ECKLER

Actuarial Report on the

# British Columbia Teachers' Pension Plan

as at December 31, 2023

Vancouver, British Columbia

September 10, 2024

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# Actuarial Report Highlights

We have completed an actuarial valuation of the Teachers' Pension Plan as at December 31, 2023. Its purpose was to:

- determine the financial position of the Plan as at December 31, 2023;
- report on the adequacy of the member and employer contribution rates;
- establish the level of sustainable indexing;
- identify whether surplus needs to be transferred from the Basic Account to the Inflation Adjustment Account (IAA); and
- identify whether any of the Rate Stabilization Account (RSA) contribution need to be redirected to the IAA, to support indexing of pensions.

## Key Results: Funding Valuation

| Basic Account ($ millions) | 2020 | 2023 |
|---|---|---|
| Asset smoothing cushion | 2,224 | (1,612) |
| Rate Stabilization Account (RSA) | 892 | 1,437 |
| Assets (smoothed) net of RSA | 31,540 | 40,210 |
| Liabilities | 29,956 | 35,638 |
| **Surplus** | **1,584** | **4,572** |
| 5% of net liabilities | (1,159) | (1,364) |
| **Accessible Going Concern Excess** | **425** | **3,208** |

| Basic Contribution Rates | 2020 | 2023 |
|---|---|---|
| Current contribution rate | 16.34% | 16.34% |
| Entry-age normal cost (EANC) rate | 17.01% | 17.28% |
| **Maximum Permissible JTA Contribution Rate = highest of:** | | |
| • Current contribution rate | 16.34% | 16.34% |
| • 25 year amortization of Accessible Going Concern Excess (with a maximum reduction of 1% below EANC) | 16.32% | 16.28% |
| **Maximum Permissible JTA contribution rate** | **16.34%** | **16.34%** |

## Key Results: Sustainable Indexing Valuation

The Sustainable Indexing Valuation shows that, taking the current Basic account contributions into account, indexing of 2.25% per year is sustainable in the long term. Thus, indexing at 100% of CPI remains sustainable.

With full indexing remaining sustainable, the contributions that were reallocated from the IAA to the RSA (2% of salaries, with 1% each from members the employer) do not need to be diverted to the IAA and should continue to be made to the RSA.

Further, stochastic modelling indicates that the IAA includes a prudent reserve (as defined in the funding policy), so no transfer of surplus from the Basic Account to the IAA is required.

## Plan Benefits, Actuarial Methods and Assumptions

There were no changes to plan benefits since the previous valuation. Plan benefits are summarized in Appendix A.

The actuarial methods were determined taking into account the Joint Trust Agreement (JTA) and the funding policy of the Board. The actuarial liabilities are calculated using the entry age normal cost method, and include the value of benefits accrued by members as at December 31, 2023 as well as the future benefits expected to be earned by existing members. Asset values are based on smoothed market values (limited to ±8% of market value for the Funding Valuation, ±5% of market value for the Sustainable Indexing Valuation), plus projected future contributions based on entry-age normal contribution rates and, where relevant, the existing amortization rates. The actuarial methods are described in more detail in Section 3.

The assumptions were also set taking into account the Board's funding policy. The Funding Valuation focuses on setting an appropriate level of contributions to ensure the security of benefits; accordingly, the economic assumptions require margins for adverse deviations. The Sustainable Indexing Valuation focuses on setting a level of indexing, given the contributions committed to the plan, which is equitable across generations. As a result, this valuation has been carried out using best estimate assumptions for future investment returns and price inflation. The key long-term assumptions are as follows (unchanged from the previous valuation):

| | Funding Valuation | Sustainable Indexing Valuation |
|---|---|---|
| Annual Investment Return | 5.75% | 6.00% |
| Annual Salary Increase | 3.25% plus seniority | 3.0% plus seniority |
| Annual Indexing | 0% for basic costs 2.50% for indexed costs | 2.25% for fully indexed costs |

We updated the demographic assumptions used for the valuation as follows:

- The assumed base rates of mortality were updated to use the latest available member-specific rates provided by Club Vita Canada, multiplied by a credibility weighting factor of 95%; and.
- We made minor updates to the assumed rates of retirement and disability to reflect the Plan's recent experience.

See Appendix B for details of the assumptions used in this valuation and the rationale employed in setting these assumptions. See Section 4 schedule 2 and 3 for the impact of the changes in assumptions on the valuation results.

### Main Reasons for Changes in Actuarial Position

The funding valuation shows an improvement in the actuarial position for the Basic Account. The surplus has increased from $1,584 million at December 31, 2020 to $4,572 million at December 31, 2023. The main reason for the improvement in the actuarial position was investment returns being greater than assumed. There was a net loss from membership experience differing from the assumptions (losses from salary, termination and mortality experience, partially offset by a gain from retirement experience) and a net loss from changes in the demographic assumptions (mainly from a change in the mortality assumption). The impact of other changes to the demographic assumptions was not significant.

### Funding Policy and JTA Implications

Members and employers currently contribute 8.17% of salaries each for basic non-indexed benefits for a total Basic Account contribution rate of 16.34%. The long-term cost rate for future service (i.e. the entry-age normal actuarial cost "EANC") has increased from 17.01% to 17.28% of salaries, or 0.94% of salaries higher than the current combined member and employer contributions.

When the current contribution rate is below the EANC, and the plan has surplus assets, the JTA requires that the Board use the Accessible Going Concern Excess (amortized over 25 years) to fund a Basic Account contribution reduction equal to the least of:

a) the difference between the EANC and the Current Contribution Rate i.e. 0.94%,

b) the maximum such reduction that can be funded with the Accessible Going Concern Excess i.e. 4.33% amortized over 25 years, and

c) 1.0% below the EANC.

As a result, the Maximum Permissible Basic contribution rate under the JTA is 16.34% of salaries (a reduction of 0.94% below the EANC) and this equals the current Basic contribution rate. In other words, the current Basic contribution should continue in force unless the Board decides to allocate further surplus to reducing the contribution rate below this level.

The JTA next requires that the remaining surplus is transferred to the Inflation Adjustment Account if needed. The Sustainable Indexing Valuation shows that, taking the current Basic account contributions into account, indexing at 100% of CPI remains sustainable in the long term, with a significant margin. In line with the funding policy, a transfer to the IAA is not required.

The Board can then elect to apply the Surplus Assets for the equal benefit of the Plan Members and the Employers in one or more of the following manners:

- Transfer to the RSA;
- Further reduce the total contribution rate to a total maximum reduction of 1% below the EANC using a 25 year amortization of the Surplus.
- Reallocate up to 1% of Basic contribution to fund post-retirement group benefits.
- Implement a combination of benefit enhancements and contribution rate reductions, where the value to the members equals that to the employer.

We would be happy to discuss the implications of each of these options with the Board.

The 2% of pay allocated to the RSA may continue and there is no need to reallocate any of this to either the IAA or the Basic Account.

The above complies with the requirements of the JTA, including the JTA-B requirements. Expanded details of this compliance are included in the main body of this report.

In line with the JTA, the maximum permissible contributions rates are equal to the current level of contributions, which can be summarized as follows:

| | Member | Employer | Total |
|---|---|---|---|
| Current Basic Account | 8.17% | 8.17% | 16.34% |
| **Maximum Permissible Basic Rate** | **8.17%** | **8.17%** | **16.34%** |
| Current IAA | 2.00% | 2.13% | 4.13% |
| Current RSA | 1.00% | 1.00% | 2.00% |
| **Total Maximum Permissible Contribution Rate** | **11.17%** | **11.30%** | **22.47%** |

In the absence of a decision to apply Basic surplus to further reduce the Basic contribution rates, contribution rates must continue at the above levels.

## Compliance with the Income Tax Act

The fully indexed valuation, recognizing the Income Tax Act (ITA) limits, shows a surplus of $4,341 million including the assets in the RSA. This surplus is less than 25% of the corresponding net liability (indexed liability less the present value of the indexed entry age normal cost), so the Plan does not have an excess ITA surplus. Given that there is a surplus, but not an excess surplus, the maximum contributions to the plan may not exceed the fully indexed, ITA limited, entry-age normal cost rate of 23.66%. The current total average contribution rate of 22.47% is less than the ITA limit and therefore is acceptable under the ITA.

The ITA also requires that individual member contributions not exceed the lesser of 9% of salaries or $1,000 plus 70% of the pension credit, though these conditions may be waived by the Minister of Finance provided members do not contribute more than half of the cost of benefits. The current member contribution rate of 11.17% of salary exceeds the 9% limit and even if a decision was made to apply Basic surplus to reduce rates to the minimum permissible rate of 1% below EANC, this would still be the case, so it is necessary to apply to the Minister for a waiver.

Currently the employer contributions exceed the member contributions by 0.13% of pay and this differential will be automatically maintained in almost all circumstances contemplated by the JTA and funding policy. The exception to this might appear to be the circumstance where the Board decides to allocate surplus to the members by means of a benefit improvement and to the employer by a contribution rate reduction. If this course of action is under consideration, we understand that the Board would have to ensure that the requirement to qualify for a waiver is met as the member contributions always need to be acceptable under the ITA. The plan has applied for and been granted the waiver at each valuation since 2005.

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# Section 1. Scope of the Valuation

In accordance with Article 10 of the Joint Trust Agreement (the "JTA") and on the instructions of the Teachers' Pension Board of Trustees (the "Board of Trustees"), we completed an actuarial valuation of the Basic Account of the Teachers' Pension Plan (the "Plan") as at December 31, 2023 and are pleased to submit this report thereon. The primary purposes of this valuation are to determine the financial or actuarial position of the Basic Account as at December 31, 2023, to report on the adequacy of the member and employer contribution rates and to establish the level of sustainable indexing.

Two main valuations were carried out:

- **A Funding Valuation** – this primary valuation is to determine the financial position of the Basic Account as at December 31, 2023 and to report on the adequacy of the member and employer Basic contribution rates. The Funding Valuation focuses only on the Basic Account and does not examine the Inflation Adjustment Account ("IAA") and its ability to meet future indexing requirements. Furthermore, it ignores the limits on benefits imposed by the *Income Tax Act* ("*ITA*") on registered pension plans - such excess benefits are paid on a current cash basis through the Supplemental Benefits Account, which is maintained at a zero balance; and

- **A Sustainable Indexing Valuation** – to determine the rate of indexing that can be sustained in the long term, based on the financial position of the Basic Account and the Inflation Adjustment Account, and the overall level of contributions to the plan. This valuation is also used to determine if a transfer of any Basic Account surplus is required to be made to the IAA, and to confirm if the contributions of 2% of salaries being made to the Rate Stabilization Account can continue, or if they should be diverted back to the IAA to support indexing.

We have also performed supplementary valuations as follows:

- For basic and indexed benefits, on the assumption that indexed benefits are to be fully funded, in advance, as for basic benefits; and

- Limiting benefits to those permitted under the *ITA*; this is done both for basic benefits only, and for basic plus indexed benefits.

The intended users of this report are The Board of Trustees, the BC Financial Services Authority ("BCFSA") and Canada Revenue Agency ("CRA"). This report is not intended or necessarily suitable for other purposes than those listed above.

# Section 2. Changes in Plan

There were no changes to Plan benefits or contributions since the previous actuarial valuation. The main provisions of the Plan are described in Appendix A.

# Section 3. Actuarial Methods and Assumptions

## 1. Financing Method and Adequacy of Contribution Rates

### *a) Funding Criteria*

The general criteria we use in establishing the appropriate level of contributions to the Teachers' Pension Plan include the following:

(i) Benefit security – the probability of fulfilling the present benefit promises provided in the Plan depends on a mixture of political, economic and financial factors; but, whatever the probability, it is clear that benefit security is enhanced by a larger accumulation of assets.

(ii) Stability of contributions – the financing system should result in contribution rates that are relatively stable over an extended period of time.

(iii) Allocation of costs – as far as is practicable, pension costs should be allocated to the generation that incurs them.

The Board's funding policy (most recently revised on June 5, 2023) identifies benefit security as its primary funding objective and contribution stability as an important secondary objective, subject to requirement of the JTA that the first priority must be to reduce contribution rates if possible when current contribution rates are higher than the entry age normal cost. We have taken this into account in carrying out this valuation.

### *b) Indexing Treatment*

The current financing provisions are described in Appendix A. Member and employer contributions are at rates set out in the Plan rules. A larger part of these contributions is allocated to the Basic Account, and a smaller portion to the IAA. The future indexing of pensions is based on funds available in the IAA, which derives its funds primarily from these allocated contributions, from investment earnings within the IAA itself and, subject to the Board's discretion, from excess investment earnings on pensioner reserves in the Basic Account.

In a sense, the IAA operates akin to a defined contribution or money-purchase account in that the value of indexing benefits is limited to the assets in the IAA. Future cost-of-living adjustments are not guaranteed, but are granted at the discretion of the Board, subject to the availability of funds in the IAA. Where there are sufficient monies in the IAA, full indexing in line with the Canada Consumer Price Index ("CPI") is provided; alternatively, if the monies in the IAA cannot provide full CPI indexing on a long term sustainable basis, then

the amount of indexing is limited to the monies available. In either case, the mechanics are such that the capitalized value of the indexing granted is transferred from the IAA to Basic Account each time indexing is granted. Thus, the system will limit indexing, if necessary, so that the granting of any indexing should not create (or increase) an unfunded liability, or reduce a Basic Account actuarial surplus. Accordingly, we did not consider any future indexing in determining the financial status of the Basic Account.

However, we also show supplementary results on the assumption that the assets of, and future contributions to, the Basic Account and the IAA are combined, with benefits to be fully indexed and funded in advance, as for basic benefits.

***c) Basic Account Valuation***

We determined the financial status of the Plan for the Basic Account only (i.e. ignoring the indexing granted after December 31, 2023). The methods used are described in Appendix B.

***d) Funding Requirements***

The approach taken in this valuation (set out in the following sections) has taken into account the requirements of the Board's funding policy, as well as the requirements of the Joint Trust Agreement.

***e) Normal Cost and Amortization of Surplus or Unfunded Liability***

An entry-age funding approach is used. As a first step, contributions are calculated as the level, long term, percentage rate required to finance the benefits of new entrants to the Plan over their working lifetimes, so that their projected benefits are fully secured by equivalent assets by the time they retire (the "normal cost rate" or the "entry-age rate"). Thus, to the extent actuarial assumptions are realized, the addition of new entrants to the Plan should generate neither unfunded liabilities nor surpluses.

Next, the funded position of the plan at the valuation date is considered. The liability takes into account benefits earned to the valuation date as well as benefits expected to be earned for future service by existing members. Asset values are taken at smoothed market values for existing assets, plus projected future contributions in respect of the existing members at the entry-age normal rates (with the first year at the current contribution rate as required by the PBSA), plus the value of the amortization amounts established at previous valuations. The resulting net financial position may be either an actuarial surplus or an unfunded actuarial liability.

This surplus or unfunded liability is amortized over a specified period as outlined in the funding policy. Adjusted contributions, expressed as a percentage of salaries, revert to the normal cost rate after the unfunded liability or surplus has been amortized.

***f) JTA-B Requirements (Pre December 31, 2019 PBSA Requirements)***

The *PBSA* imposes certain minimum funding requirements on pension plans registered in British Columbia. These include the determination of a plan's financial position on a solvency basis as well as a going-concern

basis, the amortization of unfunded actuarial liabilities over a specified maximum number of years, and special rules regarding the treatment of surplus. While the Teachers' Pension Plan is one of a number of British Columbia public sector plans that are exempt from these provisions, the JTA requires that the Plan's financing comply with the PBSA requirements for a going-concern valuation as those requirements existed prior to December 31, 2019. The relevant provisions are documented in Appendix B of the JTA, and we refer to them as JTA-B requirements. This report therefore complies with the JTA-B funding provisions.

