Halifax Regional Municipality Pension Plan

Report on the Actuarial Valuation as at December 31, 2021

Registration No. 0238063

August 2022

Prepared by:

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SUMMARY OF RESULTS

Going Concern Financial Position	December 31, 2021	December 31, 2020
Going concern value of assets (excluding the present value of special payments)	$2,357,583,000	$2,183,878,000
Going concern liabilities	(2,222,967,000)	(2,171,312,000)
Provision for adverse deviations ("PfAD")	(152,131,000)	(148,897,000)
Going concern excess / (unfunded liability)	($17,515,000)	($136,331,000)
Required PfAD	7.00%	7.00%

Solvency Financial Position	December 31, 2021	December 31, 2020
Solvency assets	$2,505,624,000	$2,264,212,000
Solvency liabilities x 85%*	(2,822,264,000)	(2,915,242,000)
Solvency excess / (deficit)	($316,640,000)	($651,030,000)
Solvency concerns ratio	75.7%	66.2%

** For measuring solvency deficiency*

Hypothetical Wind-Up Financial Position	December 31, 2021	December 31, 2020
Wind-up assets	$2,505,624,000	$2,264,212,000
Wind-up liabilities	(3,521,685,000)	(3,647,524,000)
Wind-up excess / (deficit)	($1,016,061,000)	($1,383,312,000)
Transfer ratio	71.2%	62.1%

Funding Requirements (Annualized)	Year Following December 31, 2021	
	% of Payroll	$
Estimated contributory payroll		$416,155,000
Required employee contributions	12.3%	51,154,000
Employer matching required contributions	12.3%	51,154,000
Total required contributions	24.6%	$102,308,000
Total value of benefits earned in the year	17.9%	$74,465,000
Required contributions in excess of benefits earned	6.7%	$27,843,000
Minimum special payments in 2022[1]		$16,385,000
Minimum special payments starting in 2023		$240,000
Maximum eligible employer contribution in 2022[2]		$1,039,372,000

[1] Reflects municipal solvency relief

[2] Equal to wind-up deficiency plus eligible employer current service cost

SECTION I INTRODUCTION AND PURPOSE OF VALUATION

At the request of the Halifax Regional Municipality Pension Committee (the "Committee"), we have completed an actuarial valuation of the *Halifax Regional Municipality Pension Plan* (the "Plan") as of December 31, 2021. The last actuarial valuation was performed as at December 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* and the Income Tax Act.

In this report, we provide 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 liabilities of this pension plan is provided by way of appendices for ease of reference.

The intended users of this report are the Committee, 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 December 31, 2024.

Reliance

We have relied on the asset information as provided in the plan's audited financial statements. We have also relied on the Plan administrator to provide all relevant data and to confirm the pertinent Plan terms.

SECTION II PLAN CHANGES AND SUBSEQUENT EVENTS

The *Halifax Regional Municipality Pension Plan* became effective April 1, 1998 as the result of the merger of four prior pension plans – the City of Halifax Superannuation Plan, the Halifax County Municipality Full-time Retirement Pension Plan, the City of Dartmouth Employees' Retirement Plan, and the Metropolitan Authority Employees' Pension Plan (the "Prior Plans"). A detailed description of the current provisions of the Plan is contained in Appendix F, at the end of this report.

Actuarial Assumptions

There have been no changes to the going concern assumptions since the last valuation.

The solvency economic and demographic assumptions have been changed to reflect market conditions as at the valuation date in accordance with the CIA's Standards of Practice and the CIA's Educational Note on Assumptions for Hypothetical Wind-up and Solvency Valuations.

The details of the actuarial assumptions used in the valuation and the rationale employed in setting these assumptions are provided in Appendix D.

Subsequent Events

The Actuarial Standards Board (ASB) has published two amendments to the Standards of Practice. Revisions to Section 3500 of the Practice-Specific Standards for Pension Plans - Pension Commuted Values were published on September 14, 2021 with an effective date of February 1, 2022 and changes to the complete Practice-Specific Standards for Pension Plans (Part 3000) were published June 27, 2022 with an effective date of December 1, 2022. Earlier implementation is not permitted for either change. The effect, if any, of the revised Standards of Practice have not been incorporated into this valuation.

The COVID-19 pandemic continues to evolve and any resulting impact on the Plan cannot be reasonably estimated at this time. Future valuations will reflect any long-term impact of COVID-19.

The impact on the market value of assets, underlying assumptions and any other effects related to the Russia-Ukraine crisis have not been reflected in the valuation results and as such, the plan financial position shown in this report may be materially different if those factors were incorporated in our valuation. These effects will be revealed in future valuations.

We are not aware of any other events that have 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 December 31, 2021

The following is the going concern valuation balance sheet as at December 31, 2021 based on:

- the actuarial value of assets (summarized in Appendix B);
- the going concern valuation assumptions (described in Appendix D);
- the membership data (summarized in Appendix E); and
- the Plan provisions (summarized in Appendix F).

with comparative figures from the valuation as at December 31, 2020.

In accordance with the Regulations, the going concern valuation must also reflect an explicit provision for adverse deviations ("PfAD"), which is to be applied to the going concern liabilities. A PfAD of 7.00% was determined, as detailed in Appendix D.

FINANCIAL POSITION – GOING CONCERN BASIS

	December 31, 2021	December 31, 2020
Going concern assets		
Market value of assets	$2,507,624,000	$2,266,212,000
Actuarial asset smoothing adjustment	(150,041,000)	(82,334,000)
Present value of special payments	15,842,000	22,178,000
Total going concern assets	$2,373,425,000	$2,206,056,000
Going concern liabilities		
Active and disabled members	$966,334,000	$963,602,000
Retirees and survivors	1,162,200,000	1,107,070,000
Deferred and inactive members	29,576,000	25,871,000
Deferred payouts (in-transit)	3,487,000	3,510,000
Defined contribution accounts	49,664,000	44,215,000
Transfer deficiency holdbacks	11,706,000	27,044,000
Total going concern liabilities	$2,222,967,000	$2,171,312,000
PfAD on actuarial liabilities	152,131,000	148,897,000
Total going concern liabilities including PfAD	$2,375,098,000	$2,320,209,000
Going concern excess / (unfunded liability) prior to inclusion of PV of special payments	**($17,515,000)**	**($136,331,000)**
New going concern excess / (unfunded liability)	**($1,673,000)**	**($114,153,000)**
Going concern funding ratio prior to inclusion of PV of special payments	**99.3%**	**94.1%**

As shown above, the December 31, 2021 actuarial valuation has revealed a going concern unfunded liability prior to inclusion of the present value of special payments in the amount of $17,515,000. This compares to a going concern unfunded liability at the previous valuation of $136,331,000 prior to the inclusion of the present value of special payments. Special payment requirements in respect of the unfunded liability are detailed in Section IV - Funding Requirements. The previous year credit balance was nil as at December 31, 2021. Details on the development of the previous year credit balance is provided in Appendix A.

Sensitivity Analysis

Below we show the impact on the going concern actuarial liability as at December 31, 2021 of a one percentage point drop in the discount rate assumption (i.e., from 6.45% per annum to 5.45% per annum). All other assumptions were kept unchanged.

