

Actuarial Report on

**British Columbia Municipal  
Pension Plan**

as at December 31, 2021

Vancouver, British Columbia  
September 23, 2022

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## Actuarial Report Highlights

An actuarial valuation of the Municipal Pension Plan (Plan) was completed as at December 31, 2021. Its purpose was to determine the financial position of the Plan as at December 31, 2021, to report on the adequacy of the member and employer Basic contribution rates and establish the level of sustainable indexing.

### Key Results

Basic Account (\$millions)	2018 <sup>1</sup>	2021
Asset smoothing cushion	511	4,507
Rate Stabilisation Account (RSA)	3,006 <sup>2</sup>	3,185 <sup>3</sup>
Group Contribution Rate Rebalancing Account (GCRRA)	32	42
Assets net of RSA and GCRRA	57,774	74,130
Liabilities	57,521	70,369
<b>Surplus</b>	<b>253</b>	<b>3,761</b>
5% of net liabilities	<b>2,055</b>	<b>2,466</b>
<b>Accessible Going Concern Excess</b>	<b>0</b>	<b>1,295</b>
• Used to maintain the current contribution rate	<b>0</b>	<b>277</b>
• Remaining for transfer to IAA/RSA	<b>0</b>	<b>1,018</b>
<b>Basic Contribution Rates</b>		<b>2021</b>
Average current contribution rates		15.08
<b>Average Required Rates</b>		
Entry-age normal cost rates		15.49
JTA Appendix C amortization assuming transfer of \$1,018m to IAA/RSA (pre-December 31, 2019 PBSA requirements)		(0.45)
Additional Group 2/5 amortization (to 2036) <sup>4</sup>		0.04
<b>Minimum JTA Appendix C contribution rate – Average</b>		<b>15.08</b>
<b>Required Contribution Rate = Current Contribution Rate</b>		<b>15.08</b>

<sup>1</sup> 2018 results are after the plan design changes effective January 1, 2022. These changes included a transfer of \$522 million of 2018 valuation surplus to the RSA and \$32 million transferred to the GCRRA.

<sup>2</sup> Includes \$2,484 million funded from 2015 surplus plus subsequent smoothed investment return and \$522 million funded from 2018 surplus

<sup>3</sup> Includes \$2,500 million (capped) funded from 2015 surplus and \$685 million funded from 2018 surplus (\$522 transferred effective December 31, 2018, plus subsequent smoothed investment return)

<sup>4</sup> As part of the plan design changes effective January 1, 2022, Group 2 and Group 5 contributions include 0.5% and 0.68% respectively (equivalent to 0.04% of the Plan's total payroll) to amortize over 15 years the additional cost of the Group 2 and 5 2022 plan redesign benefit improvements which was not met from their share of surplus.

The current average contribution rate of 15.08% is below the Entry-age normal cost (EANC) rate of 15.49%. In line with the Joint Trust Agreement (JTA) and the Board’s Funding Policy, in order to maintain a contribution rate below the EANC rate, an amount equal to 5% of the net liabilities (\$2,455 million) needs to be maintained in the Basic Account and surplus in excess of this amount is considered Accessible Going Concern Excess. Of this excess, \$277 million is required to maintain the average contribution rate at its current level.

Unless the Plan Partners direct the Board otherwise within 6 months of receiving this valuation report, the remaining Accessible Going Concern Excess of \$1,018 million will be split 50/50 between the IAA and the RSA.

The Plan Partners may direct other uses of surplus, subject to the requirements of the JTA, the Plan rules and regulatory requirements. Alternative uses of surplus could result in changes to the required contributions set out in this report.

Although no changes are required to the Plan’s average rate, the required contribution rates are "out of balance" in the sense that Group 1 is paying 0.01% of pay more than their theoretically correct share of the total costs, while Groups 2 and 5 are paying less (0.10% and 0.23% of pay respectively). However, given the requirement to share the effect of rebalancing equally between members and employers, the contribution rates for Group 1 should continue without adjustment for rebalancing ( $0.01\%/2=0.005\%$ , which rounds to 0.00% each). In line with the Plan’s funding policy, the rebalancing adjustments for Group 2 (0.10% of salaries) and Group 5 (0.23% of salaries) will be paid from the Group Contribution Rate Rebalancing Account (GCRRA), and the current Group 2 and 5 contribution rates will remain unchanged.

The resulting contributions are summarized in the table below.