***g) Test Contribution Adequacy - JTA provisions***

Under the JTA and JTA-B requirements, the employers and the members must contribute the full normal actuarial cost (e.g. the "entry-age rate" described in (e) above). In addition, unfunded liabilities must be amortized over not more than 15 years from when they are established (with a one year time lag). For this purpose, the unfunded liability that needs to be amortized from the valuation date is the unfunded liability described above, reduced by the present value of any previously established amortization amounts.

Surpluses may be applied to reduce the contribution requirements. The rate may only be reduced below the normal actuarial cost after a surplus margin of 5% of the net liabilities has been set aside, with the remaining surplus, or "Accessible Actuarial Excess", to be amortized over not less than 5 years.

The Board set out its policy with regard to amortization of surplus in its JTA and funding policy. Accordingly, we have calculated contribution requirements as follows:

- Calculate the minimum rate required under the JTA-B provisions
- If there are surplus assets, the Joint Trust Agreement (JTA) requires:

  (i) First reduce the aggregate Employer and Plan Member contribution rate to the Basic Account to the greater of the entry age normal cost and the minimum rate required under the JTA-B, unless the Board determines that such a reduction is not material and would be unduly disruptive to the Employers and Plan Members to implement;

  (ii) However, if the EANC is greater than the Current Contribution Rate, and there is Accessible Going Concern Excess in the Basic Account as of the effective date of the actuarial valuation report, the Board must first use the Accessible Going Concern Excess, amortized over 25 years, to fund a reduction below the EANC to the least of:

    a) the difference between the EANC and the Current Contribution Rate,

    b) the maximum such reduction that can be funded with the Accessible Going Concern Excess, subject to the JTA-B provisions, and

    c) the reduction that will result in an aggregate Employer and Plan Member contribution rate to the Basic Account equal to the EANC minus 1.0%.

(iii) Next, if there are additional surplus assets, transfer such portion of the surplus assets remaining after implementation of subsection (ii) above to the Inflation Adjustment Account (IAA) as is necessary to ensure the IAA has

a) Sufficient assets to index all benefit payments from the Basic Account for accrued and future service at a rate equal to the long term rate of inflation assumed in the most recent filed actuarial valuation report of the Plan, and

b) A prudent reserve

(iv) Then, if there are additional surplus assets, the Board may consider one or more of the following:

a) Leave all or a portion of the surplus assets in the Basic Account for the purpose of a reserve to stabilize contribution rates;

b) Improve benefits

c) Equally reduce the employer and plan member contributions, to a maximum of 1%, i.e. 0.5% each, below the EANC;

d) Divert contributions of up to 1% to fund post-retirement group benefits;

e) Subject to approval under the Income tax Act (ITA), implement a combination of benefit enhancements and contribution rate reductions, where the value to the members equals that to the employer.

A contribution rate stabilization account (RSA) was established effective December 31, 2017 within the Basic Account. Effective January 1, 2020, a third category of employer and member contributions was created to be notionally allocated to the RSA with initial rates for employers and members each set at 1% of salary. Smoothed investment returns are applied each year to the RSA. The RSA is excluded from the Basic Account assets when calculating the Basic Account funded position, but may be drawn down to the extent required to avoid increases in the required Basic Account contribution rates.

## 2. Sustainable Indexing Valuation

The Sustainable Indexing Valuation is carried out to establish the maximum level of indexing that can be provided over the period until the next valuation in a manner that allows indexing to be sustained in the long term and is fair from the perspective of intergenerational equity.

As for the Funding Valuation, we have used an entry age approach. We start by calculating the long term contribution rate that is required to fund the benefits (including indexing at the target rate) over the life time of a typical new entrant, assuming the Plan has neither a surplus nor an unfunded liability.

Next, we need to calculate how this long term contribution rate should be adjusted to reflect the funded position of the Plan. The assets, consisting of the current funds plus the value of future contributions at this entry age rate less the value of any amounts in an RSA set up to provide for rate stabilization, are compared to the liabilities (including the provision for indexing at the target rate). Subtracting the liabilities from the assets gives rise to a surplus or unfunded liability. We amortize this surplus or unfunded liability (in certain cases, adjusted as described below) over an infinite period to obtain the level long-term contribution that is required to support indexing at the target level.

For the target level of indexing to be sustainable, this long term contribution requirement must not exceed the long term contributions that are committed to be paid into the plan, while from an intergenerational equity perspective, we require the long term commitment and long term requirement to be equal.

The calculation of the long term contribution commitment can be complicated when the members and employers are paying amortization amounts into the plan for a temporary period. We therefore defined the long term contribution commitment as the normal cost of the current Basic benefits, plus the fixed IAA contributions. Effectively, these are the amounts that the members and employers can expect to pay in the absence of any unfunded liabilities or surplus.

Any Funding Valuation amortization requirements are excluded from the long term contribution commitment, as these amounts are only payable for a limited period of time. Instead, the effect of these amortization amounts, if any, is allowed for by including their present value as an adjustment to the unfunded liability; any unfunded liability calculated in the Sustainable Indexing Valuation is thus reduced by the present value of any Funding Valuation required amortization amounts.

## 3. Actuarial Assumptions

The rates of investment return, salary increase, indexing, mortality, withdrawal, disability and retirement experienced by members of the fund were examined for the three-year period ending on the valuation date, together with corresponding experience for earlier periods and with other assumptions affecting the valuation results. We discussed the implications of the assumptions, and changes to them, with the Board.

The assumptions and the approach to setting them are described in Appendix B. In summary, the Funding Valuation, used to set the Basic contribution rate, requires margins for adverse deviations, while it is appropriate to use best estimate assumptions when carrying out the Sustainable Indexing Valuation. As a result, certain key assumptions differ between the two valuations and two sets of assumptions are required. For ease of reference we refer to these as the Funding Valuation assumptions and the Sustainable Indexing Valuation assumptions.

Following discussions with the Board, we kept the economic assumptions unchanged from the previous valuation, and made adjustments to some of the demographic assumptions. The assumptions are discussed in detail in Appendix B; the key economic assumptions are summarized below.

| | Funding Valuation | Sustainable Indexing Valuation |
|---|---|---|
| Annual Investment Return | 5.75% | 6.00% |
| Annual Salary Increase | 3.25% plus seniority | 3.00% plus seniority |
| Annual Indexing | 0% for basic costs<br>2.5% for indexed costs | 2.25% for fully indexed costs |

Emerging experience differing from the assumptions will result in gains or losses that will be revealed in future valuations.

## 4. Membership Data

Data as of December 31, 2023 were prepared by the Pension Corporation. The data are described in detail in Appendix B and numerically summarized in Appendices C, D and E.

## 5. Benefits Excluded

No benefits have been excluded for the valuation.

# Section 4. Results of Funding Valuation

## 1. Basic Account – Actuarial Position

Schedule 1 shows a statement of the actuarial position of the Plan as at December 31, 2023. This statement ignores liabilities for indexing of pensions after the valuation date, and assumes that contributions will be made at the current rate of 16.34% for one year, then at the basic, non-indexed, entry-age normal cost rate of 17.28%.

***Schedule 1 – Statement of Actuarial Position as at December 31, 2023***

*Basic Account – Non-Indexed Benefits - Entry-age Normal Cost*

| | ($ millions) | |
|---|---|---|
| **Assets** | **2020** | **2023** |
| Market Value of Basic Account including RSA | 27,867 | 31,671 |
| Asset Smoothing Adjustment | (2,224) | 1,612 |
| **Smoothed Value of Basic Account including RSA** | **25,643** | **33,283** |
| RSA | (892) | (1,437) |
| **Smoothed Value of Basic Account net of RSA** | **24,751** | **31,846** |
| Actuarial present values of future contributions at entry-age rates (current rate in first year) | 6,789 | 8,364 |
| **Total Assets** | **31,540** | **40,210** |
| **Liabilities** | | |
| Actuarial present values for | | |
| • active members | 16,072 | 19,574 |
| • LTD members | 387 | 513 |
| • terminated and inactive members | 404 | 298 |
| • pensions being paid | 12,913 | 15,034 |
| • future expenses | 180 | 219 |
| **Total Liabilities** | **29,956** | **35,638** |
| **Surplus (Unfunded Liability)** | **1,584** | **4,572** |
| **Funded Ratio: Total Assets ÷ Total Liabilities** | **105.3%** | **112.8%** |
| 5% of net liabilities[1] | (1,159) | (1,364) |
| ***PBSA* Accessible Going Concern Excess** | **425** | **3,208** |

[1] Net liabilities equals total liabilities minus the value of future entry age contributions

### Change in Actuarial Position

The statement of actuarial position included in Schedule 1 indicates that the surplus has increased from $1,584 million at December 31, 2020 to $4,572 million at December 31, 2023. The $2,988 million increase in the surplus is the net result of a number of items, by far the most significant being gains due to higher than assumed investment returns.

***Schedule 2 – Change in Actuarial Position***

| | Approximate effect on surplus ($ millions) |
|---|---|
| **1. Surplus (Unfunded Liability) at December 31, 2020** | **1,584** |
| 2. Interest on Surplus | 289 |
| 3. Amortization of surplus | (87) |
| 4. Change in new entrant profile | 36 |
| 5. Experience gains / (losses) | |
| a. Smoothed investment return greater than assumed | 3,480 |
| b. Expenses lower than assumed | 3 |
| c. Salary increases higher than assumed | (203) |
| d. YMPE increases higher than assumed | 35 |
| e. Retirements later than assumed | 197 |
| f. Less terminations than assumed (including rehires) | (86) |
| g. Mortality lighter than assumed | (146) |
| h. Disability rates different than assumed | (8) |
| i. Inflation higher than assumed for LTD deferred period | (22) |
| 6. Gains / (losses) due to changes in valuation assumptions | |
| a. Disability incidence rate increased | (1) |
| b. Retirement rates reduced | 35 |
| c. Mortality rates decreased | (434) |
| d. Data treatment method change | (21) |
| 7. Miscellaneous | (79) |
| **8. Surplus (Unfunded Liability) at December 31, 2023** | **4,572** |

## 2. Adequacy of Contribution Rates

As discussed in Section 3, the required contribution rate consists of the normal cost plus an adjustment to amortise any surplus or unfunded liability. When there is a surplus, the calculations are done to show the maximum permissible rate if the surplus was only used as required under the JTA to reduce the contribution rate. Surplus assets, if any, could be used, but are not required to be used, to reduce the contribution rate below the maximum permissible level.

### *a) Normal Cost Rate*

The total current service contribution required to finance the basic pensions of new entrants (i.e. the normal cost) has increased from 17.01% of salaries as at December 31, 2020 to 17.28% of salaries as at December 31, 2023. The 0.27% of salaries increase in normal cost rate is the net result of a number of items, the most significant being the change in the mortality assumptions (cost increase of 0.18%) and the membership profile change (cost increase of 0.07%).

***Schedule 3 – Change in entry-age normal cost***

| | Combined % |
|---|---|
| **Entry-age normal cost at 2020 valuation** | **17.01** |
| Change in demographic profile of new entrants | 0.07 |
| Assumption changes: | |
| • disability incidence rates increased | 0.01 |
| • retirement rates reduced | 0.01 |
| • mortality rates reduced | 0.18 |
| **Total change** | **0.27** |
| **Entry-age normal cost at 2023 valuation** | **17.28** |

This compares to the current contribution rate to the Basic Account of 16.34% of salaries.

### *b) JTA/Funding Policy Requirements*

Since there is Accessible Going Concern Excess (AGCE), and the current contribution rate of 16.34% of salaries is less than the entry-age normal cost of 17.28%, the JTA requires that the AGCE is amortized over a 25-year period to fund a Basic Account contribution reduction below EANC equal to the least of:

a) the difference between the EANC and the Current Contribution Rate i.e. 0.94% (=17.28% - 16.34%),

b) the maximum such reduction that can be funded with the Accessible Going Concern Excess i.e. 4.33% (=amortizing the AGCE of $3,208m over 25 years), and

c) 1.0% below the EANC,

provided that the resulting rate is not below the JTA-B contribution rate. This rate is equal to the normal cost of 17.28% less the 5 year amortization of the AGCE, which is 17.27%. The JTA-B minimum permissible contribution rate is therefore 0.01% of salaries.

The smallest of these reductions is (a) 0.94%, resulting in a maximum permissible Basic Contribution rate equal to the current rate of 16.34%.

The current contribution rates, the contribution rates for current service (on an entry-age basis, i.e. the normal actuarial cost) and the maximum permissible contribution rates are summarized in Schedule 4.

***Schedule 4 – Current and Maximum Permissible Basic Account Contribution Rates***

| | Based on valuation results as at December 31 | |
|---|---|---|
| **Current Basic Account contribution rates** | **2020 (%)** | **2023 (%)** |
| Member | 8.17 | 8.17 |
| Employer | 8.17 | 8.17 |
| **Combined member/employer** | **16.34** | **16.34** |
| **Entry age normal cost rate (EANC)** | **17.01** | **17.28** |
| **Maximum Permissible Basic Account contribution rates**[1] | | |
| Amortization of Accessible Going Concern Excess – subtract smaller (highlighted) of: | | |
| • **Reduction to maintain current contribution rate** | **(0.67)** | **(0.94)** |
| • 25-year amortization of Accessible Going Concern Excess | (0.69) | (4.33) |
| • 1% below the EANC | (1.00) | (1.00) |
| • JTA-B amortization | (2.75) | (17.27) |
| **Maximum Permissible Basic Account contribution rate** | **16.34** | **16.34** |

The Maximum Permissible Basic contribution rate under the JTA is 16.34% of salaries and this equals the current Basic contribution rate. Accordingly, the current Basic contribution should continue in force unless the Board decides to further allocate surplus to reducing the contribution rate below this level.

[1] Total member plus employer, to be shared equally.

As will be discussed in the next section on the Sustainable Indexing Valuation, no transfer of surplus from the Basic Account to the IAA is required. The Board may therefore choose to use the Basic Account surplus assets to do one or more of the following:

- Transfer to the RSA.
- Improve benefits.
- Further reduce the Basic contribution rate to a total maximum reduction of 1% below the EANC (i.e. 16.28% of salaries).
- Reallocate Basic contributions of up to 1% to post-retirement group benefits.
- Subject to approval under the Income tax Act (ITA), implement a combination of benefit enhancements and contribution rate reductions, where the value to the members equals that to the employer.

Variations that combine some, or all, of the alternatives are allowed by the JTA and the Board's funding policy. We would be happy to discuss alternatives with the Board.

## 3. Revised Contribution Rates

As explained above, given the level of the Accessible Going Concern Excess, the JTA requires member and employer contribution rates not be increased above their current levels, but permits the Board to elect to use remaining surplus to further decrease the contribution rate.

When the maximum permissible rates are combined with the current IAA and RSA contribution rates, the total maximum permissible rates become:

***Schedule 5 – Current and Maximum Permissible Total Contribution Rates***

| | Member | Employer | Total |
|---|---|---|---|
| Current Basic Account | 8.17% | 8.17% | 16.34% |
| **Maximum Permissible Basic Rate** | **8.17%** | **8.17%** | **16.34%** |
| Current IAA | 2.00% | 2.13% | 4.13% |
| Current RSA | 1.00% | 1.00% | 2.00% |
| **Total Maximum Permissible Contribution Rate** | **11.17%** | **11.30%** | **22.47%** |

We would be pleased to discuss the options for use of the remaining surplus with the Board.