GOING CONCERN SENSITIVITY

	Impact 1% Drop
Total going concern actuarial liability (excluding provision for adverse deviations)	$2,499,523,000

The change in the actuarial liability would have the impact of increasing the liability by $276,556,000 or 12.4% as at December 31, 2021.

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 change in the surplus and/or unfunded liabilities (deficiencies) 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 past year.

RECONCILIATION OF GOING CONCERN FINANCIAL POSITION

Going concern excess / (unfunded liability) as at December 31, 2020		**($136,331,000)**
PfAD at December 31, 2020		148,897,000
Going concern excess / (unfunded liability) as at December 31, 2020 (excluding PfAD)		12,566,000
Contributions greater than the cost of benefits plus interest		30,543,000
Interest on going concern excess at 6.45%		811,000
Expected going concern excess (shortfall) as at December 31, 2021 (excluding PfAD)		**$43,920,000**
Plus: Actuarial gains/losses due to experience different than expected		
Gain/(loss) due to investment experience	$59,323,000	
Gain/(loss) due to pensionable earnings other than assumed	35,380,000	
Gain/(loss) due to contribution interest crediting other than assumed	1,132,000	
Gain/(loss) due to mortality other than assumed	2,974,000	
Gain/(loss) due to retirements other than assumed	(1,146,000)	
Gain/(loss) due to terminations other than assumed	(9,285,000)	
Net actuarial experience gain/(loss)		88,378,000
Data corrections and other miscellaneous gains/(losses)		2,318,000
Going concern excess / (unfunded liability) as at December 31, 2021 (excluding PfAD)		134,616,000
PfAD at December 31, 2021		(152,131,000)
Going concern excess / (unfunded liability) as at December 31, 2021 (including PfAD)		**($17,515,000)**

B. Solvency Basis: Financial Position as at December 31, 2021

The “solvency basis” is a hypothetical construct intended to portray the funded status of the Plan had it terminated or wound-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 are provided and all members were paid their entitlements as an annuity, a deferred annuity, or as a commuted value. As required under Section 7(2) of the Nova Scotia *Pension Benefits Regulations*, entitlements of a member on wind-up of the Plan under Section 97 of the Act are excluded from the solvency liabilities.

The financial position of the Plan on a solvency basis as at December 31, 2021 and as at December 31, 2020 for comparison purposes is as follows:

FINANCIAL POSITION – SOLVENCY BASIS

	December 31, 2021	December 31, 2020
Solvency assets		
Market value of assets	$2,507,624,000	$2,266,212,000
Termination expense provision	(2,000,000)	(2,000,000)
Total solvency assets	$2,505,624,000	$2,264,212,000
Solvency liabilities		
Active members	$1,506,330,000	$1,626,420,000
Retirees and survivors	1,684,520,000	1,664,986,000
Deferred and inactive members	55,839,000	55,719,000
Deferred payouts (in-transit)	3,487,000	3,510,000
Defined contribution accounts	49,664,000	44,215,000
Transfer deficiency holdbacks	11,706,000	27,044,000
Total solvency liabilities	$3,311,546,000	$3,421,894,000
Solvency asset adjustment	17,030,000	83,802,000
Applicable percentage of solvency liabilities for purposes of measuring solvency deficiency*	$2,822,264,000	$2,915,242,000
Solvency excess / (deficit) prior to inclusion solvency asset/liability adjustments	**($316,640,000)**	**($651,030,000)**
Solvency excess / (deficiency)	**($299,610,000)**	**($567,228,000)**
Solvency concerns ratio	**75.7%**	**66.2%**

**Under Section 9 of the Regulations under the Nova Scotia Pension Benefits Act, the applicable percentage of solvency liabilities to be included for purposes of measuring a solvency deficiency is 85%.*

As shown above, the solvency valuation has revealed a solvency deficit of $316,640,000 prior to the inclusion of the solvency asset adjustment as at December 31, 2021. This compares to a solvency deficit of $651,030,000 as at the previous valuation. Including the solvency asset adjustment, the solvency deficiency is $299,610,000.

As per the Nova Scotia *Pension Benefits Regulations*, the Plan is exempt from funding the solvency deficiency.

Solvency Asset Adjustment

The Nova Scotia *Pension Benefits Regulations* defines the solvency asset adjustment as follows:

(1) the amount by which the value of the solvency assets is adjusted by applying an averaging method that stabilizes short-term fluctuations in the market value of the Plan assets, calculated over a period of no longer than 5 years; and

(2) the present value of special payments, adjusted to reflect the current going-concern valuation, and due to be paid over the prescribed period following the valuation date.

Part (1) of the solvency asset adjustment is zero as an averaging method has not been used. Part (2) of the solvency asset adjustment is $17,030,000 as at December 31, 2021, reflecting the present value of the remaining special payments over the prescribed period.

Solvency Liability Adjustment

The Nova Scotia *Pension Benefits Regulations* defines the solvency liability adjustment as the amount by which solvency liabilities are adjusted as the result of using solvency interest rates that are the average of the solvency interest rates over the same period as assets are adjusted under part (1) of the solvency asset adjustment. Since assets have not been adjusted under part (1), the solvency liability adjustment is zero.

Sensitivity Analysis

Below we show the impact on the solvency actuarial liability as at December 31, 2021 of a one percentage point drop in the discount rate assumption. All other assumptions were kept unchanged.

SOLVENCY SENSITIVITY

	Impact 1% Drop
Total Solvency Actuarial Liability	$3,862,987,000

The change in the actuarial liability would have the impact of increasing the liability by $551,441,000 or 16.7% as at December 31, 2021.

Incremental Cost

In accordance with the Canadian Institute of Actuaries' Standard of Practice, we have estimated the incremental cost of the solvency liability as at December 31, 2021. This is the expected aggregate change in solvency liability between December 31, 2021 and December 31, 2024. 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 valuation date.

	3 year
Incremental Cost	$414,606,000

The Actuarial Standards Board (ASB) published amendments to the Standards of Practice (Section 3500: practice-specific standards for pension commuted values) on September 14, 2021 with an effective date no earlier than February 1, 2022 with earlier implementation not permitted. The effect, if any, of this new Standard of Practice has not been reflected in this calculation.

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.

Next Valuation Date

A valuation indicates "solvency concerns" if the ratio of solvency asset to solvency liabilities is less than 0.85. As at December 31, 2021, the ratio of the solvency assets to solvency liabilities is 0.757 (i.e., $2,507,624,000/ $3,311,546,000). Normally, if a pension plan has solvency concerns, the next valuation of the plan must be prepared with an effective date no later than one year (versus the normal three years) after the effective date of the current valuation. However, effective for valuations on and after December 31, 2019, this requirement does not apply for plans that are exempt from funding a solvency deficiency – these plans must complete a cost certificate within 1 year following the valuation that provides the regulator with certain prescribed information.

Therefore, the next full valuation of the plan must be at a date no later than December 31, 2024, with annual cost certificates as at December 31, 2022 and December 31, 2023 if full valuations are not completed at those dates.

