,846	4,518,617	3,597,535	49,401,856
	87,487	111,117	87,572	108,114	126,691	110,210	74,949	102,921
	30	52	48	54	65	52	43	344
60-65	2,566,305	4,359,660	4,286,283	5,216,659	7,080,083	6,964,538	5,023,606	35,497,133
	85,543	83,840	89,298	96,605	108,924	133,933	116,828	103,189
	10	9	14	16	17	16	25	107
Over 65	1,074,399	880,573	1,743,272	1,891,289	2,369,395	2,666,330	3,799,542	14,424,801
	107,440	97,841	124,519	118,206	139,376	166,646	151,982	134,811
	1241	636	506	430	287	150	123	3,373
Grand Total	102,129,072	60,879,550	49,202,880	47,926,777	33,766,668	17,491,089	12,940,925	324,336,960
	82,296	95,723	97,239	111,458	117,654	116,607	105,211	96,157

Key: Each cell contains the following information (in order): a "count" of the number of members who fit within the cell's parameters (for instance, the cell in the upper left corner indicates that 23 members are between the ages of 20 and 24, and have between 0 and 4 years of service); the total salaries paid to the members in the cell; and the average salary of members in the cell (the upper left cell, for instance, shows that the 23 members earned a total of \$1,163,374, or an average of \$50,581).

Note: These figures do not include individuals who have reached 35 years pensionable service and are therefore no longer accruing benefits for future service. There are 63 such members.

SALARY/ AGE/ SERVICE DISTRIBUTION FOR ACTIVE MEMBERS – MALES ONLY

Age	Service (years)							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
	8							8
20-24	411,814							411,814
	51,477							51,477
	37	1						38
25-29	2,107,208	56,682						2,163,890
	56,952	56,682						56,944
	78	15	4					97
30-34	6,384,983	1,121,092	248,296					7,754,371
	81,859	74,739	62,074					79,942
	106	41	14	3				164
35-39	9,888,774	4,023,926	1,213,412	254,056				15,380,167
	93,290	98,145	86,672	84,685				93,782
	90	56	46	12	4			208
40-44	8,970,922	5,678,507	4,993,501	996,110	337,696			20,976,736
	99,677	101,402	108,554	83,009	84,424			100,850
	56	37	52	43	12	2		202
45-49	5,217,002	4,521,080	5,498,887	5,617,715	1,135,455	164,391		22,154,531
	93,161	122,191	105,748	130,645	94,621	82,196		109,676
	43	39	45	61	40	14	2	244
50-54	4,077,743	3,918,604	5,044,563	7,797,346	5,248,510	1,221,929	196,625	27,505,320
	94,831	100,477	112,101	127,825	131,213	87,281	98,312	112,727
	23	25	31	39	44	20	17	199
55-59	1,935,042	2,909,438	2,886,294	4,656,229	6,235,435	2,201,041	1,398,419	22,221,898
	84,132	116,378	93,106	119,390	141,714	110,052	82,260	111,668
	12	18	18	23	24	31	22	148
60-65	1,145,557	1,701,239	1,688,819	2,453,735	3,056,044	4,498,837	2,615,027	17,159,258
	95,463	94,513	93,823	106,684	127,335	145,124	118,865	115,941
	5	4	4	7	14	9	18	61
Over 65	521,082	458,723	525,963	986,247	2,068,699	1,580,748	2,817,721	8,959,181
	104,216	114,681	131,491	140,892	147,764	175,639	156,540	146,872
	458	236	214	188	138	76	59	1,369
Grand Total	40,660,127	24,389,292	22,099,735	22,761,436	18,081,839	9,666,947	7,027,791	144,687,167
	88,778	103,344	103,270	121,071	131,028	127,197	119,115	105,688

Key: Each cell contains the following information (in order): a "count" of the number of members who fit within the cell's parameters; the total salaries paid to the members in the cell; and the average salary of members in the cell.

Note: These figures do not include individuals who have reached 35 years pensionable service and are therefore no longer accruing benefits for future service.