### Income Tax Act Individual Member Requirements

Under the *ITA*, there is a requirement that individual member contributions may not exceed the lesser of:

a) 9% of salary, or

b) $1,000 plus 70% of the member's pension credit

although these conditions may be waived by the Minister of Finance provided that the contributions are "determined in a manner acceptable to the Minister and it is reasonable to expect that, on a long-term basis, the aggregate of the regular current service contributions made under the provision by all members will not exceed 1/2 of the amount that is required to fund the aggregate benefits in respect of which those contributions are made."

The current member contribution rate of 11.17% of salary exceeds the 9% limit and even if rates were reduced to the minimum permissible (i.e. total basic contribution of 1% below EANC, plus IAA) this would still be the case, so it is necessary to apply to the Minister for a waiver. Currently the employer contributions exceed the member contributions by 0.13% of pay and this differential will be automatically maintained in almost all circumstances contemplated by the JTA and funding policy. The exception to this might appear to be the circumstance where the Board decides to allocate surplus to the members by means of a benefit improvement and to the employer by a contribution rate reduction. If this course of action is under consideration, we understand that the Board would have to ensure that the requirement to qualify for a waiver is met as the member contributions always need to be acceptable under the ITA. A waiver was required, and obtained, following the last valuation.

## 4. Accrued Benefits – Funded Ratio

The accrued benefit funded ratio is calculated by dividing the Basic Account assets by the total liability for benefits accrued in respect of service to the valuation date. The asset/liability comparison is analogous to that in Schedule 1, except that contributions and benefits in respect of future service to be worked by existing members are excluded from the comparison. The results are shown below.

***Schedule 6 – Accrued Benefits - Funded Ratio at December 31, 2023***

**Basic Account – Non-Indexed Benefits**

| | ($ millions) | |
|---|---|---|
| | **2020** | **2023** |
| **Fund (Basic Account):** | | |
| • **Smoothed Value of Fund (including RSA)** | **25,643** | **33,283** |
| | | |
| **Accrued Liabilities:** | | |
| • active members | 8,843 | 10,565 |
| • LTD members | 387 | 513 |
| • terminated and inactive members | 404 | 298 |
| • pensions being paid | 12,913 | 15,034 |
| **Total Accrued Liabilities** | **22,547** | **26,410** |
| | | |
| **Surplus (Unfunded Actuarial Liability):** | | |
| • for accrued service only | 3,096 | 6,873 |
| | | |
| **Funded Ratio:** | | |
| Fund ÷ Total accrued liabilities | 114% | 126% |
| Assets in RSA | (892) | (1,437) |
| Adjusted Surplus (Unfunded Liability) net of RSA | 2,204 | 5,436 |

The above schedule indicates that the funded ratio for accrued benefits has improved from 114% to 126%. This is largely for reasons similar to the items in the analysis in Schedule 2.

## 5. Sensitivity Analysis

**Sensitivity Analysis under Standards of Practice**

The Canadian Institute of Actuaries Practice-Specific Standards for Pension Plans require disclosure of the effect of using a discount rate (investment return) 1.0% lower than that used for the valuation on:

a) The actuarial present value, at the calculation date, of projected benefits allocated to periods up to the calculation date, and

b) The service cost or the rule for calculating the service cost between the calculation date and the next calculation date.

The table below shows the impact on the accrued liability as required by (a) and the entry-age normal cost as required by (b) as at December 31, 2023 of a one percentage point drop in the discount rate assumption. All other assumptions were kept unchanged.

***Schedule 7 – Sensitivity - Impact of 1% drop in investment return on Accrued Benefits and Normal Cost***

| Impact on liabilities of 1% drop in discount rates ($ millions) | Going Concern 5.75% | Going Concern 4.75% | Increase |
|---|---|---|---|
| active members | 10,565 | 12,797 | 2,232 |
| LTD members | 513 | 609 | 96 |
| terminated and inactive members | 298 | 348 | 50 |
| pensions being paid | 15,034 | 16,314 | 1,280 |
| **Total increase in liabilities** | **26,410** | **30,068** | **3,658** |

| Impact on normal cost rate of 1% drop in discount rates | Going Concern 5.75% | Going Concern 4.75% | Increase |
|---|---|---|---|
| Current service cost rate | 17.28% | 22.33% | 5.05% |

**Sensitivity Analysis for Plan Funding**

Given that the plan is funded on the entry-age basis, we have also considered the impact of a one percentage point drop in the investment return assumption on the Basic Account non-indexed benefits consistent with Schedule 1. These figures are summarized in the table below:

***Schedule 8 – Sensitivity - Impact of 1% drop in investment return on Plan Funding***

| | ($ millions) | | |
|---|---|---|---|
| | **5.75%** | **4.75%** | **Increase** |
| Smoothed Value of Fund net of RSA | 31,846 | 31,846 | - |
| Actuarial present values of future contributions at entry-age rates | 8,364 | 11,514 | 3,150 |
| **Total Assets net of RSA** | **40,210** | **43,360** | **3,150** |
| **Total Liabilities** | **35,638** | **42,369** | **6,731** |
| Surplus/ (Unfunded liability) on entry-age basis | 4,572 | 991 | (3,581) |
| Accessible Going Concern Excess | 3,208 | - | (3,208) |
| Entry Age Normal Cost | 17.28% | 22.33% | 5.05% |
| • 25 year amortization of Accessible Going Concern Excess | (4.33%) | 0.00% | 0.94% |
| • JTA-B Amortization | (17.27%) | 0.00% | |
| • JTA minimum required reduction from Normal Cost | (0.94%) | 0.00% | |
| **Maximum permissible rate** | 16.34% | 22.33% | 5.99% |

## 6. Supplementary Valuations

Expanded results are shown in Appendix F, on the following bases:

- For basic and indexed benefits combined, on the assumption that indexed benefits are to be fully funded, in advance, as for basic benefits;
- For basic only, and basic plus indexed benefits, including only benefits accrued to the valuation date; and
- Limiting benefits to those permitted under the *Income Tax Act*; this is done both for:
    - Basic benefits only; and for
    - Basic plus indexed benefits.

The adjustments to the assumptions are discussed in Appendix B. The fully indexed funding valuation result takes into account IAA contributions of 4.13% in total (2.0% from members and 2.13% from the employer).

The key results are summarized below:

***Schedule 9 – Indexed Benefits (without tax limits)***

| Funded position ($millions) | Basic Only | Basic + Indexed |
|---|---|---|
| Smoothed Value of Fund net of RSA | 31,846 | 38,453 |
| Actuarial present values of future contributions at entry-age rates | 8,364 | 11,547 |
| Total Assets net of RSA | 40,210 | 50,000 |
| Total Liabilities | 35,638 | 47,087 |
| **Surplus (Unfunded Liability)** | **4,572** | **2,913** |
| **Contribution Rates** | | |
| Current Member | 8.17% | 10.17% |
| Current Employer | 8.17% | 10.30% |
| **Current Total** | **16.34%** | **20.47%** |
| Entry-age normal cost | 17.28% | 23.75% |
| 25 year Amortization (illustrative based on total surplus) | (6.16%) | (3.83%) |
| **Total – Entry-Age with Amortization and Rounding** | **11.12%** | **19.92%** |

If assets and liabilities are restricted to accrued service only, i.e. analogous to Schedule 6 earlier, the 2023 unfunded liability and funded ratio change as follows:

***Schedule 10 – Indexed Accrued Benefits (without tax limits) – Funded Ratio at December 31, 2023***

| ($millions) | Basic Only | Basic + Indexed |
|---|---|---|
| Smoothed Value of Fund | 33,283 | 39,891 |
| Total Accrued Liabilities | 26,410 | 34,652 |
| **Surplus (Unfunded Liability)** | **6,873** | **5,239** |
| Funded Ratio | 126% | 115% |
| Assets in RSA | (1,437) | (1,437) |
| Adjusted Surplus (Unfunded Liability) net of RSA | 5,436 | 3,802 |

***Benefits Limited to ITA Maximums***

When the income tax limits on benefits are recognized, the above 2023 surplus (unfunded liabilities) and normal cost rates change marginally. The key results are summarized below.

***Schedule 11 – Benefits Limited to ITA Maximums - Basic Account Only: net of RSA***

| Basic Only | Without Tax Limit | With Tax Limit |
|---|---|---|
| **Surplus (Unfunded Liability) ($millions)** | | |
| Entry Age Basis | 4,572 | 4,567 |
| Accrued Service Only | 5,436 | 5,453 |
| **Contribution Rate** | | |
| Entry Age Normal Cost | 17.28% | 17.21% |
| 25 year Amortization of Accessible Going Concern Excess | (4.33%) | (4.32%) |
| **Total** | **12.95%** | **12.89%** |
| **Funding Policy maximum permissible rate** | **16.34%** | **16.34%** |

***Schedule 12 – Benefits Limited to ITA Maximums - Indexed Benefits: net of RSA***

| Basic and Indexed | Without Tax Limit | With Tax Limit |
|---|---|---|
| **Surplus (Unfunded Liability) ($millions)** | | |
| Entry Age Basis | 2,913 | 2,904 |
| Accrued Service Only | 3,802 | 3,825 |
| **Contribution Rate** | | |
| Entry Age Normal Cost | 23.75% | 23.66% |
| 25 year Amortization (illustrative based on total surplus) | (3.83%) | (3.82%) |
| **Total** | **19.92%** | **19.84%** |

## 7. Test Maximum Surplus and Contributions for Tax Purposes

Section 147.2(2) of the *Income Tax Act* limits employer contributions that may be made to a plan if there is a surplus that exceeds 25% of the actuarial liability - the plan becomes revocable if contributions are made when such surplus exists.

Subsection (c) of Section 147.2(2) of the *Income Tax Act* also provides that the benefits taken into account for the purposes of a contribution recommendation "may include anticipated cost-of-living and similar adjustments where the terms of a pension plan do not require that those adjustments be made but it is reasonable to expect that they will be made".

Indexing at full CPI has been provided since January 1, 1982 under the present Plan terms, and for many years before that under earlier Plan provisions. Further, there is a fund set aside to fund future indexing and contributions are made to this fund on an ongoing basis. Thus, it is appropriate for purposes of testing the *ITA* 147.2(2) limits to recognize the future indexing of pensions for the current Plan membership.

Accordingly, the valuation results on the fully indexed basis, recognizing the income tax limits on benefits, should be considered.

For the purpose of this test, the total assets should include the $1,437 million in the RSA, and the resulting EANC tested against contributions including the 2% of salaries currently being diverted to the RSA.

***Schedule 13 – Pensions Limited to ITA Maximums - Maximum Surplus and Contributions Test***

| Basic and Indexed | With Tax Limit |
|---|---|
| **Surplus (Unfunded Liability)** | **($millions)** |
| Entry Age Basis net of RSA | 2,904 |
| Amount in RSA | 1,437 |
| Resulting Surplus for ITA test | 4,341 |
| **Net liability** | 35,549 |
| 25% of Net liability | 8,887 |
| **Contribution Rate** | **%** |
| Fully Indexed Entry Age Normal Cost | 23.66 |

The fully indexed valuation, recognising the income tax limits and including the RSA, shows a surplus of $4,341 million. The corresponding net liability (indexed liability less the present value of the indexed entry age normal cost) is $35,549 million, so the 25% limit is $8,887 million. Thus, the Plan does not have an excess *ITA* surplus. Given that there is a surplus, but not an excess surplus, the maximum contributions to the plan may not exceed those calculated at the fully indexed, income tax limited, entry-age normal cost rate of 23.66%. Should contributions exceed this amount, the excess above 23.66% will need to be directed to the Supplemental Benefits Account which is used to finance benefits in excess of the *Income Tax Act* limits. The current total contributions of 22.47% are less than the ITA limit and therefore are acceptable under the ITA.

# Section 5. Sustainable Indexing Valuation

The Sustainable Indexing Valuation establishes the level of indexing that can be sustained in the long term taking into account the assets of the plan and the long term funding commitment to the Plan. The valuation basis is different from the Funding Valuation basis as discussed in Section 3 and Appendix B.

## 1. Long Term Funding Commitment and Amortization Requirements

Based on the results discussed in Section 4, the contribution requirements of the plan can be summarised as:

| Long Term Funding Commitment | 2023 |
|---|---|
| Normal (entry-age) actuarial cost | 17.28% |
| IAA contributions – current average | 4.13%[1] |
| **Long term funding commitment – excluding current amortization schedule** | **21.41%** |

## 2. Results

Taking the maximum permissible Basic account contributions of 16.34% of salaries into account, we have calculated that the 2023 sustainable indexing level exceeds the inflation assumption of 2.25% per year. Thus, indexing at 100% of CPI is sustainable. In 2020 indexing was also sustainable at 100% of CPI.

[1] Excluding 2% IAA contributions reallocated to RSA.

Allowing for indexing of 2.25% per year, and using the sustainable indexing assumptions discussed earlier, we obtain the following balance sheet and contribution requirements:

| | 2023 ($ millions) |
|---|---|
| **Sustainable Indexing Target** | **2.25%** |
| **Assets** | |
| Market Value of Fund | 37,959 |
| Asset Smoothing Adjustment (capped at 5%) | 1,897 |
| RSA | (1,437) |
| **Smoothed Value of Fund for Sustainable Indexing** | **38,419** |
| Actuarial present values of contributions at Entry Age Normal Cost[1] | 9,747 |
| **Total Assets** | **48,166** |
| **Total Liabilities** | **43,185** |
| **Surplus (Unfunded Actuarial Liability)** | **4,982** |
| Present value of Basic Account amortization if surplus used to keep the current contribution rate (maximum permissible) | (677) |
| **Adjusted Surplus (Unfunded Actuarial Liability)** | **4,305** |
| **Contribution Requirements** | |
| Entry Age Normal Cost - based on sustainable indexing target | 20.83% |
| Amortization of (surplus) / unfunded liability over infinite period | (3.06%) |
| **Required contribution** | **17.77%** |
| **Long term contribution commitment** | **21.41%** |

The above results show that, at an indexing rate of 2.25% per year, the required contribution rate is 17.77% of pay, which is 3.64% less than the long term contribution commitment of 21.41%. This represents a considerable margin in the sustainable indexing results.

Although indexing is sustainable at 100% of CPI, the JTA requires a transfer of surplus assets from the Basic account to the IAA, if needed, "to ensure the IAA has a prudent reserve".

The target amount in the IAA to achieve a prudent reserve is defined in the funding policy as "the amount required in order to keep the stochastically modeled likelihood of an indexing cap being reinstated to less than 25% over a period of 15 years following the valuation in question."

An updated stochastic model reflecting this 2023 actuarial valuation has not yet been developed. However, we have updated the stochastic model based on the 2020 valuation to allow for investment returns and

[1] This allows for indexing at 2.25% and reflects a 6.00% discount rate.

inflation between 2020 and 2023, the current investment strategy and Eckler's latest capital market assumptions. We have also made approximate adjustments to the liabilities within the stochastic model to account for experience and changes in assumptions between the 2020 and 2023 valuations. On this basis, the likelihood of an indexing cap ever being reinstated over the 12 years from 2023 is around 2%. Although the projection period is 12 years rather than 15, this is well below the 25% threshold in the funding policy, and we can conclude that there is no need to transfer any Basic account surplus to the IAA to support indexing. This conclusion will be strengthened further if the 2% of salaries we have assumed for the analysis is permanently diverted to the RSA is contributed to the IAA in part or full in the future.

If a valuation shows that indexing is not sustainable at 100% of CPI, the JTA requires that the contributions that were reallocated from the IAA to the RSA (2% of salaries, with 1% each from members the employer) must revert to the IAA for a 3 year period, to the extent required to support full sustainable indexing. The results above show that indexing remains sustainable at 100% of CPI, with a margin, so these contributions should continue to be made to the RSA.