C. Hypothetical Wind-up Basis: Financial Position as at December 31, 2021

The liabilities on a hypothetical wind-up basis include those benefits that were excluded from the solvency valuation (e.g., benefits provided under Section 97 of the Act).

The financial position of the Plan on a hypothetical wind-up basis as at December 31, 2021 and as at December 31, 2020 for comparison purposes is as follows:

FINANCIAL POSITION – WIND-UP BASIS

	December 31, 2021	December 31, 2020
Wind-up assets		
Market value of assets	$2,507,624,000	$2,266,212,000
Termination expense provision	(2,000,000)	(2,000,000)
Total wind-up assets	$2,505,624,000	$2,264,212,000
Wind-up liabilities		
Active members	$1,716,469,000	$1,852,050,000
Retirees and survivors	1,684,520,000	1,664,986,000
Deferred and inactive members	55,839,000	55,719,000
Deferred payouts (in-transits)	3,487,000	3,510,000
Defined contribution accounts	49,664,000	44,215,000
Transfer deficiency holdbacks	11,706,000	27,044,000
Total wind-up liabilities	$3,521,685,000	$3,647,524,000
Wind-up excess / (deficiency)	**($1,016,061,000)**	**($1,383,312,000)**

D. Transfer Ratio as at December 31, 2021

The Nova Scotia *Pension Benefits Regulations* also 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 the amount by which solvency assets exceed the lesser of the previous year credit balance ($0) and the amount of expected employer normal contributions and special payments over the valuation period, to the solvency liabilities and the liabilities excluded in calculating the solvency liabilities (i.e., the wind-up liabilities). As at December 31, 2021 the transfer ratio is 71.2% (i.e., $2,507,624,000 divided by $3,521,685,000).

If the transfer ratio is less than 100% then, unless certain conditions are met, a portion of a terminated member's commuted value cannot be paid in a lump sum, but instead must be held back and paid with interest within 5 years. For this Plan, the portion is 28.8%. The two conditions that allow full payment of the commuted value are:

- if an additional contribution is remitted to the fund equal to the portion of the commuted value that should be held back, or
- if the aggregate of the portions that should be held back for all members who terminated since the last valuation date is less than 5% of the assets of the Plan.

Even though the second condition that would allow full payment to be made is expected to be satisfied over the valuation period, the Plan Administrator has decided to continue to pay benefits at the transfer ratio level.

SECTION IV FUNDING REQUIREMENTS

A. Current Service Costs

The Plan's current service 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 from December 31, 2021 and the comparison with the required employee contributions over this period.

CURRENT SERVICE COST

	% of Payroll	$
Estimated contributory payroll for 2022 service		$416,155,000
Member required contributions	12.3%	51,154,000
Employer matching required contributions	12.3%	51,154,000
Total required contributions	24.6%	$102,308,000
Total value of benefits for service	17.9%	$74,465,000
Required contributions in excess of value of benefits earned	6.7%	$27,843,000

The cost of benefits accruing in respect of the year following the valuation date is $74,465,000. This amounts to 17.9% of active contributory payroll. The table below summarizes the estimated employee and employer current service contributions for the three years commencing December 31, 2021, assuming pensionable earnings of $416,155,000 for 2022 and increasing by 2.75% per annum in the years following.

	Jan. 1, 2022 – Dec. 31, 2022	Jan. 1, 2023 – Dec. 31, 2023	Jan. 1, 2024 – Dec. 31, 2024
Estimated contributory payroll	$416,155,000	$427,599,000	$439,358,000
Estimated total value of benefits for service	$74,465,000	$76,540,000	$78,645,000
Estimated employee contributions	$51,154,000	$52,595,000	$54,041,000
Estimated employer matching required contributions	$51,154,000	$52,595,000	$54,041,000
Estimated contributions in excess of value of benefits earned	$27,843,000	$28,650,000	$29,437,000

The total current service cost is 17.9% as of December 31, 2021, which is unchanged from the previous valuation.

CURRENT SERVICE COST RECONCILIATION

	% of Payroll
Current service cost as at January 1, 2021	17.9%
Change in discount rate	0.0%
Changes in Plan demographics	0.0%
Current service cost as at January 1, 2022	17.9%

Contribution Rates

The following table summarizes the current contribution rate schedules by division:

	Members	Employers
Current Plan Division		
Public Safety Occupations hired after April 1, 1998	12.56%	12.56%
Public Safety Occupations hired after July 1, 1994 under former City of Halifax Plan	12.56%	12.56%
Other Public Safety Occupations who elected "Rule of 75"	12.91%	12.21%
All other members	12.21%	12.21%
Dartmouth Plan Division		
Public Safety Occupations	11.72%	12.90%
Members contributing at a lower rate	10.42%	11.47%
All other members	11.42%	12.57%
Halifax Plan Division		
Public Safety Occupations hired after July 1, 1994	12.26%	12.26%
All other members	11.91%	11.91%
County Plan Division		
All members	11.71%	11.71%
Metropolitan Authority Plan Division		
All members	12.01%/12.91%	12.01%/12.91%

Sensitivity Analysis

Below we show the impact on the current service cost as at December 31, 2021 of a one percentage point drop in the discount rate assumption. All other assumptions were kept unchanged.

CURRENT SERVICE COST SENSITIVITY

	Impact 1% Drop
Total Current Service Cost	$88,475,000

The change in the discount rate would have the impact of increasing the current service cost by $14,010,000 or 18.8% as at December 31, 2021.

B. Special Payments

In addition to current service contributions, special payments are required in order to amortize the Plan's going concern unfunded liability. The Plan is subject to a solvency funding exemption as per the Nova Scotia *Pension Benefits Regulations*, and therefore no special payments are required to amortize the Plan's solvency deficiency.

Special Payments

Under the Regulations, special payments are to be consolidated and re-amortized over a 10-year period following each valuation. The new payment schedule is as follows:

ANNUAL SPECIAL PAYMENTS DETERMINED AS AT DECEMBER 31, 2021[1]

Payment Type	Date Established	Term Remaining	Annual Payment	Present Value of Special Payments[2]
Going Concern	December 31, 2021	10.00 years[3]	$240,000	$1,673,000
Total			$240,000	$1,673,000

[1] Special payments are determined on a flat dollar basis (i.e., the required dollar amount of special payments will not change as payroll increases). Based on 2022 payroll, the required special payment would be approximately 0.10% of payroll. Total payroll for the purpose of special payment calculations is unadjusted for decrements in the following year.

[2] Present value of payments calculated at 6.45% interest rate.

[3] As per Regulation 99(2) of the Nova Scotia Pension Benefits Act, the special payments to liquidate the going concern unfunded liability must commence no later than 12 months from the valuation date. Consequently, the special payment established as at December 31, 2021 commences at January 1, 2023.

The minimum special payment in 2022 is $16,385,000 (as determined in the December 31, 2020 actuarial valuation). Starting on January 1, 2023, the minimum special payment will be $240,000 per annum until the next valuation. Current contributions are expected to be enough to cover the value of benefits earned as well as the minimum required special payments.