SALARY/ AGE/ SERVICE DISTRIBUTION FOR ACTIVE MEMBERS – FEMALES ONLY

Age	Service (years)							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
	15							15
20-24	751,560							751,560
	50,104							50,104
	92	5						97
25-29	5,523,680	353,007						5,876,687
	60,040	70,601						60,584
	149	33	4					186
30-34	10,725,873	2,318,233	259,482					13,303,588
	71,986	70,249	64,870					71,525
	173	80	37	1				291
35-39	14,088,996	6,831,065	2,788,694	59,771				23,768,526
	81,439	85,388	75,370	59,771				81,679
	123	76	63	29	1			292
40-44	10,624,441	7,526,033	6,219,006	2,514,058	55,245			26,938,783
	86,378	99,027	98,714	86,692	55,245			92,256
	91	74	55	53	15	5		293
45-49	7,415,284	6,904,017	5,464,814	5,660,487	1,241,056	389,846		27,075,504
	81,487	93,298	99,360	106,802	82,737	77,969		92,408
	68	45	58	66	45	20	5	307
50-54	6,001,004	4,275,559	5,662,889	7,972,803	5,150,382	1,565,438	323,617	30,951,693
	88,250	95,012	97,636	120,800	114,453	78,272	64,723	100,820
	49	48	35	53	44	21	31	281
55-59	4,364,040	5,202,073	2,893,488	5,290,255	4,913,411	2,317,575	2,199,116	27,179,957
	89,062	108,377	82,671	99,816	111,668	110,361	70,939	96,726
	18	34	30	31	41	21	21	196
60-65	1,420,748	2,658,421	2,597,464	2,762,924	4,024,039	2,465,700	2,408,579	18,337,875
	78,930	78,189	86,582	89,127	98,147	117,414	114,694	93,561
	5	5	10	9	3	7	7	46
Over 65	553,317	421,851	1,217,309	905,043	300,697	1,085,583	981,821	5,465,620
	110,663	84,370	121,731	100,560	100,232	155,083	140,260	118,818
	783	400	292	242	149	74	64	2,004
Grand Total	61,468,944	36,490,258	27,103,145	25,165,341	15,684,829	7,824,142	5,913,134	179,649,793
	78,504	91,226	92,819	103,989	105,267	105,732	92,393	89,646

Key: Each cell contains the following information (in order): a "count" of the number of members who fit within the cell's parameters; the total salaries paid to the members in the cell; and the average salary of members in the cell.

Note: These figures do not include individuals who have reached 35 years pensionable service and are therefore no longer accruing benefits for future service.

PENSIONERS

Age at Valuation	Female	Male	Total
45 to 49	1		1
	4,634		4,634
	4,634		4,634
50 to 54	2	1	3
	58,522	1,341	59,862
	29,261	1,341	19,954
55 to 59	25	5	30
	542,754	124,248	667,001
	21,710	24,850	22,233
60 to 64	143	44	187
	4,112,511	1,370,537	5,483,048
	28,759	31,149	29,321
65 to 69	271	175	446
	9,227,005	7,074,627	16,301,633
	34,048	40,426	36,551
70 to 74	234	172	406
	8,689,347	9,128,126	17,817,473
	37,134	53,070	43,885
75 to 79	156	154	310
	5,002,917	8,880,412	13,883,330
	32,070	57,665	44,785
80 to 84	65	100	165
	1,811,683	5,705,439	7,517,122
	27,872	57,054	45,558
85 to 89	47	44	91
	1,485,795	2,321,295	3,807,089
	31,613	52,757	41,836
90 to 94	23	13	36
	511,142	618,700	1,129,842
	22,224	47,592	31,385
95 and over	11	4	15
	311,464	273,293	584,757
	28,315	68,323	38,984
Total count by gender	978	712	1,690
Total lifetime benefit	31,757,774	35,498,018	67,255,792
Total average lifetime benefit	32,472	49,857	39,796

Key: Each cell contains the following information (in order): count, sum of lifetime retirement benefit, and average lifetime retirement benefit.

APPENDIX E SUMMARY OF PLAN PROVISIONS

The following is a summary of the Plan's main provisions in effect on January 31, 2023. This summary is not intended as a complete description of the Plan. For specific details of the Plan provisions, reference should be made to the Plan text.

Effective Date of the Plan

Contributions to this Plan (and eligibility for pension benefits) commenced effective September 1, 1959.

Eligibility and Membership

Up to June 30, 1996 all full-time employees and regular part-time employees of Dalhousie University are eligible to join the Plan upon completion of at least 75 days of employment with the University. After June 30, 1996 eligibility for membership occurs at the date of employment.

Statutory part-time employees may elect to join the Plan following completion of two consecutive calendar years of employment during which, in each of the calendar years, their earnings were at least 35% of the Canada Pension Plan YMPE, or their hours worked were at least 700.