The sustainable level of indexing will be re-evaluated at the next valuation and is likely to differ from the current level as a result of ongoing experience gains or losses and any changes to the valuation assumptions at that time.

## Section 6. Subsequent Events

To the best of our knowledge there have been no events subsequent to the valuation date that would have an impact on the results of this valuation, or alter our opinion.

## Section 7. Actuarial Opinion

In our opinion,

a) The membership data on which the valuation is based are sufficient and reliable for purposes of the valuation;

b) The assumptions are appropriate for 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. Pursuant to the JTA and regulatory requirements, the next valuation should be completed no later than as of December 31, 2026.

## Section 8. Acknowledgement

We gratefully acknowledge the generous assistance of the staff of the Pension Corporation in the preparation of the data and other items required for this report.

Respectfully submitted,

Catherine Robertson
Fellow of the Canadian Institute of Actuaries[1]
Fellow of the Institute and Faculty of Actuaries

Euan Reid
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September 10, 2024

[1] Canadian Institute of Actuaries is the Primary Regulator.

# Appendix A: Summary of Plan and Amendments

## As at December 31, 2023

***Changes to the Plan***

The previous valuation was based on the provisions of the Teachers' Pension Plan as at December 31, 2020.

Between January 1, 2021 and December 31, 2023, the plan text was amended once. Plan rule amendment no. 42 took effect on December 4, 2023. Changes were made to the plan text to clarify terminology, correct grammar, remove redundancies and improve readability.

The main provisions of the plan are summarized below. Except as otherwise noted, the section references are to the Teachers' Pension Plan Rules as at December 31, 2023. The valuation is based on these provisions.

***Employer and Employee Eligibility***

The plan applies to a board of education constituted under the *School Act*, a francophone education authority established under the *School Act*, an official trustee appointed under the *School Act* and to any other body designated by the board or former board as an employer, on terms and conditions of eligibility specified by the board or former board. [Section 2]

Participation is compulsory for teachers, administrative officers, associated professionals, and certified professionals employed by boards of school trustees or francophone education authorities. [Section 3]

***Member Contributions***

Section 5 defines the following contributions, which are deducted from a member's salary effective January 1, 2020:

a) 8.17% of the member's salary—paid into the Basic Account;

b) 2.0% of the member's salary—paid into the Inflation Adjustment Account (IAA); and

c) 1.0% of the member's salary—notionally allocated to the Rate Stabilization Account (RSA) within the Basic Account.

Prior to January 1, 2018, member contributions ceased if a member accrued 35 years of pensionable service. Effective January 1, 2018, members continue to contribute after 35 years of pensionable service, and member contributions resumed for any active members who had 35 years of pensionable service at that date.

***Employer Contributions***

Section 6 requires every employer to contribute the following amounts effective January 1, 2020:

a) 8.17% of the member's salary—paid into the Basic Account;

b) 2.13% of the member's salary—paid into the IAA; and

c) 1.0% of the member's salary—notionally allocated to the RSA within the Basic Account.

Employer contributions continue to be remitted on behalf of employees who have accrued 35 years of pensionable service.

***Funding and Transitional Rules***

On June 28, 2021, the partners signed the Restated Joint Trust Agreement (Restated JTA). This document amends the Joint Trust Agreement signed by the partners in 2001, as amended from time to time (2001 JTA).

The previous funding and transitional rules were covered in Articles 10, 15 and Appendix B of the 2001 JTA, as amended by Amending Agreement No. 3, dated December 11, 2015, Amending Agreement No. 4, dated June 16, 2016, and Amending Agreement No. 5, dated June 28, 2019.

***Retirement Benefits: Eligibility Conditions for Retirement Benefit***

The normal retirement age is 65 for all members. Section 50 provides that an active member who, on or after September 30, 2015, terminates employment on or after reaching earliest retirement age is, on application, entitled to receive a retirement benefit calculated in accordance with sections 54 and 55.

***Calculation of Unreduced Retirement Benefit***

Section 54 provides that the unreduced lifetime monthly pension payable to a member, in the form of a single life annuity with a 10-year guarantee, is calculated as the sum of the following:

a) 1.3% of the lesser of

   1. the member's highest average salary, and

   2. 1/12 of the year's maximum pensionable earnings (YMPE) for the calendar year immediately before the calendar year of the effective date of the retirement benefit payable to the member,

      multiplied by the number of years of pensionable service accrued before January 1, 2018, not exceeding 35 years,

b) 2% of the excess of the member's highest average salary over the amount determined under paragraph (a) (ii), multiplied by the number of years of pensionable service accrued before January 1, 2018, not exceeding 35 years, and

c) 1.9% of the member's highest average salary multiplied by the number of years of pensionable service accrued after December 31, 2017. Note: if a member terminated employment before January 1, 2019, the reference to "1.9%" is deemed to be a reference to "1.85%".

In addition, the member is entitled to a monthly bridge benefit payable until the earlier of the death of the member or the member reaching age 65; that is:

d) 0.7% of the lesser of

1. the member's highest average salary, and
2. 1/12 of the YMPE for the calendar year immediately before the calendar year of the effective date of the retirement benefit payable to the member,

   multiplied by

3. the number of years of pensionable service accrued before January 1, 2018.

Highest average salary means one-twelfth of the average annual salary earned by a member during the 5 years of pensionable service (not necessarily consecutive) in which the salaries were highest (or, if the member has accrued less than 5 years of pensionable service, the total number of years and partial years of pensionable service).

A member who has made voluntary additional contributions in the past (these are no longer accepted) will be granted an additional pension or may take a refund of the balance in that account, including interest at fund interest rates.

***Calculation of Reduced Retirement Benefit***

Where a reduced retirement benefit is payable under section 55 to members who have 2 or more years of contributory service,

a) section 55 (3) (a) provides that the retirement benefit described above for service accrued before January 1, 2018, is reduced by a percentage equal to 3% for each year by which the member's age is less than 60, or the sum of the member's age plus years of contributory service is less than 90, prorated for fractions of a year, whichever is less; and

b) section 55 (3) (b) provides that the retirement benefit described above for service accrued after December 31, 2017, is reduced by a percentage equal to 4.5% for each year by which the member's age is less than 61, prorated for fractions of a year.

Where a reduced retirement benefit is payable under section 55 to members aged between 55 and 65 who have less than 2 years of contributory service,

c) section 55 (2) (a) provides that the retirement benefit, described above for service accrued before January 1, 2018, is reduced by a percentage equal to 5% for each year by which the member's age is less than age 65, prorated for fractions of a year; and

d) section 55 (2) (b) provides that the retirement benefit, described above for service accrued after December 31, 2017, is reduced by a percentage equal to 4.5% for each year by which the member's age is less than age 65, prorated for fractions of a year.

If the member terminates employment, under age 55, with less than 10 years of pensionable service, or has not completed at least 1 year of pensionable service or 2 years of contributory service in the 24 calendar months immediately preceding termination of employment, then the 3% (per year) early retirement reduction factor referred to in section 55 (3) (a) for service accrued prior to January 1, 2018 is increased to 5% (per year).

***Alternative Types of Pensions***

Section 56 provides that a pension may be granted on the single life plan with no guaranteed period (normal form if the member terminated employment before January 1, 2019), single life plan with a guaranteed period of 5 years, 10 years (normal form if the member terminates employment on or after January 1, 2019) or 15 years, joint life and last survivor plan, temporary annuity plan or a combination of these plans with the approval of the plan administrative agent. The amount of any pension granted on a form other than the normal form is calculated on an actuarially equivalent basis.

Section 56 (6) provides that where a member has a spouse at retirement, the member is required, at a minimum, to elect that 60% of the member's pension be paid on the joint life and last survivor plan, unless the spouse waives this requirement in writing or there is a written agreement or court order made under Part 5 or 6 of the *Family Law Act* that is filed with the plan administrative agent. A spouse is as defined in section 96 (1) of the plan rules and includes a common-law or same-sex spouse.

***Disability Benefits***

Sections 12 (7) and 99 (2) provide that if a member is receiving a monthly income benefit from an approved group disability plan, the member and employer do not make contributions and the member is not entitled to a benefit under the plan, but the period for which the member receives such group disability income benefit is considered pensionable service, with the final retirement benefit based on the highest average salary at disablement increased to retirement in accordance with changes in the Consumer Price Index (CPI).

Section 60 provides that a member is entitled upon application to a disability benefit if the member, before reaching age 61, has terminated employment, is totally and permanently disabled, has completed 2 years of contributory service (but less than 35 years), is not eligible for a monthly income benefit from a group disability plan, and has not received a lump sum payment in lieu of monthly long-term disability payments from a group disability plan. Section 63 provides that where a disability benefit is payable, the disability benefit is an immediate unreduced benefit based on service earned to date.

***Pre-retirement Death Benefits***

The pre-retirement death benefits for active and inactive plan members are covered in section 69, and are as follows:

a) if there is no surviving spouse or a valid spousal waiver has been filed, the benefit payable to the beneficiary is an amount equal to the greater of a refund of the member's contributions with interest at the refund interest rates, and the commuted value of the retirement benefit earned to the date of death. If a valid spousal waiver has been filed, the surviving spouse cannot be designated as beneficiary;

b) if the member has not attained age 55 at the date of death, and there is a surviving spouse and a valid spousal waiver has not been filed, the spouse may elect to receive as a benefit either of the following:

   (i) the greater of a refund of the member's contributions with interest at the refund interest rates, and the commuted value of the retirement benefit earned to the date of death; or

   (ii) an immediate pension that is actuarially equivalent to the commuted value of the retirement benefit earned to the date of death, payable for the life of the spouse;

c) if the member has attained age 55 on the date of death, and there is a surviving spouse and a valid spousal waiver has not been filed, then the benefit is an immediate pension to the spouse that is actuarially equivalent to the commuted value of the retirement benefit earned to the date of death calculated as though the member had terminated employment immediately before death, payable for the life of the spouse.

***Vesting and Portability***

Under sections 42(1)(b) and 45, a terminating member is entitled to a deferred retirement benefit equal to the full normal pension accrued to the date of termination; this may be paid on a reduced basis at an early retirement date depending on the service to termination (see above "Eligibility Conditions for Retirement Benefit" section).

Sections 42 (1) (c) and 46 provide for the payment of a lump sum commuted value in lieu of the deferred retirement benefit, if the member is below age 55, subject to the commuted value being payable on a locked-in basis. Under certain limited conditions (small pensions, non-resident status or small commuted values) the PBSA permits the election of a lump-sum pay-out, regardless of age, and on a non-locked-in basis.

Section 100 provides that the deferred retirement benefit of a terminating member is based on the highest average salary at termination, first increased, if applicable, to December 31, 1980, based on calendar year changes in the CPI, and then to retirement based on the percentage increase granted to retirement benefits each January 1 under section 73. After 1980, the highest average salary is increased to retirement by the percentage increase granted to retirement benefits for the period between the month of termination and the month the retirement benefit becomes effective.

Section 75 (3) (h) provides that the cost of the deferred indexing described above is funded from the IAA.

***Cost of Living Benefits (Indexing)***

Section 73 sets out how cost-of-living benefits are to be administered. It provides that on January 1st of each year, a retired member may receive a cost-of-living increase, subject to sufficient funds being available in the IAA from which the benefit is funded. The benefit is based on the total amount of pension being received, including previous cost of living increases, less any portion of the pension that is a result of voluntary contributions (which are no longer permitted). The bridge benefit to age 65, payable as part of the regular pension formula, and a temporary annuity arising as a result of converting some or all of the regular pension to one of the optional forms, are also subject to indexing increases (benefits subject to indexing are indexable benefits). The maximum increase is equal to the percentage increase in the CPI over the 12 months ending on September 30 of the previous year.

Section 73 sets out additional requirements with regards to the cost-of-living benefit, including:

a) The same uniform percentage increase will be granted in respect of all indexable benefits eligible for adjustment;

b) The increase is prorated if the indexable benefit has not been in payment for at least 12 months;

c) The total capitalized value of all cost-of-living benefits granted on January 1 must not exceed the amount in the IAA on the preceding September 30;

d) The capitalized value of all cost-of-living benefits granted annually is transferred from the IAA to the Basic Account; and

e) In the event of deflation, the deflation will be recovered before any further cost of living adjustments are granted in the future.

***The Fund***

Section 75 provides that the pension fund is divided into the following three accounts:

a) The Basic Account, consisting of all the assets in the fund other than assets in the IAA and the Supplemental Benefits Account (for greater certainty, the RSA is notional account within the Basic Account);

b) The IAA, consisting of:

   (i) the 2.00% contribution by each of the members under section 5 (1) (c);

   (ii) the 2.13% employer contributions under section 6 (1) (c);

   (iii) the net investment income earned on the IAA;

   (iv) subject to the prior approval of the board, all or such lesser part as the board designates of the income, as determined by the plan administrative agent, that is earned on fund assets held in the

Basic Account in respect of indexable benefits being paid and that is in excess of the investment return anticipated in the most recent actuarial valuation; and

(v) amounts transferred from the RSA within the Basic Account in accordance with section 75 (2.1) (f);

less:

(vi) amounts transferred to the Basic Account in respect of capitalized cost of living benefits granted under section 73;

(vii) refunds to plan members in respect of the 2.00% contribution made to this account under section 5 (1) (c), or amounts otherwise transferred out of this account in respect of member and employer contributions allocated to this account;

(viii) amounts determined by the plan administrative agent in respect of the portions of commuted value payments or other transfers out of the plan that are attributable to cost of living adjustments;

(ix) amounts transferred to the Basic Account that are equal to the capitalized value of increases in deferred retirement benefits resulting from increases in highest average salaries under section 100; and

(x) amounts transferred to the Supplemental Benefits Account to cover inflation protection on benefits in excess of those registrable under the *Income Tax Act*; and

(Article 10.2 of the Restated JTA also permits the board to transfer portions of any surplus assets in the Basic Account to the IAA.)

c) The Supplemental Benefits Account, consisting of assets required for the administration and payment of benefits that are non-registrable under the *Income Tax Act*.

***Income Tax Act Limits***

The *Income Tax Act* imposes certain limits on the contributions that may be made to, and the benefits that may be paid from, a registered pension plan. However, in total, the contribution requirements from, and the benefit promises to, plan members have not been altered under the Teachers' Pension Plan. To this end, a Supplemental Benefits Account has been created to cover the financing and payment of benefits in excess of those registrable under the *Income Tax Act*. The excess benefits are paid on a current cash basis, by allocating from the regular employer contributions, the amounts necessary to maintain the Supplemental Benefits Account at a zero balance. Effectively, from a plan member's perspective, it is expected that these procedures will be invisible, as the total contribution and benefit obligations remain unchanged. We have ignored the implications of all such internal restructuring in completing the primary, Basic Account valuation. In the plan summary herein, and elsewhere in this valuation report, our references to contributions/benefits to/from the Basic Account/IAA are inclusive of the allocations to/from the Supplemental Benefits Account; in general, the allocations to/from the Supplemental Benefits Account have not been referenced.

We have also completed supplementary valuations recognizing the income tax limits on pensions. We understand that these limits are applied only in respect of service after 1991. The maximum annual pension permitted (before application of any early retirement reductions, where applicable) is the lesser of:

**a)** $3,506.67 in 2023 (increasing thereafter in accordance with an external general wage index) multiplied by the years of service; and

**b)** 2% multiplied by the years of service further multiplied by the average of the best 3 years of remuneration paid to the member.