C. Maximum Contribution

The maximum tax-deductible contributions the employers could make prior to the next valuation is:

1. A lump sum equal to the hypothetical wind-up deficit, which was $1,016,061,000 as of December 31, 2021 plus interest from the valuation date to the date of payment at the applicable interest rate less any deficiency payments made from the valuation date to the payment date; plus
2. The employer portion of the current service cost, which is estimated as $23,311,000 in 2022.

In 2022 therefore, the maximum tax-deductible contribution the employers could make is $1,039,372,000.

D. Timing of Contributions

Contributions for current service must be made no later than 30 days following the month for which the contribution is payable. Special payments must be paid by equal instalments, within 30 days following the end of each month.

Section V Actuarial Opinion

The following represent our primary conclusions as a result of our actuarial valuation as at December 31, 2021:

1. As at December 31, 2021 the Plan has a going concern unfunded liability of $1,673,000 ($17,515,000 excluding the present value of special payments).

2. The Plan has a solvency deficiency of $299,610,000 after inclusion of 5 years' worth of special payments. The Plan is subject to a solvency funding exemption as per the Nova Scotia *Pension Benefits Regulations*. Accordingly, no solvency deficiency payments are required at this time.

3. The going concern unfunded liability must be amortized according to the special payment schedule detailed in Section IV.

   The minimum required annual special payment in 2022 is $16,385,000, and $240,000 per annum commencing January 1, 2023 for the following 10 years. Matched contributions in excess of the value of benefits earned are sufficient to fund these minimum special payments.

4. The cost of benefits accruing in respect of the year following the valuation date is $74,465,000, which amounts to 17.9% of active contributory payroll. Employee contributions will be 12.3%. We note that the Plan text requires the employers to match employee contributions for most members of the Plan.

5. The adequacy and appropriateness of this funding level should be reviewed at the next actuarial valuation of this Plan, which should take place as at December 31, 2024 at the latest.

6. If the Plan were to be wound up on the valuation date, the value of Plan assets would be less than actuarial liabilities by an amount of $1,016,061,000, after allowance for "grow-in benefits" under the Nova Scotia *Pension Benefits Act and Regulations*.

7. The maximum employer contribution permitted in 2022 is estimated to be $1,039,372,000.

8. The transfer ratio of the Plan is 71.2%.

9. Pursuant to the *Income Tax Act and Regulations*, there is no excess surplus as of the valuation date.

10. Other than those described in Section II, we are not aware of any other 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.

11. In our opinion,

    a. the data on which the valuation is based are sufficient and reliable for the purposes of the valuation as described in Section I;

    b. the assumptions described herein are appropriate for the purposes of the valuation; and

    c. 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.

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

Respectfully submitted,

Philip Churchill, FSA, FCIA

Colleen Glenn, FSA, FCIA, CERA

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APPENDIX A DEVELOPMENT OF PREVIOUS YEAR CREDIT BALANCE

The table below, shows the reconciliation of the previous year credit balance between December 31, 2020 and December 31, 2021.

Previous year credit balance at December 31, 2020		0
Actual employer contributions		
Current service cost	22,976,000	
Special payments:		
- Unfunded actuarial liability	29,588,000	
Transfer deficiency contributions	0	
Additional employer contributions	0	
Total		52,564,000
Minimum required contributions between December 31, 2020 and December 31, 2021		
Current service cost	22,976,000	
Special payments:		
- Unfunded actuarial liability	22,938,000	
Transfer deficiency contributions	0	
Total		45,914,000
Application of previous year credit balance between December 31, 2020 and December 31, 2021		6,650,000
Previous year credit balance at December 31, 2021		0

APPENDIX B PLAN ASSETS

Sources of Plan Asset Data

The pension fund is held in trust by Northern Trust under the Halifax Regional Municipality Master Trust and is invested in accordance with the investment policy. The Halifax Regional Municipality Pension Plan and the Halifax Regional Water Commission Employees' Pension Plan are the only two plans that participate in the Master Trust.

We have relied upon audited financial statements prepared by KPMG for the 2021 plan year.

Market Value of Plan Assets

The following is a summary of the market value of Plan assets by category as at December 31, 2021:

December 31, 2021	$	%
Cash & cash equivalents	$15,046,000	0.6
Fixed income	694,612,000	27.7
Canadian equity	100,305,000	4.0
Global equity	880,176,000	35.1
Minimum targeted return[1]	817,485,000	32.6
Total	**$2,507,624,000**	**100.0**

[1] The minimum targeted return portfolio investments are private investments in real estate, infrastructure, private equity and private debt.

Target Asset Mix

The target asset mix contained in the Plan's Statement of Investment Policies and Procedures effective December 9, 2021 is as follows:

	Minimum	Target	Maximum
Public equities	**30%**	**40.00%**	**60%**
Canadian equities		4.00%	
Global equities		30.00%	
Emerging market equities		6.00%	
Fixed income	**15%**	**20.00%**	**50%**
Cash & cash equivalents		2.50%	
Canadian government bonds		7.50%	
North American credit		7.00%	
Global bonds		3.00%	
Private investments	**20%**	**40.00%**	**50%**
Private equity		7.00%	
Infrastructure		15.25%	
Real estate		15.25%	
Private debt		2.50%	
Public Market Alternatives	**0%**	**0.00%**	**7.5%**
		100.00%	

Reconciliation of Plan Assets

A summary of pension fund transactions for the period January 1, 2021 to December 31, 2021 is summarized below:

RECONCILIATION OF PLAN ASSETS

	2021
January 1	**$2,266,212,000**
Employee contributions	50,465,000
Employer contributions	52,564,000
Transfers from other plans	1,567,000
Investment income and net capital gains	277,027,000
Pension payments	(99,041,000)
Lump sum payments	(31,206,000)
Administrative expenses	(9,964,000)
December 31	**$2,507,624,000**

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 December 31, 2021 and December 31, 2024 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 Dec. 31, 2021	Plausible Adverse Scenario Results at December 31, 2021		
		Interest rate risk	Deterioration of asset values	Longevity risk
Going concern assets	2,357,583,000	2,361,132,000	2,297,400,000	2,357,583,000
Going concern liabilities	2,222,967,000	2,287,187,000	2,222,967,000	2,253,446,000
PfAD on going concern liabilities	152,131,000	156,627,000	152,131,000	154,265,000
Total going concern liabilities plus PfAD	2,375,098,000	2,443,814,000	2,375,098,000	2,407,711,000
Going concern excess / (unfunded liability)	**(17,515,000)**	**(82,682,000)**	**(77,698,000)**	**(50,128,000)**
Current service cost	74,465,000	77,633,000	74,465,000	75,098,000
Change in going concern liabilities	-	68,716,000	-	32,613,000
% change in going concern liabilities	-	2.89%	-	1.37%
Change in current service cost	-	3,168,000	-	633,000
% change in current service cost	-	4.25%	-	0.85%
Discount rate	6.45%	6.20%	6.45%	6.45%
PfAD	7.00%	7.00%	7.00%	7.00%
Market value of assets	2,507,624,000	2,525,372,000	2,206,709,000	2,507,624,000

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 D). 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,
- 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 25 basis points as of December 31, 2021, and long-term yields on fixed income investments would decrease by 63 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 D). 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 determined the decrease in median investment returns over the 500 trials where investment returns are lowest at the one-year horizon.