	Current and Required (%)			
	Basic	Net IAA <sup>1</sup>	Benefit Trust	Total
<b>Members</b>				
Group 1	7.34	1.27	0.00	8.61
Group 2	7.14	1.78	0.00	8.92
Group 5	9.08	2.04	0.00	11.12
<b>Employers</b>				
Group 1	7.34	1.37	0.60	9.31
Group 2	10.84	0.98	0.60	12.42
Group 5	12.79	1.28	0.60	14.67
<b>From GCRRA</b>				
For Group 2	0.10	0.00	0.00	0.10
For Group 5	0.23	0.00	0.00	0.23

<sup>1</sup> Employer IAA contributions are shown net of the 0.6% of salaries allocated to the Municipal Retiree Benefit Trust.

The Sustainable Indexing Valuation shows that, taking the required Basic account contributions into account, and after transferring \$509 million to the RSA, indexing at 100% of CPI is sustainable in the long term. Previously, the level of Sustainable Indexing was limited to 2.15% per year.

The above complies with the requirements of the JTA, including the pre December 31, 2019 going concern funding provisions of the PBSA (which are now captured in the JTA). Expanded details of this compliance are included in the main body of this report.

### **Key Plan Changes Since the Previous Valuation**

The last valuation of the Plan was prepared as at December 31, 2018, and our valuation report showed a Basic Account surplus of \$663 million, excluding the present value of past amortizations. Following the valuation, a Partners and Signatories Agreement dated December 7, 2020 (the Agreement) was finalized, which required the Board to amend the Plan Rules effective January 1, 2022 to implement the agreed plan redesign.

The main changes, which are effective for service from January 1, 2022 (unless otherwise indicated), are as follows:

#### **Group 1**

- Lifetime accrual rate of 1.90%;
- Elimination of the bridge benefit;
- Early retirement reduction calculated from age 60 of 6.2% per annum for members with 2 or more years of service and from age 65 of 5.2% per annum for members with less than 2 years of service;
- Elimination of the rule of 90;
- Member and employer contribution rate to Basic Account and IAA amended as shown in the contribution rate table above, including an employer contribution of 0.6% of payroll to the Municipal Retiree Benefit Trust.

#### **Groups 2 and 5**

- Group 5 – Lifetime accrual rate of 2.12%; a bridge of 0.21% calculated on salary below the YMPE;
- Group 2 – no change to accrual rates, but adoption of flat member and employer contribution rates as noted in the contribution rate table above;
- Highest average salary component of the benefit formula changed from the highest 5 years to the highest 4 years (applies to all service provided the member was employed in Group 2 or Group 5 after December 31, 2021).

- Normal form of pension changed from a single life non-guaranteed to a single life 10-year guarantee (applies to all service provided the member was employed in Group 2 or Group 5 after December 31, 2021);
- Group 5 past unfunded liability (being paid by amortization of 0.23% of Group 5 salaries due to 2024) was retired, using \$8 million of surplus;
- Group 5 – Member and employer contribution rate to Basic Account and IAA amended as shown in the contribution rate table above;
- Group 2 and Group 5 contributions include 0.5% and 0.68% of salaries respectively to amortize over 15 years the additional cost of the Group 2 and 5 2022 plan redesign benefit improvements which was not met from their share of surplus;
- Establish a Group Contribution Rate Rebalancing Account (GCRRA) in the Basic Account, using \$32 million of surplus (including Group 2 share of surplus of \$2 million), for the purpose of rate stability for Groups 2/5 if group contribution rate rebalancing is required as per the Board’s funding policy and results in Group2/5 contribution rates increasing.

### **General**

- All prior unfunded liabilities in the Plan were funded with 2018 surplus;
- The cap was removed from the Rate Stabilization Account (“RSA”) effective December 31, 2021 so it can increase with investment returns and potential future transfers of surplus;
- A transfer of \$522 million of 2018 surplus to the RSA;

The net impact was a surplus of \$253 million as of December 31, 2018, which was retained in the Basic Account.

The impact of these changes on the valuation results was set out in our letter dated January 27, 2021. In this report, where we show comparative figures at the previous valuation, these figures incorporate the Plan design changes described above unless noted otherwise.

There were no other benefit changes that had a material financial impact on the Plan.

### **Key Long term Assumptions**

We also updated the actuarial assumptions. In particular:

- The discount rates used for the Funding valuation and the Sustainable Indexing valuations were both reduced by 0.25%, reflecting a reduction in the expected long-term nominal rate of investment returns.