For service earned before 2018, the plan also imposes a 35-year cap on accruals at the above maximum rate.

***Other Items***

1. The Post-Retirement Group Benefit Rules set out the non-pension (i.e. group) benefits that are provided to retired members. Non-pension benefits were previously contained in sections 91 through 95 of the plan rules which were repealed effective January 1, 2004.

   Effective May 1, 2002, the member was responsible for paying for 100% of the premiums for coverage under the British Columbia Medical Services Plan (MSP) for the member and any eligible dependants. An unsubsidized voluntary dental plan came into effect August 1, 2007. An unsubsidized voluntary extended health care plan came into effect January 1, 2012. The provincial government eliminated MSP premiums effective January 1, 2020.

2. Section 3.2 of the Restated JTA provides that all expenses incurred in the administration of the plan are to be paid from the fund.

3. Section 57 enables an employer to request the plan administrative agent to adopt a Special Retirement Incentive Plan (SRIP), whereby the age and service conditions, or the early retirement percentage reductions, or both, may be adjusted. Where the plan administrative agent agrees, the administrative agent must also determine the members eligible for the SRIP, the period it remains open, the conditions applicable to the incentives, the additional costs to the employer, and the timing of these payments to fund the SRIP.

4. Transfers between the four public sector pension plans in British Columbia exist under the National Public Service Pension Transfer Agreement (NTA). The NTA operates as a transfer of reserve agreement, providing for the transfer of funds equal to the actuarial value of the benefit from the exporting plan to the importing plan. Members have an opportunity to purchase any shortfall.

5. A maximum of 5 years taken to raise a child may be recognized as contributory service in establishing eligibility for a pension provided the member has a period of pensionable service immediately before and after the child-rearing period(s).

# Appendix B: Actuarial Methods and Assumptions

The most significant actuarial assumptions are summarized below. These assumptions are unchanged from those assumed for the previous valuation.

| | Funding Valuation | Sustainable Indexing Valuation |
|---|---|---|
| **Investment Return** | 5.75% per annum | 6.00% per annum |
| **General ("across-the-board") Salary Increases** | 3.25% per annum | 3.00% per annum |
| **Seniority Salary Increases** | Annual percentages varying by age and sex | Annual percentages varying by age and sex |
| **CPI Increases** | 2.50% | 2.25% |
| **Pension Indexing** | • Future indexing of pensions and deferred pensions ignored, as will be covered by Inflation Adjustment Account<br>• Future indexing (by inflation) of wage base for disability accruals assumed to be a charge to the Basic Account and to be 2.50% per annum. Indexing to date is capitalized and forms part of pension | • Future indexing of pensions and deferred pensions at "Sustainable Indexing Rate" – This rate is calculated and is the primary output of this valuation<br>• Future indexing (by inflation) of wage base for disability accruals assumed to be a charge to the Basic Account and to be 2.25% per annum. Indexing to date is capitalized and forms part of pension |
| **Asset Values** | • Assets carried at smoothed market values<br>• Smoothed value restricted to a range of 92% to 108% | • Assets carried at smoothed market values<br>• Smoothed value restricted to a range of 95% to 105% |
| **Costing Method** | • Contributions are based on an entry-age funding approach | • Contributions are based on an entry-age funding approach |

More detail with respect to the above, detail with respect to other assumptions, and comparisons with assumptions and approaches in the previous valuation follow.

## 1. Actuarial Methods

The plan has been valued on a going concern basis, which assumes that the plan will continue to operate indefinitely. The going concern basis is used to estimate the funded position of the Plan, and to estimate the contributions required to be made to the Plan's fund.

The methodology used to calculate the valuation liabilities shown in the statement of actuarial position was as follows:

- The liability for current pensioners and active members was calculated by projecting the benefit payments to be made to those persons and to their eligible spouses using the actuarial assumptions described below and then discounting those projected payments to the valuation date at the investment return assumption.
- The liability for members currently receiving benefits from a long-term disability plan was calculated as if they would continue to earn service credits and ultimately receive a pension from the Plan.
- The liability for the inactive group (including those entitled to deferred vested pensions) was calculated on the assumption that they would collect deferred vested pensions.
- The liability for the remaining inactive members was generally calculated as twice their accumulated refund values.

In order to test the adequacy of the current contribution rates, we calculated the required member/employer contribution rate for current service in accordance with the entry-age actuarial cost method, based on the data for those members who joined the plan in the last three years prior to the valuation date and the actuarial assumptions described below. This method produces the level rate of the member/employer contributions sufficient to provide the benefits for the average future new entrants to the plan. The cost so determined is also referred to as the normal actuarial cost and is calculated on an aggregate basis for all entrants as a level percentage of salaries.

The valuation assets consist of:

(i) The Basic Account; and

(ii) The present value of future member and employer contributions at the entry-age normal cost rates (with the first year's contributions at the current rate), for the closed active group, for the basic non-indexed benefits.

(iii) The present value of any existing amortization requirements established at previous valuations.

The funded position, including the present value of any previously established unfunded liability amortization requirements, is then considered. If the assets exceed the liabilities, then the difference between them gives rise to an actuarial surplus. If the liabilities exceed the assets, then there is an unfunded liability. Adjustments to the normal cost, sufficient to amortize the surplus or unfunded liability were then determined in accordance with the Joint Trust Agreement and the Board's funding policy. The required contributions are the sum of the normal actuarial cost and the amounts required to amortize the unfunded actuarial liability/surplus.

The contribution rates must comply with the JTA-B funding requirements (the going concern funding requirements of the PBSA, as those requirements existed prior to December 31, 2019). This means that if

there is an unfunded liability, it must be amortized over 15 years from one year after the date it is established as described above. If there is a surplus, the contribution rate may not be less than the normal cost, reduced by the rate that amortizes the surplus in excess of 5% of net liabilities over not less than 5 years.

## 2. Treatment of Member and Pensioner Data

Data as of December 31, 2023 were prepared by the Pension Corporation and the membership counts received are as follows:

| | Pension Corp. Data |
|---|---|
| Pensioners | 41,741 |
| Active Members | 50,318 |
| Long Term Disability | 1,107 |
| Terminated Vested | 7,451 |
| Inactive Members (not including 4 on leave of absence) | 6,035 |
| Leave of absence | 4 |
| Limited Data | 1,178 |
| **Total Membership** | **107,834** |

The data also included 7,179 active member terminations and 2,867 pensioner terminations during the period January 1, 2021 to December 31, 2023. The Pension Corporation advised us that the data supplied are generally proper, complete and in accordance with specifications, unless otherwise noted.

Where possible, we compared totals with corresponding details in the Plan's audited Annual Reports. We also subjected the 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;
- A member's date of birth did not change;
- A member joined the plan or commenced pension at a reasonable age;
- Accrued service increased by a reasonable amount (e.g. no more than 30 months since the last valuation and no more than 10 months in the valuation year);
- The salary level and the salary increase from the previous valuation was within a reasonable range;
- Pensions in pay increased by a reasonable amount (e.g. in line with the indexation since the last valuation); 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) 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.

There were a number of discrepancies recorded during our examination of the data and we sought clarification of these from the Pension Corporation. Where necessary, we modified the data, our assumptions, or both, to compensate for these discrepancies.

**Active Members**

The active member data includes a number of individuals who work less than full time. For the purposes of calculating liabilities and normal actuarial costs, we treated all members as if they were full-time employees after the valuation date; however, in calculating the amortization costs as a percentage of total future payrolls, we reduced the total payroll base by 12% to reflect the part-time employment (the same adjustment was applied at the previous valuation).

The active member data included 2,939 persons who had no salary or service reported for the year ending December 31, 2023, or with a last-contribution-date prior to December 2023. We treated these active members as follows:

- For the 1,887 of them who have at least 2 years of service, have contributed to the Plan in the last 10 years and have basic employee contributions with interest balances of at least $1,500, we treated them as active members (we set their salaries equal to the average salaries for active members in the same age-group category for those members missing salaries);
- For the remaining 1,052 members, we held a liability equal to twice the basic employee contributions with interest balance.

In the previous valuation, the liability for the first group was calculated as two and half times their employee contribution with interest balance, which was a proxy for 50% of the group receiving deferred vested pensions and 50% becoming active again. In recent valuations, we have seen a high percentage of these members listed as active with less than 10 years of service return to active membership, and hence we have simplified the approach to assume all remain active.

We calculated the liability for the 4 members on a leave of absence on the assumption that these members became active members again on January 1, 2024 (with assumed average salary equal to the average salary for active members in the same age sex category).

Salary details were inappropriate (very low) for 4 active members. We assumed that these members had the same average earnings as for other actives in the same age-sex category.

**Members on Long-Term Disability**

We calculated the liability for 1,107 of the members on long-term disability as if these individuals would ultimately collect deferred vested pensions starting at age 61 (unchanged from previous valuation) with deferred pensions on the basis of service projected to retirement date and the actual salaries indexed to the

valuation date. Where the actual salary detail shown for those members was inappropriate or missing, we used the average salaries for active members in the same age-sex category.

In the previous valuation, the liabilities for members on long-term disability were calculated as 85% of the amount from the deferred vested pension treatment outlined above and 15% of the liability as if these members became contributing members of the plan again. This combined treatment explicitly allowed for the possibility of recoveries from disability. Whilst it is expected (and observed) that some members do recover, the liabilities from the two methods are relatively similar. The deferred vested pension approach produces a slightly higher liability, although the difference is not material. Hence, we have simplified the approach to use 100% of the deferred vested pension method.

In previous valuations, for members on long-term disability who had missing, invalid or inconsistent detail (mostly missing salaries), we held a liability for them of twice their accumulated accounts. There were no members missing such details (other than salaries) in this valuation.

**Terminated Members**

We divided the 7,451 terminated members entitled to a vested pension into two classes:

(i) 325 terminated members with missing, invalid or inconsistent detail, and

(ii) All other terminated members.

The liability for the first group was held as twice their accumulated accounts. For the second group, we calculated liabilities on the assumption that 100% of these members would receive vested pensions.

In the previous valuation, we calculated the labilities for those in the second group on the assumption that 50% of those who had been inactive for less than 10 years would be reactivated immediately (with salaries set equal to the average salaries for active members in the same age-sex category), and that the remaining members would remain inactive and receive deferred vested pensions. In recent valuations, we have seen very few of those members listed as terminated with less than 10 years of service return to active membership. As a result, we have simplified the approach for this valuation and valued all terminated members in the second group on the assumption that they receive a vested pension. This revised assumption marginally reduces the liability when compared to the previous approach.

**Inactive Members**

We calculated the liability for 6,035 inactive members to be twice their basic employee contributions with interest balance. A similar approach was used in the previous valuation.

**Members with Limited Data**

With respect to the 1,178 remaining non-retired members with limited data, we held a liability equal to twice their basic employee contributions with interest balance.

**Reactivated Members**

In previous valuations, as noted in various of the data treatment summaries above, we treated a number of members as reactivated i.e. we valued them assuming they were granted future salary increases, but with no corresponding future service or contributions. The number of members assumed to be reactivated was a small percentage of total. As noted above, we've simplified the approach for this valuation, and removed any allowance for reactivated members. Removing the allowance for reactivating in the valuation of the terminated members reduces the liability, whereas it increases the liability in the case of the other groups where the approach was used. The net impact is a small increase in the total liability.

**Pensioners**

Of the total pensioner data, there were 67 members excluded from the valuation because they died prior to the valuation date with no outstanding guaranteed pensions due or they were in receipt of a remaining guarantee only which rounded to zero months remaining, and hence their liability is zero.

The data from the Pension Corporation and our treatment of this data is summarised below. Further details on the active member data, the new entrant groups on which our entry-age costs are based, the inactive member data and the pensioner data are summarized in Appendices C, D and E.

| | Pension Corp. Data | Valuation Treatment | | | | | |
|---|---|---|---|---|---|---|---|
| | | Pensioners | Pensioners with zero liability | Active Members | LTD | Vested | Refund 2 x CWI[1] |
| Pensioners | 41,741 | 41,674 | 67 | | | | |
| Active Members | 50,318 | | | 49,266 | | | 1,052 |
| Long Term Disability | 1,107 | | | | 1,107 | | |
| LOA members | 4 | | | 4 | | | |
| Terminated Vested | 7,451 | | | | | 7,126 | 325 |
| Inactive Members | 6,035 | | | | | | 6,035 |
| Limited Data | 1,178 | | | | | | 1,178 |
| **Total Membership** | **107,834** | **41,674** | **67** | **49,270** | **1,107** | **7,126** | **8,590** |

[1] Contributions with interest

## 3. Actuarial Assumptions

**Investment Return and General Salary Increase Rates**

Our actuarial costing method involves projecting future benefit disbursements and contribution and investment income. In such projections, the most significant assumptions are those that are made for the future rates of return to be earned by the fund and future general salary increases (which are across-the-board increases applying to employees regardless of service, rank or position).

**a) Relationship to Excess Investment Return Threshold**

The investment return assumption can also be significant for another reason. The plan rules permit the Board, at its discretion, to transfer to the IAA excess investment returns over the valuation investment return assumption on pensioner liabilities in the Basic account, i.e. on that part of the Basic account that covers pensions in payment. Between 1980 and 2017, such transfers of excess investment returns to the IAA were automatic. Since 2017, transfers have been at the discretion of the Board, and the Board has elected not to transfer excess investment returns in the Basic Account to the IAA.

A decrease in the investment return assumption, and hence in the excess return threshold, would have at least two effects if the Board used their discretion to affect the excess transfer to the IAA:

(i) It would increase the amount of excess investment return potentially allocated to the IAA, and hence increase the potential for future indexing; and

(ii) It would increase the costs of the basic non-indexed plan, provided benefit levels are not changed.

An increase in the investment return assumption would have the opposite effects. In this context, the excess investment return threshold takes on benefit design connotations as well, and thus consistency in the assumptions, from one valuation to the next, has added significance.

Where the Board uses their discretion to make excess transfers to the IAA, the Basic Account earns no more than the investment return assumption during the post-retirement period.

**b) Actual Returns and Asset Mix**

The actual asset allocations for the Basic Account and IAA at December 31, 2023 are as follows:

| Asset Class | Asset Mix at December 31, 2023 |
|---|---|
| Short Term | 2.0% |
| Bonds (net of repurchase agreement) | 21.0% |
| Private Debt | 9.2% |
| Mortgages | 4.3% |
| Canadian Equities | 3.7% |
| Global Equities | 11.9% |
| Emerging markets equities | 3.4% |
| Real Estate | 16.0% |
| Private Equity | 15.8% |
| Infrastructure and Renewable Resources | 12.7% |
| **Total Portfolio** | **100.0%** |

The long-term asset mix is set out in the Plan's Statement of Investment Policies and Procedures and summarized in the table below.

| Asset Class | Long-term Asset Mix |
|---|---|
| Short Term | 2.0% |
| Government Bonds | 25.0% |
| Corporate Bonds | 9.0% |
| Private Debt | 9.0% |
| Mortgages | 4.4% |
| **Total Fixed Income** | **49.4%** |
| Canadian Equities | 2.6% |
| Global Equities | 10.4% |
| Emerging Markets | 2.0% |
| Private Equity | 13.0% |
| **Total Equity** | **28.0%** |
| Real Estate | 17.6% |
| Infrastructure and Renewable Resources | 15.0% |
| **Total Real Assets** | **32.6%** |
| **Total Portfolio** | **110.0%**[1] |

[1] The total adds to more than 100% due to the use of leverage.