As such, under deterioration of assets values scenario, the market value of assets is decreased by 12% as of December 31, 2021.

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 an age setback of one year for all active members for the going concern valuation as of December 31, 2021, that is, a more conservative mortality assumption than currently employed.

APPENDIX D ACTUARIAL METHODS AND ASSUMPTIONS

A. Going Concern Valuation

Asset Valuation Method

For the going concern valuation, we have employed an asset valuation method that contains a smoothing of asset values, but still relates them to their market values. This smoothing approach amortizes the difference between actual and expected investment returns over a five-year period (the current and four subsequent years).

The following table shows the development of the actuarial value of assets as at December 31, 2021:

ACTUARIAL VALUE OF ASSETS

Market value of assets at December 31, 2021			$2,507,624,000
Less unrecognized investment return in excess (deficient) of discount rate assumption in each year:	2021:	$121,719,691 x 80%	97,376,000
	2020:	$43,175,634 x 60%	25,905,000
	2019:	$91,191,562 x 40%	36,477,000
	2018:	($48,582,819) x 20%	(9,717,000)
			$150,041,000
Actuarial value of assets at December 31, 2021			**$2,357,583,000**

Actuarial Cost Method

For the purposes of the going concern valuation, we have used the Projected Unit Credit actuarial cost method in the determination of current service contributions as well as the accrued liabilities.

In using the Projected Unit Credit method, as a first step, a calculation is made of the liability in respect of all benefits that have accrued to members for service up to and including the valuation date based on projected final average earnings. This represents the "accrued liability".

As a separate process, the current service cost has been calculated. 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 over that period. The difference represents the required employer contribution necessary for those benefits to be properly funded.

Under this funding method, the cost of a dollar per year of deferred pension commencing at retirement age increases with the age of an employee. Thus, the dollar cost rises steadily over an individual's working life. However, for the group as a whole, if the average age remains reasonably constant (which can occur through the retirement of older members and the addition of new, young members), the recommended contribution rate will remain relatively stable. If the Plan membership's average age increases, on the other hand, the current service costs will also increase. Such increases would be revealed in future valuations.

Actuarial Assumptions

For the purposes of a going concern valuation, we select actuarial assumptions with a long-term focus. That is, we anticipate that the Plan will continue indefinitely into the future. Actuarial assumptions are selected considering historical trends, future expectations and 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:

1. as to the probability that a particular payment will be made at a certain time (for example, depending upon whether the individual concerned survives to that date); and
2. the expected amount of each such payment.

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

(a) future salary increases;

(b) future rates of mortality (and the corresponding life expectancies of the Plan members);

(c) future rates of employee turnover (withdrawal from the Plan); and

(d) the retirement experience.

Finally, the actuary must consider the rate of interest that will be earned on the assets of the pension fund 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 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 consider statistics developed from many other pension plans.

Going Concern Discount Rate Assumption

The discount rate assumption remains unchanged from the previous valuation at 6.45% per annum for the December 31, 2021 actuarial valuation. The selection of the discount rate for this valuation was based on reasonable expectations for the relationships between 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 each of the asset classes in which the Halifax Regional Municipality Pension Plan invests;
- combining these best estimate long-term expected future investment returns to reflect the Plan’s investment policy, thereby creating an “expected” total 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 based on the results of stochastic modelling conducted specific to the Plan’s target asset mix; and
- making appropriate provision for expenses.

In employing this approach, we recognize that there are a range of reasonable assumptions for each component of the model. In determining an overall best estimate assumption, we have neither selected the most optimistic nor the most pessimistic point of the range for each of these components. The result of our analysis is depicted in the following table:

GOING CONCERN DISCOUNT RATE

Discount Rate Components	
Portfolio return reflecting the Plan’s investment policy	6.20%
Diversification / rebalancing	0.40%
Added value from active management	0.25%
Provision for expenses	(0.40%)
Best estimate discount rate	**6.45%**

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	Expected Weight	Expected Return
Cash	3.50%	1.40%
Canadian equity	4.00%	6.70%
US equity	4.50%	6.60%
International equity	6.50%	6.90%
Global equity	15.00%	6.80%
Emerging market equity	6.00%	8.50%
Small cap equity	4.00%	7.20%
Corporate bonds	3.50%	3.30%
High yield bonds	2.00%	5.30%
Mortgages	2.00%	3.20%
Universe government bonds	6.50%	2.70%
Emerging market debt	0.50%	5.20%
Private debt (investment grade)	2.00%	5.00%
Real estate	15.25%	6.30%
Infrastructure	15.25%	7.00%
Private equity	7.00%	8.50%
Private debt	2.50%	6.90%
Total portfolio	**100.00%**	**6.20%**

Inflation

The inflation assumption has a direct bearing on the assumption with respect to active member salary increases. The inflation assumption remains unchanged from the previous valuation at 2.00% per annum, as it is in in alignment with our overall economic outlook. This rate is within the Bank of Canada's 1% - 3% inflation-control target range.

Salary Increase

The salary increase assumption includes a base component as well as a component for seniority, merit and promotion, and varies by age. The rate assumed for the base component has not been changed from 2.75% as at the previous valuation. The component for seniority, merit and promotion has remained the same and is outlined below:

ANNUAL SALARY INCREASE RATES

Age Group	Seniority, Merit and Promotion Component
< Age 30	2.0%
30 – 39	1.5%
40 – 44	1.0%
45 – 49	0.5%
Age 50 +	0.0%

YMPE and CRA Defined Benefit Limit Increase

We have assumed the Year's Maximum Pensionable Earnings (YMPE) would increase at a rate of 2.75% per annum from the current known level of $64,900 in 2022.

We have assumed the Canada Revenue Agency defined benefit limit would also increase at a rate of 2.75% per annum from the current known level of $3,420.00 for 2022. In combination with a member's pensionable service and their year of retirement, this limit determines the maximum pension that may be payable from a registered defined benefit pension plan under the Income Tax Act.

Both of these assumptions are consistent with the previous valuation.

Contribution Crediting

Interest is credited on member contributions at a rate based on the 5-year personal fixed term chartered bank deposit rate as determined from the Canadian Socio-Economic Information Management (CANSIM) Series V80691336 (previously V122515), published in the Bank of Canada Review.

In order to project member contribution-with-interest balances to the expected date of termination, death or retirement, we have assumed contribution rates as a percent of pensionable earnings would continue into the future, and that interest would be credited on those contributions at a rate of 3.0% per annum, as in the previous valuation.

Mortality

For this valuation, we have continued to use the CPM 2014 Private Sector Mortality Table (CPM2014Priv), and we have assumed mortality improvements in accordance with CPM Improvement Scale B (CPM-B). The CPM 2014 Private 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 private sector. The membership of this Plan consists of various employee groups, including outside workers, inside workers, as well as uniformed workers from Police & Fire. Given the diverse group, the CPM 2014 Private table was considered to offer the most appropriate "best estimate" of mortality patterns for participants in this Plan.