Required Contributions

- A. By Members: 4.65% of the first \$5,000 of annual salary plus 6.15% of annual salary in excess of \$5,000 (where the salary is ultimately limited to that which would produce a pension entitlement in the year equal to the maximum pension for that year according to the provisions of the *Income Tax Act*), plus Supplementary Contributions in the amount of 2.00% of the same annual salary.
- B. By the University: the amount required to meet the cost of all benefits not met by the Members' required contributions.

Interest

Any refund of contributions, payable either to a member or his or her estate, includes interest credited each year from the 1st of October at a rate based on the average of the yields of 5-year personal fixed term chartered bank deposit rates (CANSIM series V122515) over the 12-month period ending on the most recent June 30th.

Normal Retirement Date

The normal retirement date for all employees is the July 1st immediately following attainment of age 65 except for those members who were on full-time staff prior to July 1, 1964. In the latter case, normal retirement date is the 1st day of September immediately following the attainment of age 65.

Early Retirement

A member who has attained age 55 may retire at any time prior to attainment of his or her normal retirement age. In these circumstances, the member would receive a reduced pension in accordance with the following table:

Full Years Prior to Age 65	Early Retirement Adjustment Factor	
	For benefits earned after June 30, 2004	For benefits earned up to June 30, 2004
10	.63	.76
9	.66	.80
8	.69	.84
7	.72	.88
6	.75	.92
5	.78	.95
4	.81	.98
3	.85	1.00
2	.90	1.00
1	.95	1.00

These adjustment factors are interpolated where retirement occurs between anniversary dates. Under Phase Three of the Surplus Use Agreement (1996), these reduction factors are applicable prior to exact age 65 instead of the normal retirement date.

Partial Early Retirement and Reduced Workload Arrangements

Any regular full-time staff member may apply for partial early retirement through an approved reduced workload arrangement provided that he or she has completed at least three years of Continuous full-time or regular part-time employment since last date of hire. A Reduced Workload Period shall be for a fixed term. Participation in and approval of such RWA is by mutual consent and is not extended as a matter of right.

In respect of any Member working under an RWA, the following shall apply:

- (1) the calculation of the Member's pension benefit shall be based on the Member's Nominal Salary (pre-RWA Salary with adjustments for salary increases) rather than the actual Salary received by the Member under RWA;
- (2) the Member will make pension contributions through payroll deduction based on the actual Salary received during the period rather than the Member's Nominal Salary on which the benefits are based; and
- (3) the University will pay contributions on behalf of the Member in respect of the difference between the Member's actual Salary and Nominal Salary as well as its contributions on the Nominal Salary.

This provision does not mean that a member can retire and commence receipt of pension benefits and continue to accrue benefits simultaneously. Such action is not permitted.

Deferment of Pension Benefits

Any member eligible to receive a pension (either at normal or early retirement age) may elect to defer commencement of pension payments until some later date (but not beyond the end of the calendar year the member attains age 71 in any event). In these circumstances, the actuarial equivalent value of the member's pension as of the selected retirement date is transferred into the Retirees' Trust Fund and is credited with investment income until the member's pension payments start. The actual pension payable from deferred retirement date is calculated on a consistent actuarial equivalent basis. The ultimate pension at date of commencement must not exceed the maximum pension payable from a Defined Benefit Plan, as prescribed in the *Income Tax Act*.

Pension at Normal Retirement

The pension provided under this Plan is expressed as a certain percentage of the average of the best three years of remuneration received by the member.

For the total period of membership in the Plan, the percentage applicable is 2% multiplied by the number of years of participation during that period.

The annual amount of lifetime pension payable to members, excluding any benefits derived from the member's AVCs, for the calendar year in which these benefits commence to be paid shall not exceed the product of:

- A. the number of years of Pensionable Service of the Member which, when combined with the Member's Pensionable Service prior to January 1, 1992, if any, will not exceed 35 years, and
- B. the lesser of:
 - (1) 1/9 of the Money Purchase Limit in the calendar year in which benefits commence, and
 - (2) 2% of the average of Member's best three consecutive years of Compensation in respect of the Employer.

Type of Pension

Pensions are payable throughout the lifetime of a Pensioner. For service up to June 30, 2004, the minimum guaranteed number of payments for single members or for married members electing a single life form of pension is 120 months. For married members electing a joint form of pension, the normal form of pension is a lifetime pension payable to the member and spouse jointly. The benefit is payable at a rate reduced by one third to the spouse should the spouse survive the member, provided that the spouse is not younger than the member by more than 60 months. If the spouse is younger by more than 60 months, the benefit is reduced in consideration of the actual age of the spouse to be actuarially equivalent to the benefit payable to a member whose spouse is 60 months younger. No fewer than 60 monthly payments shall be paid in any event.