### c) Expected Returns

After examining the net average investment return earned by the fund's investments, the yield on investments made in recent years, the likely future trend of investment returns in general, the investment practices, and the provisions of this Plan, we have concluded that a reasonable best estimate of the long term investment return on the plan's assets is 6.00% (no change from the previous valuation). We also concluded that a reasonable best estimate of the real return on the assets, i.e., the investment return in excess of inflation, is 3.75% (no change from the previous valuation).

In setting the valuation assumptions it is necessary to reduce these expected returns by a margin, so that the resulting liabilities have a suitable provision for adverse deviations. Following discussions with the Board regarding the appropriate adjustments to the best estimate assumptions and taking into account the requirements of the Board's funding policy, for the purposes of this valuation we continue with our long-term investment return assumption of 5.75% per annum and the real return of 3.25% from the previous valuation. In other words, there is a margin of 0.25% on the investment return assumption, and a margin of 0.5% on the real return assumption (no change in the margins compared to our previous valuation).

The following table shows the development of the investment return assumption:

| | Discount Rate |
|---|---|
| Weighted average return | 5.95% |
| Diversification and rebalancing effect | 0.30% |
| Passive investment management fees | (0.24%) |
| Active investment management fees | (0.58%) |
| Value-added from active management | 0.58% |
| Rounding | (0.01%) |
| **Estimated net investment return before margin** | **6.00%** |
| Margin for adverse deviation | (0.25%) |
| **Discount return assumption (rounded to nearest 0.25%)** | **5.75%** |

To determine the going concern discount rate, our model determined expected long-term capital market returns, standard deviations and correlations for each major asset class by using historic returns, current yields and forecasts. We then stochastically generated projected asset class returns for 5,000 paths over 30 years to create expected returns for each major asset class and applied these to the Plan's target asset mix.

For the purposes of establishing the discount rate used in this report, we have assumed that there will be no added-value returns from employing an active management strategy in excess of the associated additional investment management fees. The total investment expense allowance of 0.82% and the allowance for passive investment management fees of 0.24% were derived from estimates provided by BCi. The allowance

for additional fees for active management (and our allowance for the value added from active management) is calculated as the difference between these two figures. As the sustainable indexing target is not guaranteed, and the primary objective of the sustainable indexing approach is to improve intergenerational equity, it is not appropriate to include margins in the sustainable indexing basis. The Sustainable Indexing Valuation therefore assumed a nominal investment return of 6.00% and real investment return of 3.75% (no change from the previous valuation).

**d) Real Return and Salary Relationships – Derive Salary Assumption**

The 6.0% investment return assumption used in the last valuation was viewed as consisting of a real return component of about 3.25% per annum plus a long-term underlying inflation assumption of about 2.5% per annum. Continuing with the same real return component of 3.25%, we get a same long-term underlying inflation assumption of 2.5% per annum (i.e. 5.75% - 3.25%). This can also be viewed as a best estimate of future inflation of 2.25% (derived from the best estimate nominal return assumption of 6.0% less the best estimate real return assumption of 3.75%), plus a margin for adverse deviations of 0.25%.

The general salary increase assumption used in the last valuation was 3.25% per annum. This was viewed as consisting of the underlying inflation assumption of 2.5% per annum, plus a real salary increase component of 0.75% per annum. For this valuation, as the underlying inflation assumption of 2.5% is unchanged, we keep the same general salary increase assumption of 3.25%. The real salary increase assumption of 0.75% consists of a best estimate of real salary increases of 0.50%, plus a margin for adverse deviations of 0.25%.

For the Sustainable Indexing Valuation, the general salary increase assumption is 3.00% per annum. This is made up of the best estimate inflation assumption of 2.25% plus the real salary increase assumption of 0.75%.

The impact of these assumptions on the valuation result is discussed further below.

**e) Impact of Investment Return and Salary Assumptions on the Valuation**

During the **post-retirement period**, the investment return assumption is critical as this is the discount rate for the Basic Account post-retirement liabilities. It also sets the excess investment return threshold at which the Board may consider transferring assets from the Basic account to the IAA.

During the **pre-retirement period**, it is the relationship, i.e. the net difference, between the investment return and general salary increase assumptions that is the key, rather than their absolute levels - projected benefits increase each year by the salary assumption and are then discounted by the investment assumption, i.e. the net result is that the liabilities are effectively being discounted by the net difference between the two assumptions. For example, the long-term assumptions we have used in this valuation (i.e., 5.75% investment return, 3.25% salary, 2.50% underlying inflation) would produce results similar to those using assumptions of 6.00% investment return and 3.50% salary, with 2.75% underlying inflation; or 5.50% investment return and 3.00% salary, with 2.25% underlying inflation, etc. Thus, the underlying inflation assumption in itself is not material to the results.

### f) Summary of interrelationships

The annual investment return and general salary increase assumptions, and their underlying economic interrelationships, are summarized below. These assumptions are unchanged from the previous valuation.

| Assumptions (%) | | 2023 | | | 2020 |
|---|---|---|---|---|---|
| | | Best Est. | Margin | Valn. | Valn. |
| 1 | Nominal Investment Return | 6.00 | (0.25) | **5.75** | 5.75 |
| 2 | Real Investment Return | 3.75 | (0.50) | **3.25** | 3.25 |
| 3 | **Implied Inflation (1) – (2)** | **2.25** | **0.25** | **2.50** | **2.50** |
| 4 | Real Salary Growth | 0.50 | 0.25 | **0.75** | 0.75 |
| 5 | **Nominal Salary Growth (3) + (4)** | **2.75** | **0.50** | **3.25** | **3.25** |
| | Resulting Net Rates | | | | |
| 6 | Pre-retirement | | | **2.50** | 2.50 |
| 7 | Post-retirement | | | **5.75** | 5.75 |

### g) Salaries

The 2023 valuation data indicates that average annual earnings increased by about 12.5% from mid-fiscal-2020 to mid-fiscal-2023 (i.e., about 4.0% per annum), as compared with an expected increase of about 10.1% (i.e., 3.25% per annum) on the basis of the assumptions used in the 2020 valuation.

The input data salaries provided to us for this valuation were the annualized earnings during fiscal 2023. We took them without further adjustment as being equal to the salary rates on the valuation date (this may slightly understate the actual salary rates at the valuation date). Thereafter, the assumed rates of salary increase are applied continuously during each future year.

### h) YMPE Increase

We also assumed that the YMPE under the Canada Pension Plan would increase at the general salary increase rate (3.25% per year for the Funding Valuation, 3.00% per year for the Sustainable indexing Valuation) from its 2023 level of $66,600. In the previous valuation we assumed that the YMPE would increase at the same rate of 3.25% per year for the Funding Valuation and 3.00% per year for the Sustainable Indexing Valuation from its 2020 level of $58,700.

## Pension Indexing – Basic Valuation

### a) Basic Funding Valuation

Indexing supplements on and after January 1, 1982 are provided on an annual basis and are limited to those amounts that can be appropriately financed by the balances available in the Inflation Adjustment Account. Thus, we do not need to allow for future indexing in our calculations as the costs of this indexing are currently fixed at 2.00% of salaries to be paid by the members, plus 2.13% paid by the employers. With respect to indexed supplements granted through January 1, 2023, the present values have been included in the actuarial liabilities for pensions in the course of payment and thus form part of the determination of the recommended contribution.

As in the previous valuation, we ignored the future pre-retirement escalation that applies to vested pensions, since the cost of this "indexing" is also charged to the Inflation Adjustment Account.

With regard to the vested pensions of members who have terminated employment, we were supplied with deferred pension amounts both including and excluding indexing during the deferred period to date. We understand that transfers from the Inflation Adjustment Account to finance this indexing do not occur until retirement (theoretically, such transfers should be made on an annual basis as the indexing occurs, so as to reduce the inter-generational transfer of the costs of such indexing). We have therefore used the deferred pension amounts without indexing so that the Basic Account liability is aligned with the allocation of assets between the Basic and IAA accounts.

The indexing of salaries before retirement in the case of members on long-term disability is, on the other hand, a charge to the Basic Account rather than to the Inflation Adjustment Account. Accordingly, in valuing the deferred pensions for those currently on long-term disability, we have made an allowance for this by applying an escalation assumption (at the full underlying inflation assumption) of 2.5% per annum during the deferral period to retirement.

### b) Sustainable Indexing Valuation

All current and future pensions are assumed to increase at the sustainable indexing level.

For those on long term disability, we allow for escalation in the deferral period at a rate of 2.25% per annum, which equals the best estimate assumption for inflation. In other words, for the sustainable indexing valuation, the escalation assumption does not include the 0.25% margin taken into account in the funding valuation.

For those with vested pensions, we use the deferred pensions including indexing during the deferred period to date, and allow for escalation in the future deferred period at a rate of 2.25% per annum.

## Asset Values

The fund's annual reports record assets on a market value basis. We relied on these annual reports for the asset values used for the years ending December 31, 2021 to December 31, 2023.

Following the December 31, 2017 valuation, in line with the JTA, a Rate Stabilization Account (RSA) was established within the Basic Account. Effective January 1, 2020, the employer and member IAA contributions were reduced by 1% of salary each and allocated to the RSA. Interest is applied to the RSA based on the smoothed one-year fund return. The RSA is excluded from the Funding and Sustainable Indexing valuations. It can be drawn down as needed to stabilize the Basic contribution rate.

As in the previous valuation, we applied a five year smoothing technique to these assets. We believe a smoothing approach is appropriate as it cushions the actuarial valuation results against dramatic swings in market value that can occur.

To obtain the unconstrained smoothed value, we first determine the actual return on the basis of market values during the year (taking into account the timing of non-investment related cashflows, i.e. the net contributions minus benefits and non-investment expenses). We then determine an assumed return for the year at a rate equal to the assumed underlying real return rate (with only a 0.25% margin for this purpose) plus the year-over-year change in the Consumer Price Index. The difference between these two returns is then spread over a five-year period, recognizing one-fifth of it in each of the current and four succeeding years. This approach effectively spreads the difference between (a) the total investment return (including both realized and unrealized capital changes) and (b) a hypothetical return based on a long-term real return rate, over a five-year period.

Effective January 1, 2024, we will use an assumed return for the year equal to the nominal investment return assumption. The method is being changed to reduce the potential volatility in the smoothing that can arise as CPI fluctuates.

### a) Funding Valuation Assets

The smoothed value is then restricted to a range of 92% to 108% of market value, if necessary (the same range was applied in the previous valuation). This means that in periods of significant market decline (growth) the smoothed value does not become too large (low) relative to the market value - effectively the constraint accelerates recognition of very poor (strong) market returns and allows the contribution rate to more appropriately reflect the actual returns earned by the plan. The constraint of 92% applied as of December 31, 2020.

The application of this approach to the total fund yields the following results:

***Total Fund Smoothing***

| Target Return | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|
| 1. Dec-over-Dec increase in CPI | 0.7% | 4.8% | 6.3% | 3.4% |
| 2. Base return = (1) + 3.5% | 4.2% | 8.3% | 9.8% | 6.9% |
| **Year-end asset values - $ millions** | | | | |
| 3. Market value | 34,282 | 37,767 | 35,913 | 37,959 |
| 4. Smoothed value | 31,539 | 34,966 | 37,946 | 39,891 |
| 5. Ratio of (4) ÷ (3) | 0.920 | 0.926 | 1.057 | 1.051 |
| **Annual Returns** | | | | |
| 6. Market value | 10.6% | 11.8% | -3.4% | 7.5% |
| 7. Smoothed value | 8.1% | 12.7% | 10.3% | 6.8% |

The annualized market value rate of return since last valuation is 5.1%.

Using the relationship between the market and smoothed values shown in line 5 above, and applying this relationship to the Basic Account and Inflation Adjustment Account balances, we get:

***Year-end Asset Values – $millions***

| Basic Account (including RSA) | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|
| 8. Market value | 27,867 | 30,521 | 29,317 | 31,671 |
| 9. Smoothed value | 25,643 | 28,257 | 30,977 | 33,283 |
| 10. Ratio of (9) ÷ (8) | 0.920 | 0.926 | 1.057 | 1.051 |
| **Inflation Adjustment Account** | | | | |
| 11. Market value | 6,415 | 7,246 | 6,596 | 6,288 |
| 12. Smoothed value | 5,896 | 6,709 | 6,969 | 6,608 |
| 13. Ratio of (12) ÷ (11) | 0.920 | 0.926 | 1.057 | 1.051 |
| **RSA** | | | | |
| 14. Market Value and Smoothed Value | 892 | 1,080 | 1,269 | 1,437 |
| **Basic Account excluding RSA** | | | | |
| 15. Market value | 26,975 | 29,440 | 28,048 | 30,234 |
| 16. Smoothed value | 24,751 | 27,177 | 29,708 | 31,846 |

The Basic Account market value includes contributions receivable of $43 million.

**b) Sustainable Indexing Valuation Assets**

As mentioned previously, a primary reason for using a sustainable indexing approach is to improve intergenerational equity. Intergenerational equity would be best served by using best estimate assumptions (as we are doing) and not smoothing the assets. However, an important secondary objective is to attempt to stabilize the indexing target over time. This secondary objective is aided by smoothing the assets. In discussion with the Board, it was concluded that using a best estimate basis together with a low smoothing limit would provide a suitable balance between these two objectives. Accordingly, in our assessment we have used the five year smoothed value of assets, restricted to a range of 95% to 105% of the market value of assets. This lower constraint applied as at December 31, 2020 where the smoothed assets for the sustainable indexing purposes were capped at 95% of market value. The higher constraint applied as at December 31, 2023 where the smoothed assets for the sustainable indexing purposes were capped at 105% of market value.

## Mortality

The assumed incidence of mortality both before and after retirement was based on Club Vita Canada's CV22 VitaCurves multiplied by a 95% credibility weighting factor, with generational projection using the CPM-B improvement scale.

VitaCurves are baseline mortality rates that vary by member based on their individual longevity characteristics and have been developed using a generalized linear modelling framework. (More details on the methodology can be found in the Canadian Institute of Actuaries member's paper: *Key Factors for Explaining Differences in Canadian Pensioner Baseline Mortality*.) The CV22 VitaCurves have been calibrated based on Club Vita Canada's longevity dataset for the years 2018-2020 and thus an appropriate base year in 2019. Improvements in baseline mortality from 2019 to the calendar year of determination are projected based on each member's year of birth.

Club Vita Canada's longevity dataset is composed of a subset of Canadian registered pension plans across Canada, and includes plans covering a range of industries in both the private and public sector. Club Vita Canada's CV22 VitaCurves have been developed based on longevity experience consisting of 2.5 million exposure years and 65 thousand deaths over 2018-2020, and vary by the following longevity factors:

- Gender;
- Pensioner type – pensioner or surviving spouse;
- Disability status at retirement for pensioners – disabled or non-disabled pensioner;
- Postal code-based lifestyle/longevity group – five groups for each of males and females;
- Affluence as measured by pension amount or earnings – there are four pension bands for males and three pension bands for females and four earnings bands for males and females;

- Occupation type – currently or formerly employed in a blue or white collar occupation; and
- Pension form at retirement for pensioners – single life or joint life.

Given that the availability of longevity factors varies by plan, and also by members within a plan, the CV22 VitaCurves are calibrated based on different combinations of the factors outlined above, resulting in over 1,000 baseline mortality tables. The best VitaCurve is assigned to each individual member based on the longevity factors available for that member. Plan experience is then considered and this led to the application of a credibility adjustment factor of 95% to the Club Vita Canada's CV22 VitaCurves.

For pensioners who retired on account of disability, for members currently on long-term disability and for those assumed to become disabled in future, the assumed rates of mortality were based on an aggregate VitaCurve with a credibility adjustment factor of 95% for disabled pensioners, with generational projection using the CPM-B improvement scale.