Retirement Age

The retirement age assumption remains unchanged from the previous valuation. For the current valuation, we have continued to assume 40% of members who achieve eligibility for unreduced retirement will retire when first eligible. The remaining 60% retire based on the following retirement table:

Age	Non-PSO	PSO
50	0.00%	2.00%
51	0.00%	3.50%
52	0.00%	4.75%
53	0.00%	6.00%
54	0.00%	7.25%
55	5.00%	7.50%
56	3.75%	7.50%
57	5.75%	7.50%
58	7.50%	7.50%
59	9.50%	18.75%
60	20.00%	100.00%
61	12.50%	0.00%
62	12.50%	0.00%
63	12.50%	0.00%
64	25.00%	0.00%
65	100.00%	0.00%

Our assumption is based on a retirement study conducted in 2018 of the retirement patterns for Plan members over the previous five years, as well as continued monitoring of the Plan's retirement experience through the annual gain and loss analysis.

Marital Status

There has been no change since the previous valuation in the marital status assumptions. For members who have not yet retired, we have assumed that 85% of members will have an eligible spouse on the earlier of death or retirement. For members who have retired, actual marital status on file was used, with an assumption that 5% of pensioners who were married at retirement are single at the date of the valuation. Further, we have continued to assume that male spouses are 3 years older than female spouses.

Termination Rates

The annual termination decrement rate assumption has not changed from the previous valuation. The rates vary by age. Sample rates are as follows:

TERMINATION RATES

Age	Annual Termination Decrement Rate
20	20.0%
25	13.1%
30	7.0%
35	5.4%
40	4.1%
45	3.1%
50	2.4%
55	0.0%
60	0.0%

Our assumption is based on a termination study conducted in 2019 of the termination patterns for Plan members over the previous five years, as well as continued monitoring of the Plan's termination experience through the annual gain and loss analysis.

The termination scale stops at a member's earliest retirement date (age 50 for Public Safety Occupation members and 55 for other members).

For those who are assumed to terminate, 30% elect a deferred pension and 70% elect an immediate commuted value payout. We have assumed that the discount rate at which members' deferred pensions are converted to a commuted value is 3.75% per annum. The mortality table is the CPM Combined Table with improvements in accordance with Scale CPM-B.

Disability Rates

There is no explicit assumption for disability rate for the members of this plan. However, the overall current service cost is increased by 0.25% of total payroll to account for the potential cost of members who could become disabled in the year. The additional cost would be a waiver of member contributions for these individuals.

Provision for Adverse Deviations (PfAD)

The PfAD is derived from the target investment portfolio of the Plan and Section 12B of the Nova Scotia *Pension Benefits Regulations*. 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 December 31, 2021:

DETERMINATION OF PFAD AS PER THE NOVA SCOTIA *PENSION BENEFITS REGULATIONS*

Asset Class	Target Asset Allocation Per Plan's Statement of Investment Policies and Procedures	Per Regulation 12C, Percentage of Asset Class Deemed Non-Fixed Income Assets
Cash	3.50%	0%
Canadian equity	4.00%	100%
US equity	4.50%	100%
International equity	6.50%	100%
Global equity	15.00%	100%
Emerging market equity	6.00%	100%
Small cap equity	4.00%	100%
Corporate bonds	3.50%	0%
High yield bonds	2.00%	50%
Mortgages	2.00%	50%
Universe government bonds	6.50%	0%
Emerging market debt	0.50%	50%
Private debt (investment grade)	2.00%	50%
Real estate	15.25%	50%
Infrastructure	15.25%	50%
Private equity	7.00%	100%
Private debt	2.50%	50%
Total	100.00%	
Product of allocation and portion deemed non-fixed income assets		66.75%

Determine Provision for Adverse Deviations (Regulation 12B)	
Per Regulation 12D(1), table amount for 60% non-fixed income assets	5.00%
Per Regulation 12D(1), table amount for 70% non-fixed income assets	8.00%
Per Regulation 12D(2), linear Interpolation = 0.3325 X 5.00% + 0.6675 X 8.00%	7.00%

Therefore, the total PfAD for the Plan is equal to “A” + “B” = 0% + 7.00% = 7.00%

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

GOING CONCERN VALUATION ACTUARIAL ASSUMPTIONS

	December 31, 2021		December 31, 2020	
Discount rate:	6.45% per annum		6.45% per annum	
Annual salary increase:	Promotional component: Age-based scale	Promotional component: Age-based scale	Promotional component: Age-based scale	Base component: 2.75% per annum
Maximum pension and YMPE:	2022: $3,420.00 and $64,900 2023+: Increase at 2.75% per annum		2021: $3,245.56 and $61,600 2022+: Increase at 2.75% per annum	
Contribution crediting:	3.00% per annum		3.00% per annum	
Mortality:	CPM 2014 Private Sector Mortality Table projected generationally with CPM Improvement Scale B		CPM 2014 Private Sector Mortality Table projected generationally with CPM Improvement Scale B	
Retirement age:	40% of members retire when eligible for an unreduced pension; remainder retire according to an age-based table		40% of members retire when eligible for an unreduced pension; remainder retire according to an age-based table	
Marital status:	Non-retired members: 85% married Retired males and females (with spouse on file): 95% married Retired males and females (no spouse on file): 0% married Male spouse is assumed to be 3 years older than female spouse		Non-retired members: 85% married Retired males and females (with spouse on file): 95% married Retired males and females (no spouse on file): 0% married Male spouse is assumed to be 3 years older than female spouse	
Termination rates:	Variable by age, and 30% of members elect a deferred pension, 70% elect a commuted value. Commuted value discount rate: 3.75% per annum Commuted value mortality assumption: CPM Combined, with CPM-B improvement scale		Variable by age, and 30% of members elect a deferred pension, 70% elect a commuted value. Commuted value discount rate: 3.75% per annum Commuted value mortality assumption: CPM Combined, with CPM-B improvement scale	
Disability rates:	No rates, but load of 0.25% of payroll on current service cost to account for members who could become disabled in the year.		No rates, but load of 0.25% of payroll on current service cost to account for members who could become disabled in the year.	
Actuarial method:	Projected Unit Credit		Projected Unit Credit	

B. Solvency Valuation

The Nova Scotia *Pension Benefits Act* 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. If solvency assets are not sufficient to fund a specified percentage (85% for valuations on or after December 31, 2019) of the solvency liabilities (i.e., the Plan has a solvency deficiency), then special payments are required in order to eliminate the deficiency, unless the Plan is subject to solvency relief in accordance with the Act and Regulations.

Benefits are assumed to be settled through a lump sum transfer for 100% of active members who are not retirement eligible as at the date of valuation. Benefits are assumed to be settled through the purchase of annuities for 100% of active members who are eligible for retirement at the date of valuation and for all pensioners and deferred pensioners.

For active members whose benefits are assumed to be settled through lump sum transfer, the interest rate used for calculating solvency liabilities was 2.30% per annum for 10 years and 3.40% per annum 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 the month of December 2021. The mortality assumption used was the CPM-2014 (Combined) mortality table projected with Scale CPM-B.

In accordance with the CIA Transfer Value Recommendations, the retirement age assumption is 50% at the age that maximizes the liability and 50% at the earliest unreduced retirement age. Note that at current interest rates, the age that maximizes the liability is the same as the earliest unreduced retirement age, but this could change in the future.