For service from July 1, 2004, the normal form of pension for all members is a lifetime pension payable to the member, with a guarantee that no fewer than 84 payments shall be paid in any event.

A member with a spouse is required to receive a pension which includes a 60% survivor's pension; such pension being the actuarial equivalent of the pension otherwise payable in the normal form. Other optional forms of pension are available on an actuarial equivalent basis subject to signature of a waiver form by member and spouse.

Adjustment to Pensions in Course of Payment

Effective July 1, 1982, the decision was made to discontinue the previous policy of purchasing immediate annuities from life insurance companies in respect of retiring employees. Accordingly, a separate Retirees' Trust Fund was established and, in respect of employees retiring on or after July 1, 1982, pension payments are being made directly from this Retirees' Trust Fund.

At the time of retirement, a capital sum is transferred from the Pension Trust Fund into the Retirees' Trust Fund in respect of each retiring employee; the amount of this transfer being based on the mortality and interest assumptions used in the most recent actuarial valuation of this Pension Plan.

The three-year average investment yield on the Retirees' Trust Fund in excess of the post-retirement interest assumption (PRIA) will be used to fund indexing of pensions in the manner described below, subject to a "hold back" as a provision against life expectancy variations and other contingencies of 0.1% for Members who retired prior to June 30, 1994, 0.4% for Members who retired on or after June 30, 1994 but before June 30, 1996 and 0.5% for Members who retired on or after June 30, 1996.

In addition, accumulated pension increases shall not exceed corresponding accumulated increases in the Consumer Price Index.

Notwithstanding the above, in the event that the applicable three-year average investment yield on the Retirees' Trust Fund does not exceed the PRIA by the "hold back" percentages, then there shall be no adjustment to pensions in course of payment for that year except as may be provided with surplus funds. Furthermore, in these circumstances, there will be a corresponding reduction in the rate of increase of pensions in the following year or years of such amount, or amounts that would be required to bring pensions in course of payment to the same level that would apply if negative adjustments had been made in those years when the three-year average investment yield on the Retirees' Trust Fund did not exceed the PRIA by the "hold back" percentages.

The first such increase took effect as of January 1, 1984, and further increases after that date – to the extent an adjustment can be made – take place on each subsequent 1st of January.

Death Benefits Before Retirement

Upon death prior to retirement, the benefit payable to the member's spouse or beneficiary is an amount equal to the sum of:

- (i) The greater of
 - a. The Member's required contributions plus interest in respect of service prior to January 1, 1988, plus 100% of the Commuted Value of the Member's pension accrued to the date of death, in respect of service after December 31, 1987; and
 - b. An amount equal to the Sum of Contributions Compounded of the Member up to the date of death; and
- (ii) The Member's additional voluntary contributions plus interest.

In lieu of the lump sum described above, the Member's spouse can elect to receive a lifetime pension equal to the actuarial equivalent of the lump sum.

Disability Benefit

In the event that a member becomes totally and permanently disabled prior to normal retirement date and becomes eligible to receive benefits under the University's Long Term Disability Plan, provision is made for the continuation of joint contributions to the Pension Plan while the member is receiving LTD Benefits until normal retirement age. At that time, the disability benefit ceases, and a pension will become payable under this Plan with full credit being given both for years of active participation and for years when the member continued to contribute to the Plan while disabled.

Termination of Employment

A Member who terminates employment is entitled to a deferred pension payable at the normal retirement date. A Member can elect to receive an early retirement pension which is the pension payable at the normal retirement date, with the appropriate actuarial reduction factors applied, as outlined above.

In lieu of a pension benefit as described above, a Member may elect to have the greater of (i) their Locked-in Contributions, and (ii) the Commuted Value of the Member's pension accrued to the date of termination, including any 50% rule excess employee contributions, transferred to a Registered Plan permitted under the *Pension Benefits Act* and the *Income Tax Act*, provided that such arrangement is administered as locked-in as required by the *Pension Benefits Act*.

APPENDIX F EMPLOYER CERTIFICATION

On behalf of Dalhousie University, I hereby certify that the employee data provided to Eckler Ltd. for the purposes of the actuarial valuation of the Dalhousie University Staff Pension Plan as at January 31, 2023 are accurate and complete.

October 26, 2023

Date

Laurie A. Adams

Signature

Senior Pension Advisor

Title