For deferred vested pensions, mortality was ignored during the deferral period before retirement. The same assumption was made for the previous valuation.

In the previous valuation, the assumed rates of mortality were based on Club Vita Canada's CV19 VitaCurves, also projected using CPM-B improvement scale. Plan experience suggested that no credibility adjustment factor was required.

### Withdrawal

We examined the rates of withdrawal for reasons other than death, retirement or disability over the period January 1, 2021 to December 31, 2023 and compared this with the experience observed and the rates used for previous valuations. In general, the observed rates are close to those assumed in the previous valuation for both males and females. As a result, we have kept the same withdrawal rates used for the previous valuation. Sample withdrawal rates are shown in the following tables.

***A. Withdrawal Rates Applicable in the First 3 Years of Service (these also include terminations from disability)***

| Age at entry | 2020 and 2023 Valuations | | |
|---|---|---|---|
| | 1st year | 2nd year | 3rd year |
| **Males** | | | |
| 20 | .101 | .072 | .056 |
| 30 | .101 | .072 | .056 |
| 40 | .101 | .072 | .056 |
| 50 | .101 | .072 | .056 |
| **Females** | | | |
| 20 | .041 | .042 | .040 |
| 30 | .105 | .087 | .061 |
| 40 | .093 | .053 | .045 |
| 50 | .093 | .053 | .045 |

***B. Withdrawal Rates Applicable After 3 Years of Service***

| Attained age | 2020 and 2023 Valuations | |
|---|---|---|
| | Males | Females |
| 23 | .031 | .058 |
| 33 | .020 | .039 |
| 43 | .015 | .017 |
| 53 | .015 | .016 |

The withdrawal rates we have used do not extend past age 54.

## Disability

The Plan provides for either the payment of a disability pension from the Plan or, for members receiving long-term disability benefits, the continued accrual of pension benefits. We examined the combined experience of members going on disability pensions and on long-term disability and concluded that the experience in the inter-valuation period merited an increase in the assumed rates for females from those used in the previous valuation. The rates used for this valuation are 120% for males and 105% for females of the respective rates used for the valuation of the Pension Plan for the Public Service of Canada as at March 31, 2020. The rates used at the 2020 valuation were based on 130% for males and 120% for females of the respective rates used for the 2011 valuation of the Pension Plan for the Public Service of Canada.

Since most members receive continuing disability service credits rather than an immediate pension, we have continued to value the disability cost for active members as a deferred pension (indexed before retirement) with continued accrual of service, rather than as an immediate pension. Based on an examination of those now retired who had, prior to retirement, been in receipt of disability service credits, we assumed that the deferred pensions would commence at age 61 (or, immediately, for those older than age 61). The same commencement age was assumed in the 2020 valuation.

Sample disability rates are shown in the following table. No allowance is made for the possibility of an individual recovering from disability prior to retirement.

***Sample Disability Rates***

| Age | 2020 Valuation | | 2023 Valuation | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| 25 | .0002 | .0001 | 0.0001 | 0.0001 |
| 35 | .0002 | .0008 | 0.0005 | 0.0009 |
| 45 | .0015 | .0026 | 0.0017 | 0.0029 |
| 55 | .0050 | .0071 | 0.0049 | 0.0074 |

## Retirement

We examined the 2021-2023 retirement experience of members retiring from active service and compared this with the experience observed in our previous analyses of the retirement rates and with the rates used in the previous valuation. In general, the actual experience showed fewer retirements than were indicated on the basis of the rates used in the previous valuation, indicating that members are generally retiring later than assumed. We gave partial recognition to the observed experience by making modest adjustments to the rates previously used

The rates used in this and the previous valuation, are as follows:

***Retirement Rates from Active Service***

| | | 2020 valuation | | 2023 valuation | |
|---|---|---|---|---|---|
| **Age** | **Service** | **Males** | **Females** | **Males** | **Females** |
| 55-59 | at least 10 years, but age and service less than 80 | .05 | .05 | 0.04 | 0.05 |
| 55-59 | age and service at least 80 | .10 | .10 | 0.10 | 0.09 |
| 55-59 | age and service at least 90 | .40 | .34 | 0.38 | 0.31 |
| 60 | 10 | .35 | .34 | 0.32 | 0.29 |
| 61 | 10 | .23 | .22 | 0.23 | 0.22 |
| 62 | 10 | .23 | .22 | 0.23 | 0.22 |
| 63 | 10 | .23 | .21 | 0.23 | 0.21 |
| 64 | 10 | .27 | .27 | 0.27 | 0.26 |
| 65 | 0 | 1.00 | 1.00 | 1.00 | 1.00 |

Even though pensions are available with less than 10 years of service, we have continued to apply the retirement rates before age 65 only to those with 10 or more years of service, on the assumption that those with fewer than 10 years would not retire until age 65. Adding an assumption allowing for retirement with less than 10 years based on observed experience would not have a material impact on the results.

As for the previous valuation, we assumed that all deferred vested members at the valuation date will retire at age 60, or immediately if older than 60, and that members terminating service in future will subsequently retire at age 55.

## Seniority Salary Scales

Seniority salary increases are in addition to the general salary increases and are intended to reflect increasing seniority, recognition of merit and promotion. We examined the seniority salary scales based on the earnings history of the active members during the 3-year period ended December 31, 2023 and compared these with the experience observed and rates used in the previous valuation. Based on these investigations we decided to continue with the previous salary scales.

The annual seniority increases are assumed to reduce with age. Sample seniority increase assumptions at key ages are shown below. The assumptions represent the assumed seniority increase in the next year.

***Sample Seniority Earnings Rates***

| Age | 2020 and 2023 valuations | |
|---|---|---|
| | Males | Females |
| 25 | .036 | .044 |
| 35 | .038 | .021 |
| 45 | .006 | .011 |
| 55 | .003 | .003 |
| 65 | .000 | .000 |

## Proportions of Members Married at Death

Given the pre-retirement death benefit, we value a commuted value on pre-retirement death for all members. As the benefit is the same regardless of marital status, the proportions of members assumed to be married at death are irrelevant for the valuation. The same assumption was made in the previous valuation.

## Growth of Active Teacher Population

We assumed in all the actuarial projections that there would be no future growth or decline in the Teacher population. The same assumption was made in the previous valuation.

## Payroll for Amortization

The data provided the annualized salary at the valuation year. We examined the experience of members working part time and assumed that the total payroll is 88% of annualized salary from the valuation data. The same assumption was assumed in the previous valuation. The total payroll for amortization purpose was assumed to be $4,038 million.

## Expenses

Administration expenses are paid out of the Teachers' fund. These amounts totalled 0.45%, 0.42% and 0.42% of salaries during 2021, 2022 and 2023 respectively. Projected expenses provided by the Pension Corporation for the next few years anticipate that administration expenses will continue at a similar rate. Therefore, we kept the expense provision unchanged from 0.45% of payroll used in the previous valuation, as part of the normal actuarial costs in the determination of the required contribution rates under the entry-age funding method. We also included a provision for the present value of expenses in the statement of actuarial position. The same approach was used in the previous valuation. Based on the projected payroll of $4,038 million, the estimated expenses for the 2024 are $18 million.

As before, the investment management fees are excluded from our analysis above and from the expense provision we have made as they are reflected in the long-term investment return assumption.

## Recognition of Child-Rearing Periods for Pension Eligibility

We continued to assume that this would only affect female members, and that, on average, it would increase the member's contributory service (which is used for determining pension eligibility) by 2 years; there would, of course, be no increase to the member's pensionable service (which is used for determining pension amounts). The impact of this would be to reduce the eligibility requirement for unreduced pensions between ages 55 and 59, from a rule-of-90 to a rule-of-88 for service earned prior to 2018, from 35 years to 33 years of contributory service for service earned post 2017, and we assumed that there would be no impact on the eligibility assumptions made for other benefits. The same assumption was made in the previous valuation.

## Plan Termination

The Standards of Practice issued by the Canadian Institute of Actuaries require that a valuation report "disclose the financial position of the plan if it were to be wound up on the calculation date, unless the plan does not define the benefits payable upon wind-up, in which case the actuary should include a statement to that effect".

While the Joint Trust Agreement deals with plan termination in Sections 13.4 and 13.5, it is our, and the Board's, opinion that the benefits on wind-up are not defined. Accordingly, we do not comment on the financial position of the plan if were to be wound up.

## Fully Indexed Valuation – Assumption Changes

We made the following changes to the assumptions for the fully indexed valuations:

- We combined the assets in the Basic and Inflation Adjustment Accounts, using a smoothed asset value of $38,453 million, net of the assets in the RSA;

- We applied an indexing assumption equal to the full assumed underlying inflation rate, i.e. 2.5% per annum. This indexing rate was applied both to pensions after retirement and during the pre-retirement period in the case of deferred vested pensions and disability salary accruals. We loaded the pensions in pay by 3.8% to cover the actual January 1, 2024 indexing increase. The indexing is thereafter assumed to apply annually, in arrears; and
- We combined the contribution rates to Basic and IAA. Contributions to the RSA are excluded.

### ITA Maximum Pension Rule – Assumption Changes

As noted earlier, we have not applied these rules when doing the primary Basic and the fully Indexed valuations. We have applied them, as described below, when doing the supplementary valuations with benefits limited to the *ITA* maximums.

The maximum annual pension currently permitted under the income tax rules is the lesser of:

(i) $3,610.00 in 2024 multiplied by the years of service; and

(ii) 2% multiplied by the years of service further multiplied by the average of the best 3 years of remuneration paid to the member.

While the Plan applies the *ITA* limits only in respect of service after 1991, we have, for ease of calculation, assumed that this limit applies on all service; this assumption does not affect the future normal costs, but the accrued liabilities will be slightly understated. The Plan previously applied a 35-year cap on accruals at the above maximum rate, but this was removed effective January 1, 2018.

For an individual in this Plan to be currently affected by the $3,610.00 maximum, the final average salary must be very high. While current salaries are not such as to cause many problems, the salaries projected in the future through application of the assumed salary increase rates outlined above are such that some individuals would be limited. However, under the income tax rules, the flat $3,610.00 limit is automatically indexed each year after 2024 in accordance with increases in the average wage. Accordingly, we have applied a 3.25% per annum increase to the $3,610.00 limit after 2024. (At the previous valuation the corresponding dollar limit was $3,245.56 for 2021, and was scheduled to be automatically indexed each year after 2021 in accordance with increases in the average wage; the same 3.25% increase rate was applied after 2021 to the $3,245.56 limit at the previous valuation.)

As with the previous valuation, in the tax-limited results, we valued the deferred vested pensions not yet in pay, in full, as provided to us, i.e. we were unable to carve out any "excess" portions. Supplemental pensions in pay were carved out.

When testing the ITA maximum requirements, full RSA assets and contributions are included.

# Appendix C: Active Member Data as at December 31, 2023

| Age group[1] | Active members December 31, 2023 | | | | New entrants Jan. 1, 2021 to Dec. 31, 2023 and still active Dec. 31, 2023 | |
|---|---|---|---|---|---|---|
| | Number | Average annual earnings[2] $ | Average Pre 2018 service (years) | Average Post 2017 service (years) | Number | Average annual earnings[2] $ |
| **Males** | | | | | | |
| Under 25 | 69 | 63,214 | 0.0 | 0.6 | 229 | 65,629 |
| 25-29 | 791 | 67,813 | 0.0 | 1.9 | 554 | 66,497 |
| 30-34 | 1,489 | 75,972 | 0.4 | 3.6 | 356 | 69,820 |
| 35-39 | 1,613 | 87,261 | 1.9 | 4.5 | 214 | 76,116 |
| 40-44 | 1,838 | 98,618 | 5.3 | 5.0 | 148 | 81,105 |
| 45-49 | 1,984 | 105,175 | 9.2 | 5.3 | 87 | 82,345 |
| 50-54 | 2,131 | 109,071 | 13.4 | 5.5 | 67 | 83,268 |
| 55-59 | 1,666 | 109,799 | 17.5 | 5.6 | 38 | 81,838 |
| 60-64 | 692 | 106,886 | 16.8 | 5.4 | 23 | 96,786 |
| 65 & over | 209 | 99,205 | 15.4 | 5.0 | 8 | 92,963 |
| **Total males** | **12,482** | **97,089** | **8.4** | **4.8** | **1,724** | **71,832** |
| **Females** | | | | | | |
| Under 25 | 354 | 62,860 | 0.0 | 0.5 | 1,164 | 65,443 |
| 25-29 | 3,414 | 68,288 | 0.0 | 2.0 | 1,870 | 66,531 |
| 30-34 | 4,804 | 77,923 | 0.7 | 3.7 | 795 | 71,173 |
| 35-39 | 5,120 | 88,287 | 2.6 | 4.0 | 550 | 75,659 |
| 40-44 | 6,013 | 94,708 | 5.2 | 4.3 | 494 | 77,834 |
| 45-49 | 5,778 | 98,697 | 7.7 | 4.8 | 331 | 78,812 |
| 50-54 | 5,429 | 102,042 | 11.4 | 5.1 | 150 | 87,606 |
| 55-59 | 3,693 | 103,317 | 15.0 | 5.3 | 116 | 83,103 |
| 60-64 | 1,660 | 101,169 | 14.7 | 5.2 | 44 | 83,295 |
| 65 & over | 523 | 98,876 | 14.9 | 5.0 | 11 | 76,194 |
| **Total females** | **36,788** | **91,788** | **6.6** | **4.3** | **5,525** | **70,698** |
| **Total all** | **49,270** | **93,131** | **7.0** | **4.4** | **7,249** | **70,968** |

The average age of the 49,270 active members is 43.9.

[1] Age nearest birthday at December 31, 2023 for actives and at entry for new entrants.

[2] Actual earnings in 2023 for those employed all year and annualized for others. Zero, very low or very high earnings figures were replaced by the average earnings in the same age-sex group.

A comparison of the December 31, 2023 active membership with the December 31, 2020 active membership is as follows:

| Active Members | December 31, 2020 | December 31, 2023 | Change 2020 to 2023 |
|---|---|---|---|
| **Males** | | | |
| Number | 12,081 | 12,482 | + 3.3% |
| Proportion of total | 26.2% | 25.3% | - 0.9% |
| Average age (at 12.31) | 44.9 | 45.1 | + 0.2 years |
| Average service | 13.2 | 13.2 | no change |
| Average salary | $86,818 | $97,089 | + 11.8% |
| **Females** | | | |
| Number | 34,047 | 36,788 | + 8.1% |
| Proportion of total | 73.8% | 74.7% | + 0.9% |
| Average age (at 12.31) | 43.3 | 43.5 | + 0.2 years |
| Average service | 10.9 | 10.9 | no change |
| Average salary | $81,365 | $91,788 | + 12.8% |

The above comparison indicates an increase in both male and female membership during the 3-year intervaluation period. The proportion of males to females continues to decrease. The average age has increased slightly for both males and females. The increase in average salary is slightly higher for females than for males.

A comparison of the new entrant subset used at December 31, 2023 with that used at December 31, 2020 in determining the entry-age normal costs is as follows:

| New Entrants | December 31, 2020 | December 31, 2023 | Change 2020 to 2023 |
|---|---|---|---|
| **Males** | | | |
| Number | 1,820 | 1,724 | - 5.3% |
| Proportion of total | 25.7% | 23.8% | - 1.9% |
| Average age at entry | 33.1 | 33.7 | + 0.6 years |
| Average salary | $61,793 | $71,832 | + 16.2% |
| **Females** | | | |
| Number | 5,273 | 5,525 | + 4.8% |
| Proportion of total | 74.3% | 76.2% | + 1.9% |
| Average age at entry | 32.1 | 32.4 | + 0.3 years |
| Average salary | $60,137 | $70,698 | + 17.6% |

The number of new entrants has increased for females and decreased for males, and the proportion of males to females has decreased. The average age of new entrants has increased for both males and females. The increase in average salary for new entrants is higher than the average salary increases for both active males and females.