For those members whose benefits are assumed to be settled through purchase of annuities, the solvency liabilities were calculated using an interest rate of 2.86% per annum and mortality at CPM-2014 (Combined) mortality table projected with 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 are in accordance with the Canadian Institute of Actuaries Educational Note entitled "Assumptions for Hypothetical Wind-Up and Solvency Valuations with Effective Dates on or after December 31, 2021 and no later than December 30, 2022".

Note that the solvency valuation does not make any assumptions about future pay increases or future terminations of employment, since all members are assumed to terminate on the valuation date. In accordance with the Nova Scotia *Pension Benefits Regulations*, the solvency valuation does not include the value of any grow-in benefits that would apply on plan wind-up.

The actuarial assumptions for the solvency valuation are described in the following table:

SOLVENCY VALUATION ACTUARIAL ASSUMPTIONS

	December 31, 2021	December 31, 2020
Interest rates for benefits to be settled through annuity purchase:	2.86% per annum	2.55% per annum
Interest rates for benefits to be settled through lump sum transfer:	2.30% per annum for 10 years and 3.40% thereafter	1.40% per annum for 10 years and 2.90% thereafter
Pre-retirement mortality:	None	None
Post-retirement mortality:	CPM-2014 Combined mortality, projected with Scale CPM-B	CPM-2014 Combined mortality, projected with Scale CPM-B
Retirement age (transfer value basis):	50% at age that maximizes lump sum value 50% at earliest unreduced age	50% at age that maximizes lump sum value 50% at earliest unreduced age
Retirement age (annuity purchase basis):	Age that maximizes liability	Age that maximizes liability
Salary scale:	None	None
Married assumption:	85% married (male spouse is 3 years older)	85% married (male spouse is 3 years older)
Actuarial cost method:	Termination Method	Termination Method

C. Incremental Cost

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 and change in membership status, service accrual and increase in earnings 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 D 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.

D. Hypothetical Wind-Up Valuation

The hypothetical wind-up valuation liability assumptions are the same as those used in the solvency valuation, except that the wind-up valuation also includes liabilities with respect to benefits commonly known as "grow-in benefits" which are described in Section 97 of the Nova Scotia *Pension Benefits Act*. In particular, members whose age plus service is greater than or equal to 55 at the valuation date are assumed to "grow-in" to (i.e., become entitled to) early retirement eligibility and provisions.

APPENDIX E MEMBERSHIP DATA

The membership data in respect of this Plan is maintained by the Halifax Regional Municipality Pension Plan Office.

We have reviewed the data as to accuracy and reasonableness and we are satisfied that the data are complete. In addition, we have performed various checks of reasonableness on dates of employment, plan membership and birth. We also compared lists of active members with lists of inactive and retired members to check for duplicates. In all cases, we found the data to be sufficient and reliable for the purposes of the valuation.

Appendix G contains confirmation by Halifax Regional Municipality Pension Plan Office as to the accuracy and completeness of the data provided.

Plan membership data are summarized below. For comparison, we have also summarized corresponding data from the previous valuation.

MEMBERSHIP DATA

	December 31, 2021	December 31, 2020
Active Members		
Number	7,261	7,046
Average pensionable earnings	$63,338	$64,370
Average years of pensionable service	9.3 years	9.5 years
Average age	46.6 years	46.7 years
Proportion female	53.2%	51.9%
Accumulated contributions with interest	$447,342,000	$428,297,000
Deferred Pensioners/Inactive Members		
Number	873	707
Average annual pension	$4,208	$4,547
Average age	45.8	46.7
Proportion female	56.1%	58.4%
Pensioners and Survivors		
Number	4,817	4,649
Average annual pension	$21,511	$21,189
Average age	71.1	70.9
Proportion female	51.2%	51.1%

Active membership includes members who are still accruing service under the prior plans as follows:

1 member in the City of Halifax Superannuation Plan

2 members in the Halifax County Municipality Full-time Retirement Pension Plan

2 members in the City of Dartmouth Employees' Retirement Pension Plan; and

0 members in the Metropolitan Authority Employees' Pension Plan

The membership movement for all categories of membership since the previous actuarial valuation is as follows:

RECONCILIATION OF MEMBERSHIP

	Active Members	Inactive and Deferred	Pensioners and Survivors	Total
Total at December 31, 2020	**7,046**	**707**	**4,649**	**12,402**
New members	827	-	-	827
Terminations paid out	(148)	(46)	-	(194)
Terminations to deferred	(243)	243	-	-
Return to active	12	(12)	-	-
Retirements	(225)	(18)	243	-
New survivors	-	-	41	41
Deaths (paid out)	(6)	-	-	(6)
Deaths (with survivor)	-	-	(41)	(41)
Deaths (no survivor)	-	-	(84)	(84)
New Ex-Spouse	-	-	6	6
Data adjustments	(2)	-	(1)	(3)
Record (consolidation)/split	-	(1)	4	3
Total at December 31, 2021	**7,261**	**873**	**4,817**	**12,951**

The distribution of the active members' pensionable earnings by age and pensionable service as at December 31, 2021, is summarized as follows:

	Years of Pensionable Service							
Age	**<5**	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**>30**	**Total**
<25	96 *	1 *						**97** **$48,665**
25-30	377 56,624	37 *						**414** **$58,848**
30-35	537 57,898	149 77,772	41 94,434					**727** **$64,032**
35-40	549 54,955	165 73,458	142 82,751	35 99,552				**891** **$64,564**
40-45	480 51,856	180 69,325	193 80,680	122 91,328	29 99,503			**1,004** **$66,701**
45-50	449 48,251	178 61,031	182 74,065	176 80,456	118 88,546	21 71,892		**1,124** **$64,169**
50-55	332 49,369	202 56,660	211 61,521	161 77,835	142 78,574	103 94,589	39 102,546	**1,190** **$65,754**
55-60	247 50,487	175 54,197	200 56,647	168 66,939	118 70,173	80 78,907	99 87,511	**1,087** **$62,361**
60-65	112 52,129	87 61,857	117 52,901	98 57,673	87 51,986	42 73,104	62 66,917	**605** **$57,526**
>65	26 45,379	21 59,791	34 57,336	15 55,718	13 50,090	5 69,595	8 72,948	**122** **$55,766**
Total	**3,205** **$52,936**	**1,195** **$65,052**	**1,120** **$68,860**	**775** **$76,196**	**507** **$74,844**	**251** **$83,599**	**208** **$83,631**	**7,261** **$63,338**

** To protect confidentiality, some cells do not have the earnings shown.*

The distribution of the inactive members by age as at December 31, 2021, is summarized as follows:

DISTRIBUTION OF INACTIVE MEMBERS

	Deferred Pensioners		Pensioners and Survivors	
Age	**Number**	**Average Annual Pension**	**Number**	**Average Annual Pension**
<20			1	*
20-25	21	588		
25-30	65	1,165		
30-35	78	1,879		
35-40	105	3,018	1	*
40-45	123	5,181		
45-50	138	5,055	1	*
50-55	132	5,681	90	40,723
55-60	142	5,619	356	34,125
60-65	59	3,610	819	25,928
65-70	9	*	1,069	22,632
70-75	1	*	996	19,814
75-80			687	16,449
80-85			420	15,012
85-90			251	14,189
90-95			92	11,924
95-100			27	10,900
100-105			6	8,379
>105			1	*
Total	**873**	**$4,208**	**4,817**	**$21,511**

** To protect confidentiality, some cells do not have the pensions shown.*

APPENDIX F SUMMARY OF PLAN PROVISIONS

Introduction

The *Halifax Regional Municipality Pension Plan* became effective April 1, 1998 as the result of the merger of four prior pension plans – the City of Halifax Superannuation Plan, the Halifax County Municipality Full-time Retirement Pension Plan, the City of Dartmouth Employees' Retirement Plan, and the Metropolitan Authority Employees' Pension Plan.