- The assumed rates of price inflation, salary increases, and annual cost of living increases were also reduced by 0.25%, leaving the assumed long-term real rates of return unchanged.
- The assumed rates of death, withdrawal, disability and retirement were updated to reflect our analysis of Plan experience.

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

### **Main Reasons for Changes in Funding Valuation Actuarial Position**

As noted above, following the Plan redesign, the remaining Basic Account surplus was \$253 million at December 31, 2018. The increase of the surplus to \$3,761 million at December 31, 2021 is primarily because of smoothed investment returns being higher than assumed over the three years. This was partially offset by the transfer of excess investment returns from the Basic Account to the IAA, and by the changes made to the economic assumptions. See Section 4(2) for more detail of the actuarial gains and losses since the previous valuation.

### **Compliance with the Income Tax Act**

The fully indexed valuation, recognising the income tax limits, shows a surplus of \$4,381 million including the assets in the RSA and GCRRRA. 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, income tax limited, entry-age normal cost rate of 21.04%. The current total average contribution rate of 17.76% 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 rates of 8.61% for Group 1 and 8.92% for Group 2 are below this limit, and the \$1,000 plus 70% of the pension credit rule which may affect high paid members is applied by the Pension Corporation (with excess contributions going through the Supplemental Benefits Account). However, the contribution rate of 11.12% for Group 5 exceeds the limit, so it will be necessary to apply to the Minister for a waiver for Group 5 members. Following the 2018 valuation, for all groups a similar exemption was required, and obtained.

The Municipal Pension Board of Trustees  
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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 Municipal Pension Board of Trustees (the "Board of Trustees"), we have completed an actuarial valuation of the Basic Account and the Inflation Adjustment Account of the Municipal Pension Plan (the "Plan") as at December 31, 2021 and are pleased to submit this report thereon. The primary purpose of this valuation is to determine the financial position of the Basic Account as at December 31, 2021 and 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, 2021 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.

In addition to the above, we have 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

The Board amended the Plan Rules effective January 1, 2022 to implement a redesign of Plan benefits and contributions. The changes generally apply only to service earned on or after January 1, 2022 and to contributions due effective that same date, although the changes to highest average salary and normal form for Groups 2 and 5 apply to all service if the member was employed in Group 2 or Group 5 after December 31, 2021. The key details of the plan redesign are as follows:

	Contribution rates effective January 1, 2022			
	Basic	Net IAA <sup>1</sup>	Benefit Trust	Total
<b>Members</b>				
Group 1	7.34	1.27	0.00	8.61
Group 2	7.14	1.78	0.00	8.92
Group 5	9.08	2.04	0.00	11.12
<b>Employers</b>				
Group 1	7.34	1.37	0.60	9.31
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### Group 1

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- Elimination of the rule of 90;
- Member and employer contribution rate to Basic Account and IAA amended as shown in the contribution rate table above, including an employer contribution of 0.6% of payroll to the Municipal Retiree Benefit Trust.

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<sup>1</sup> Employer contributions to the IAA are shown net of the 0.6% of salaries allocated to the Municipal Retiree Benefits Trust.

**Groups 2 and 5**

- Group 5 – Lifetime accrual rate of 2.12%; a bridge of 0.21% calculated on salary below the YMPE;
- Group 2 – no change to accrual rates, but adoption of flat member and employer contribution rates as noted in the contribution rate table above;
- Highest average salary component of the benefit formula changed from the highest 5 years to the highest 4 years (applies to all service provided the member was employed in Group 2 or Group 5 after December 31, 2021);
- Normal form of pension changed from a single life non-guaranteed to a single life 10-year guarantee (applies to all service provided the member was employed in Group 2 or Group 5 after December 31, 2021).
- Group 5 past unfunded liability (being paid by amortization of 0.23% of Group 5 salaries due to 2024) was retired, using \$8 million of surplus;
- Group 5 – Member and employer contribution rate to Basic Account and IAA amended as shown in the contribution rate table above;
- Group 2 and Group 5 contributions include 0.5% and 0.68% of salaries respectively to amortize over 15 years the additional cost of the Group 2 and 5 2022 plan redesign benefit improvements which was not met from their share of surplus;
- Establish a Group Contribution Rate Rebalancing Account (GCRRA) in the Basic Account, using \$32 million of surplus (including Group 2 share of surplus of \$2 million), for the purpose of rate stability for Groups 2/5 when group contribution rate rebalancing is required as per the Board’s funding policy and results in Group2/5 contribution rates increasing.