# Appendix D: Inactive Member Data as at December 31, 2023

***1. Members on Long-Term Disability with Projected Deferred Pensions***

| Age group[1] | Males | | Females | |
|---|---|---|---|---|
| | Number | Average annual deferred pensions[2] $ | Number | Average annual deferred pensions[3] $ |
| Under 35 | 6 | 46,180 | 19 | 46,229 |
| 35-39 | 3 | 45,955 | 49 | 48,278 |
| 40-44 | 17 | 44,621 | 104 | 48,408 |
| 45-49 | 25 | 50,285 | 161 | 48,467 |
| 50-54 | 35 | 54,612 | 209 | 45,185 |
| 55-59 | 61 | 52,075 | 232 | 45,733 |
| 60 & over | 48 | 42,491 | 138 | 35,127 |
| **Total** | **195** | **49,016** | **912** | **44,937** |

| | Number | Average age | Average annual deferred pensions[3] |
|---|---|---|---|
| **Total males & females** | **1,107** | **52.0** | **$45,656** |

| | Number | Average age | Average pensionable service | Average salary | Expected average remaining service life |
|---|---|---|---|---|---|
| **Active and LTD Combined** | **50,377** | **44.1** | **11.6** | **93,172** | **12.2** |

[1] Age nearest birthday at December 31, 2023.

[2] Basic lifetime portions payable from age 61; additional temporary amounts payable from age 61 to 65.

### *2. Terminated Vested Members Entitled to Vested Pensions*

| Age group[1] | Males | | | Females | | |
|---|---|---|---|---|---|---|
| | Average annual vested pensions | | | Average annual vested pensions | | |
| | Number | Initial[2] $ | Offset at age 65 $ | Number | Initial[2] $ | Offset at age 65 $ |
| Under 30 | 77 | 1,109 | 15 | 303 | 1,232 | 3 |
| 30-34 | 171 | 2,013 | 116 | 656 | 1,939 | 155 |
| 35-39 | 215 | 2,702 | 345 | 662 | 2,996 | 598 |
| 40-44 | 218 | 5,186 | 1,007 | 772 | 4,615 | 1,097 |
| 45-49 | 255 | 6,309 | 1,365 | 881 | 5,712 | 1,342 |
| 50-54 | 342 | 9,387 | 2,006 | 951 | 6,862 | 1,616 |
| 55-59 | 236 | 8,079 | 1,915 | 661 | 7,025 | 1,717 |
| 60 & over | 228 | 8,145 | 1,284 | 498 | 5,283 | 840 |
| **Total** | **1,742** | **6,156** | **1,202** | **5,384** | **4,834** | **1,043** |

| Total Vested | Number | Average age | Average annual vested pension - initial | Average annual vested pension - offset at age 65 |
|---|---|---|---|---|
| **Total Vested males & females** | **7,126** | **46.4** | **5,157** | **1,082** |

### *3. Remaining Inactive Members*

| | Number | Average age | Member contributions with interest |
|---|---|---|---|
| **Valued at 2 x contributions with interest** | **8,590** | **61.7** | **18,669,758** |

[1] Age nearest birthday at December 31, 2023.

[2] These pensions are assumed to commence at the first age at which the member is entitled to an unreduced pension, assuming this is no earlier than age 60 i.e. at various ages between 60 and 65.

# Appendix E: Pensioner Data as at December 31, 2023

### *1. Pensioners*

| | | Annual Pensions ($000's) | | | | |
|---|---|---|---|---|---|---|
| Age group[1] | Number of pensioners | Single life | Joint life & Survivor | Joint life & Survivor with guarantee | Single life with guarantee | Temporary life |
| **Male pensioners** | | | | | | |
| Under 60 | 324 | 118 | 5,524 | 2,267 | 2,512 | 3,845 |
| 60-64 | 1,249 | 973 | 24,751 | 10,437 | 8,913 | 16,290 |
| 65-69 | 2,000 | 7,591 | 37,866 | 16,002 | 13,984 | 2,226 |
| 70-74 | 2,804 | 27,206 | 62,521 | 10,317 | 10,401 | - |
| 75-79 | 3,218 | 48,088 | 77,104 | 1,757 | 2,856 | - |
| 80-84 | 2,232 | 47,861 | 44,954 | 108 | 318 | - |
| 85-89 | 1,005 | 26,794 | 15,752 | - | - | - |
| 90-94 | 389 | 11,725 | 3,609 | | | |
| 95 & over | 92 | 2,680 | 722 | - | - | - |
| **Total male** | **13,313** | **173,036** | **272,803** | **40,888** | **38,984** | **22,361** |
| **Female pensioners** | | | | | | |
| Under 60 | 819 | 503 | 9,266 | 4,901 | 8,092 | 8,654 |
| 60-64 | 2,893 | 4,526 | 30,703 | 21,079 | 34,563 | 32,559 |
| 65-69 | 4,839 | 36,166 | 44,570 | 31,531 | 45,439 | 4,347 |
| 70-74 | 6,295 | 100,367 | 59,762 | 12,768 | 30,595 | - |
| 75-79 | 5,530 | 121,304 | 44,760 | 2,276 | 7,439 | - |
| 80-84 | 2,911 | 74,119 | 13,257 | 43 | 558 | - |
| 85-89 | 1,151 | 30,916 | 3,240 | - | - | - |
| 90-94 | 546 | 13,594 | 549 | | | |
| 95 & over | 203 | 4,657 | 71 | - | - | - |
| **Total female** | **25,187** | **386,152** | **206,178** | **72,598** | **126,686** | **45,560** |
| **Grand Total** | **38,500** | **559,188** | **478,981** | **113,486** | **165,670** | **67,921** |
| **Supplemental Pensions (included above)** | | **48** | **393** | **42** | **31** | **-** |

Average age of the 38,500 pensioners is 73.6.

[1] Age nearest birthday at December 31, 2023.

**2. *Beneficiaries (*spouses (or estates) currently receiving benefits where the former contributor is deceased)**

| | | Annual Pensions ($000's) | |
|---|---|---|---|
| Age group[1] | Number of beneficiaries | Single Life | Single Life with Guarantee |
| **Male beneficiaries** | | | |
| Less than 50 | 10 | 72 | - |
| 50-54 | 11 | 120 | - |
| 55-59 | 15 | 288 | - |
| 60-64 | 42 | 810 | 124 |
| 65-69 | 70 | 1,435 | 210 |
| 70-74 | 146 | 3,141 | 363 |
| 75-79 | 194 | 3,917 | 254 |
| 80-84 | 156 | 3,136 | 120 |
| 85-89 | 110 | 2,258 | 44 |
| 90-94 | 54 | 952 | 0 |
| 95 & over | 10 | 167 | 38 |
| **Total** | **818** | **16,296** | **1,153** |
| **Female beneficiaries** | | | |
| Less than 50 | 5 | 132 | - |
| 50-54 | 17 | 350 | 11 |
| 55-59 | 27 | 605 | 93 |
| 60-64 | 52 | 1,084 | 221 |
| 65-69 | 123 | 3,092 | 485 |
| 70-74 | 264 | 7,143 | 111 |
| 75-79 | 453 | 12,567 | 125 |
| 80-84 | 533 | 15,304 | 72 |
| 85-89 | 414 | 12,382 | - |
| 90-94 | 247 | 6,742 | |
| 95 & over | 131 | 3,711 | - |
| **Total** | **2,266** | **63,112** | **1,118** |
| **Remaining guarantees** | **90** | | **2,348** |
| **Grand Total** | **3,174** | **79,408** | **4,619** |
| **Supplemental Pensions (included above)** | | **28** | **-** |

Average age of the 3,084 beneficiaries in receipt of a lifetime pension is 79.8.

| | Number | Average age | Average annual pension ($) |
|---|---|---|---|
| Total Retirees | **41,674** | **74.0** | **35,256** |

[1] Age nearest birthday at December 31, 2023.

# Appendix F: Additional Results Detail

### Additional Funding Valuation Results Detail on Fully Indexed Basis, and with Income Tax Limits

The results in this Appendix expand on some of details included in the body of the report. The results are included for:

- Basic (i.e., non-indexed) benefits only, no tax limits;
- Basic plus Indexed, no tax limits;
- Basic only, with tax limits; and
- Basic plus Indexed, with tax limits

### Schedule F1: Statement of Actuarial Position as at December 31, 2023

| *($ millions)* | Without Tax Limits | | With Tax Limits | |
|---|---|---|---|---|
| | Basic Only | Basic + Indexed | Basic Only | Basic + Indexed |
| **Assets** | | | | |
| Market value of Fund net of RSA | 30,234 | 36,521 | 30,234 | 36,521 |
| Asset smoothing adjustment | 1,612 | 1,932 | 1,612 | 1,932 |
| **Smoothed value of Fund net of RSA** | **31,846** | **38,453** | **31,846** | **38,453** |
| Actuarial present values of future contributions at entry-age rates | 8,364 | 11,547 | 8,333 | 11,503 |
| **Total Assets** | **40,210** | **50,000** | **40,179** | **49,956** |
| | | | | |
| Actuarial present values for: | | | | |
| • active members | 19,574 | 26,369 | 19,554 | 26,343 |
| • LTD members | 513 | 656 | 513 | 656 |
| • terminated and inactive members | 298 | 558 | 298 | 558 |
| • pensions being paid | 15,034 | 19,285 | 15,028 | 19,276 |
| • future expenses | 219 | 219 | 219 | 219 |
| **Total Liabilities** | **35,638** | **47,087** | **35,612** | **47,052** |
| **Surplus (Unfunded Liability)** | **4,572** | **2,913** | **4,567** | **2,904** |
| **Accessible Going Concern Excess** | 3,208 | n/a | 3,203 | n/a |

**Schedule F2: Current and Maximum Permissible Contribution Rates - December 31, 2023**

| | Without Tax Limits | | With Tax Limits | |
|---|---|---|---|---|
| | Basic only % | Basic + Indexed % | Basic only % | Basic + Indexed % |
| **Current contribution rates** | | | | |
| Member | 8.17 | 10.17 | 8.17 | 10.17 |
| Employer [1] | 8.17 | 10.30 | 8.17 | 10.30 |
| **Combined member/employer[1, 2]** | **16.34** | **20.47** | **16.34** | **20.47** |
| **Required contribution rates[2]** | | | | |
| Entry age normal cost rate[1] | 17.28 | 23.75 | 17.21 | 23.66 |
| | | | | |
| • 25 year amortization of surplus | n/a | (3.83) | n/a | (3.82) |
| • 25 year amortization of Accessible Going Concern Excess "AGCE" (maximum of 1% reduction) | (1.00) | n/a | (1.00) | n/a |
| • *JTA -B amortization* | (17.27) | n/a | (17.21) | n/a |
| **Total contribution rate** | | | | |
| • 25-year amortization[3] | 11.12 | 19.92 | 11.05 | 19.84 |
| • *JTA-B* rate | 0.01 | n/a | 0.00 | n/a |
| **JTA maximum permissible rate** | **16.34** | **n/a** | **16.34** | **n/a** |
| **JTA minimum permissible rate** | **16.28** | **n/a** | **16.21** | **n/a** |

[1] Non-indexed costs ignore IAA contributions; indexed costs include IAA contributions, at 2.00% for members and 2.13% for employers. In addition, there are RSA contributions at 1.00% for members and 1.00% for employers

[2] Total member plus employer, to be shared equally.

[3] Amortization is of AGCE for Basic results and of full surplus for illustrative Basic plus Indexed results.

**Schedule F3: Accrued Liabilities and Funded Ratio - December 31, 2023**

| ($ millions) | Without Tax Limits | | With Tax Limits | |
|---|---|---|---|---|
| | Basic only | Basic + Indexed | Basic only | Basic + Indexed |
| **Funds** | | | | |
| • **Smoothed Value of Fund** | 33,283 | 39,891 | 33,283 | 39,891 |
| **Accrued Liabilities** | | | | |
| • active members | 10,565 | 14,153 | 10,554 | 14,139 |
| • ltd members | 513 | 656 | 513 | 656 |
| • terminated and inactive members | 298 | 558 | 298 | 558 |
| • pensions being paid | 15,034 | 19,285 | 15,028 | 19,276 |
| **Total Accrued Liabilities** | **26,410** | **34,652** | **26,393** | **34,629** |
| **Surplus (Unfunded Actuarial Liability)** | | | | |
| • for accrued service only | 6,873 | 5,239 | 6,890 | 5,262 |
| **Funded Ratio** | | | | |
| Fund ÷ Total accrued liabilities | 1.26 | 1.15 | 1.26 | 1.15 |
| | | | | |
| Assets in RSA | (1,437) | (1,437) | (1,437) | (1,437) |
| **Adjusted surplus (unfunded liability) net of RSA** | 5,436 | 3,802 | 5,453 | 3,825 |

# Appendix G: Plausible Adverse Scenarios

The following analysis does not impact the funding requirements of the Plan and is for information purposes only, and to meet disclosure requirements. In practice, the Board generally considers additional factors and analysis when monitoring plan risks.

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 key valuation results 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.

| | Basic Account Results at December 31, 2023 | Plausible Adverse Scenario Results at December 31, 2023 | | |
|---|---|---|---|---|
| | | Interest Rate Risk | Deterioration of Asset Values | Longevity Risk |
| **Basic Account ($millions)** | | | | |
| Smoothed Value of Fund | 33,283 | 33,429 | 30,928 | 33,283 |
| Less RSA | (1,437) | (1,444) | (1,339) | (1,437) |
| Actuarial present values of future contributions at entry-age rates | 8,364 | 9,001 | 8,364 | 8,458 |
| **Total Assets** | **40,210** | **40,986** | **37,953** | **40,304** |
| **Total Liabilities** | **35,638** | **37,045** | **35,638** | **36,228** |
| **Surplus / (Unfunded Liability)** | **4,572** | **3,941** | **2,315** | **4,076** |
| Funded Ratio:<br>Total Assets ÷ Total Liabilities | 113% | 111% | 106% | 111% |
| | | | | |
| **Entry-age normal cost rates** | **17.28%** | **18.33%** | **17.28%** | **17.47%** |
| | | | | |
| Discount rate | 5.75% | 5.52% | 5.75% | 5.75% |
| Adjusted market value of assets (including RSA) | 31,671 | 32,398 | 28,637 | 31,671 |

### Interest Rate Risk

This scenario illustrates the sensitivity of the key Basic Account valuation results 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 over 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.

As such, under the interest rate risk scenario, the going concern discount rate is decreased by 0.23% to 5.52% as of December 31, 2023.

With respect to the impact on fixed income assets, the scenario results in a decrease in long term yields on fixed income investments of 0.80%.

Based on the estimated duration of the Plan assets, liabilities and the entry age normal cost rate, we have then determined the estimated change to the Plan's key valuation results 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 variables, 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 the lowest at the one-year horizon.

As such, under the deterioration of asset values scenario, the actuarial value of assets (smoothed assets) is decreased by 7.08% as of December 31, 2023. Note that market value of assets is assumed to decrease by 9.58%; the use of smoothed assets decreases the immediate effect of the asset shock.

### 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 by assuming that mortality rates are 85% of the Club Vita Canada's CV22 VitaCurves, compared to the 95% of those mortality rates used for the going concern valuation as of December 31, 2023, that is, a more conservative mortality assumption than currently employed.