This valuation is based on the Plan provisions in effect on December 31, 2021. The following is a summary of the Plan's main provisions in effect on December 31, 2021. It is not intended as a complete description of the Plan.

Eligibility for Membership

A full-time employee of a participating employer must join the Plan on the date of full-time employment.

Part-time employees may join on the first day of January or July coincident with or next following the completion of twelve months of continuous service provided that, in the twelve months preceding Plan membership, the employee has:

- earned at least 25% of the YMPE; or
- worked at least 700 hours for the employer.

The YMPE, or Year's Maximum Pensionable Earnings, refers to the maximum annual amount of earnings upon which an employee and an employer contribute to the Canada Pension Plan (CPP).

Contributions – Defined Benefit

Members and their employer contribute in equal proportions in the amount required to pay the cost of providing benefits under the Plan's defined benefit provision to which members are entitled as determined by the actuary.

Contributions – Defined Contribution

Members may elect to contribute to the Plan's defined contribution provision on their defined contribution earnings based on the contribution rates defined in the Plan.

Earnings – Defined Benefit

Defined benefit earnings are regular earnings in respect of a normal work schedule, excluding overtime or other forms of differential or premium pay or other allowances and entitlements, except where such differential or premium pay is part of the Member's regular compensation based on the Member's regular work schedule.

Earnings – Defined Contribution

Defined contribution earnings are overtime and other non-regular earnings as defined in the Plan.

Normal Retirement Date

The normal retirement date is the first day of the month coincident with or next following the member's 65th birthday (60th birthday for employees in Public Safety Occupations).

Early Retirement Date

A member may choose to retire as early as 10 years prior to their normal retirement date, or on or after their optional retirement date.

A member's optional retirement date is the first day of the month coincident with or next following the earlier of:

- the date on which the member's age plus continuous service totals 80 (75 for members in Public Safety Occupations who were hired on or after July 1, 1994 and were members of the City of Halifax Superannuation Plan, members in Public Safety Occupations who became members after April 1,1998, or other members in Public Safety Occupations who elected to convert to the current plan and elected "Rule of 75"); and
- the date the member reaches 60 years of age.

Should a member retire on or after their optional retirement date, the pension will be unreduced.

Postponed Retirement

Members may postpone retirement as late as December 31 of the year the member reaches 71 years of age.

Pension at Normal Retirement

If a member retires on the normal retirement date, the member will be entitled to an annual pension, payable monthly, equal to the member's credited service multiplied by 2% of the average annual earnings over the three highest consecutive years while a member of the Plan.

The member will also receive the value of their defined contribution account.

Early Retirement Pension

If an active member retires early, the member will be entitled to a pension that is calculated the same way as for a normal retirement. The pension payable, however, will be reduced by 0.5% for each month the retirement date precedes the date the member would have been eligible for an unreduced pension, assuming continued employment.

If a deferred member retires early, the member will be entitled to the accrued defined benefit earned. The pension payable, however, will be reduced by 0.5% for each month the retirement date precedes age 60, if the member terminated prior to December 31, 2010, or the normal retirement date if the member terminated on or after December 31, 2010.

The member will also receive the value of their defined contribution account.

Postponed Retirement Pension

If a member postpones retirement, the benefit will be calculated the same way as for a normal retirement, based on credited service and earnings to the postponed retirement date.

The member will also receive the value of their defined contribution account.

Maximum Pension

The total annual pension payable under the defined benefit provisions of the Plan upon retirement, death or termination of employment cannot exceed the lesser of:

- 2% of the average of the best three consecutive years of total compensation paid to the member, multiplied by total credited service; and
- The defined benefit limit under the *Income Tax Act* (or such lesser amount for service purchased after June 7, 1990 that was not previously pensionable), multiplied by the member's total credited service.

Death Benefits Before Retirement

If a member dies before eligibility for an immediate pension, the member's spouse, or beneficiary (or estate) if there is no spouse, will receive a lump sum settlement equal to the commuted value of the member's benefit.

If a member dies after eligibility for an immediate pension, but before pension payments start, the member's spouse is entitled to receive an immediate pension calculated as if the member retired on the day before death and elected a joint and survivor 66.67% pension. In addition, if the commuted value of the member's pension exceeds the commuted value of the survivor pension, the member's spouse will receive the difference as an actuarially equivalent pension. The member's spouse can also elect to receive the commuted value of the survivor pension as a lump sum. If there is no spouse, the beneficiary (or estate) will receive the commuted value of the member's benefit.

In addition, the member's spouse or beneficiary (or estate) if there is no spouse, will receive the value of the member's defined contribution account.

Death Benefits After Retirement

The normal form of payment for a member without a spouse is a lifetime pension guaranteed for ten years. If the member has a spouse, the spouse will receive 66.67% of the pension being received by the member prior to death.

In either case, there is a guarantee to ensure that payments to or in respect of a member are at least equal to their own contributions with interest at the time of retirement.

Disability Benefits

If a member qualifies for benefits under a participating employer sponsored long term disability plan, the Canada Pension Plan or the Workers Compensation Board, credited service under the Plan continues to accrue and member required contributions are waived.

Termination Benefits

If a member's employment terminates for reasons other than death or retirement, the member is entitled to the defined benefit pension accrued to the date of termination of employment.

If the member terminated employment prior to December 31, 2010, the deferred pension is payable commencing at age 60. If the member terminated employment on or after December 31, 2010, the deferred pension is payable commencing at the member's normal retirement date. A member may elect to receive a reduced early retirement pension as early as age 55 (age 50 for members in Public Safety Occupations). The pension will be reduced by 0.5% for each month the pension commences prior to the date it would have been payable on an unreduced basis.

If a member is not eligible to receive an immediate pension, the member may transfer the commuted value of that pension into another retirement vehicle in accordance with the applicable federal and provincial legislation.

The member is also entitled to receive the value of their defined contribution account.

APPENDIX G ADMINISTRATOR CERTIFICATION

On behalf of the Administrator of the *Halifax Regional Municipality Pension Plan*, I hereby certify that the employee data provided to Eckler Ltd. for the purposes of the actuarial valuation as at December 31, 2021 are accurate and complete.

Paula Boyd

Name

Paula Boyd

Signature

Chief Pension Officer

Title

September 22, 2022

Date