**General**

- All prior unfunded liabilities in the Plan were funded with 2018 surplus;
- The cap was removed from the Rate Stabilization Account (“RSA”) effective December 31, 2021 so it can increase with investment returns and potential future transfers of surplus;
- A transfer of \$522 million of 2018 surplus to the RSA.

The net impact was a surplus of \$253 million as of December 31, 2018, which was retained in the Basic Account.

There were no other benefit changes that had a material financial impact on the Plan.

The above changes along with a number of other mainly housekeeping changes, and the main provisions of the Plan, are described further in Appendix A.

## Section 3. Actuarial Methods and Assumptions

### 1. Financing Method and Adequacy of Contribution Rates

#### a. Funding Criteria

In any pension system, the rates of member and employer contribution should be such that:

- The present value of all future contributions at those rates
- **equals** the present value of all future benefits
- **minus** the funds on hand.

There are numerous financing methods that will satisfy this equation. The general criteria we use in establishing the appropriate level of contributions to the Municipal Pension Plan include the following:

- Benefit security** – the probability of fulfilling the current benefit promises provided in the Plan depends on a mixture of political, economic and financial factors; but, whatever the probability, obviously benefit security is enhanced with a larger accumulation of assets.
- Stability of contributions** – the financing system should result in contribution rates that are relatively stable over an extended period of time.
- Allocation of costs** – as far as is practicable, pension costs should be allocated to the generation that incurs them; there is no assurance that future generations will assume the burdens transferred to them by prior generations.

The Board has adopted a formal funding policy (most recently revised on June 24, 2021) in which it established that its overall goal for basic benefits is the long term sustainability of the fund. The funding policy further identifies benefit security as the primary objective and stability of contributions as an important secondary objective. 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 excess investment earnings on pensioner liabilities in the Basic Account, and from investment earnings within the IAA itself.

In a sense, the IAA operates akin to a defined contribution or money purchase liability 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 CPI indexing is provided; alternatively, if the monies in the IAA cannot support full CPI indexing, 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 increases for indexing should not create (or increase) a Basic Account 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. *Retirement Annuity Account***

In considering the fund assets for valuation purposes, we excluded the Retirement Annuity Account. This account holds member voluntary contributions as well as other balances in respect of special agreements with various employers that are accumulated on a money-purchase basis and may be converted at a member's retirement into additional amounts of pension. We excluded these assets from our valuation together with corresponding actuarial liabilities, on the assumption that any pension purchases for retiring employees from time to time will have a neutral effect on the Basic Account.

**d. *Basic Account Valuation – Current Financing***

We determined the financial status of the Plan for the Basic Account only (i.e. ignoring the indexing granted after December 31, 2021). The methods used are described in Appendix B.

**e. *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.

**f. *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 not generate either unfunded liabilities or 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 any 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 payroll, revert to the normal cost rate after the unfunded liability or surplus has been amortized.

***g. Pre December 31, 2019 PBSA Requirements – JTA-C***

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 no more than a specified number of years from when they are established, and special rules regarding the treatment of surplus. While the Municipal Pension Plan is one of a number of British Columbia public sector plans that are exempt from these provisions, the current 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 C of the JTA, and we refer to them as the JTA-C requirements. This report therefore complies with the JTA-C funding provisions.

***h. Test Contribution Adequacy***

Under the JTA and JTA-C requirements, the employers and the members must contribute the full normal actuarial cost (e.g. the "entry-age rate" described in (f) 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 any amortization requirements established on or after September 30, 2015). For this purpose the unfunded liability that needs to be amortized from the valuation date is the unfunded liability described above.

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 sets out its policy with regard to amortization of surplus in its funding policy. Accordingly, we have calculated theoretical contribution requirements as follows:

- Calculate the minimum rate required under the JTA-C provisions (the “JTA-C Contribution Rate”). The requirements of JTA-C are:
  - i. pay the entry-age normal cost (EANC)
  - ii. if there is an unfunded liability (UL), it should be amortized over 15 years
  - iii. if there is a surplus
    - a surplus cushion equal to 5% of the net liability must be retained (the “JTA-C minimum surplus”),
    - the remaining balance can then be amortized over not less than five years.
- Actuarial gains and surpluses must be used in the following sequence to:
  - i. First eliminate unfunded liabilities in the Basic Account and ensure the Plan is funded at the Entry Age Normal Cost.
  - ii. Surplus can then be used to maintain the current contribution rate if it lower than the EANC.
  - iii. Then split any remaining surplus on a 50/50 basis between the IAA and RSA, unless the IAA has sufficient funds to provide full sustainable indexing without a cap or the RSA has reached the targeted funding level, in which case the share that would otherwise go to the IAA or RSA will go to the other account until both targets are met.

The Plan Partners maintain the discretion to direct the Board otherwise at each valuation, provided this is exercised within 6 months of receipt of the Valuation Report.

- If Plan still has an actuarial excess, in other words once the IAA and the RSA are fully funded as described above, such actuarial excess will be considered unallocated actuarial excess of the Plan unless and until the Board elects to apply it in one or more of the following manners:
  - i. Transferred to the RSA;
  - ii. Transferred to the IAA;
  - iii. Used to apply an equal reduction in plan member and employer contribution rates to the Basic Account for a period of time;
  - iv. Used to improve benefits (amortized over 25 years);
  - v. Apply towards the payment of contributions otherwise payable by Plan Members, Employers, or both, pursuant to the Pension Plan Rules (amortized over a period of 15 years)

- The funds in the RSA are 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.
- The funds in the GCRRA are also excluded from the Basic Account assets when calculating the Basic Account funded position. Funds in the GCRRA may be used to mitigate the impact of contribution rate increases to Group 5 and Group 2 arising as the result of the need to rebalance contribution rates between the groups in the plan.
- The JTA requires any contribution rate changes, up or down, to be shared equally by the members and the employers. Thus, we express the future contribution requirements as a combined member-plus-employer amount.

## 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 the RSA and GCRRA, 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; the 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 made adjustments to some of the demographic and other assumptions. The assumptions are discussed in detail in Appendix B; the key economic assumptions are summarized below (assumptions for the previous valuation are in brackets).

	<b>Funding Valuation</b>	<b>Sustainable Indexing Valuation</b>
Annual Investment Return	6.00% (6.25%)	6.25% (6.50%)
Annual Salary Increase	3.25 (3.50%) plus seniority	3.00% (3.25%) plus seniority
Annual Indexing	0% for basic costs 2.50% (2.75%) for indexed costs	2.25% (2.50%) for fully indexed costs Sustainable level of indexing calculated as valuation output

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

**4. Membership Data**

Data as of December 31, 2021 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**

With respect to the indexed valuation results, we have excluded the 0.6% of salaries contributed by the employers which is allocated to the Municipal Retiree Benefits Trust effective January 1, 2022. We have not otherwise considered the liabilities and the financing of these benefits.

Plan benefits are summarized in Appendix A. Key changes since the last valuation which had an impact on the results are summarized in Section 2. No benefits have been excluded from 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, 2021. This statement ignores liabilities for indexing of pensions after the valuation date, and assumes that member and employer contribution rates for basic pensions will be made at the entry-age normal cost rate i.e. 15.49% of salary, plus the amortization amounts of 0.5% of salary for Group 2 members and 0.68% of salary for Group 5 members currently scheduled to expire in 2036. As noted earlier, the comparative results shown as at December 31, 2018 are after the plan design change effective January 1, 2022.

#### **Schedule 1 – Statement of Actuarial Position as at December 31, 2021**

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

	(\$ millions)	
<b>Assets</b>	<b>2018</b>	<b>2021</b>
Market Value of Basic Fund including RSA and GCRRA <sup>1</sup>	44,076	60,752
Asset Smoothing Adjustment	(511)	(4,507)
<b>Smoothed Value of Basic Fund including RSA and GCRRA<sup>1</sup></b>	<b>43,565</b>	<b>56,245</b>
RSA (capped at \$2,500 million prior to 2022)	(2,484)	(2,500)
RSA from 2018 surplus	(522)	(685)
GCRRA	(32)	(42)
<b>Smoothed Value of Fund net of RSA and GCRRA</b>	<b>40,527</b>	<b>53,018</b>
Actuarial present values of:		
• Future contributions at entry-age rates	16,417	21,049
• Present value of existing amortization		
o Future contributions in excess of entry-age rates for three years	779	-
o For Groups 2 and 5	51	63
<b>Total Assets</b>	<b>57,774</b>	<b>74,130</b>
<b>Liabilities</b>		
Actuarial present values for:		
• Pensions being paid	18,122	22,379
• Inactive members		
o Deferred vested members	934	1,240
o LTD members	1,459	1,834
o Other inactive members	392	519
• Active members	36,103	43,786
• Future expenses	511	611
<b>Total Liabilities</b>	<b>57,521</b>	<b>70,369</b>
<b>Surplus (Unfunded Actuarial Liability)</b>	<b>253</b>	<b>3,761</b>
<b>Funded Ratio: Total Assets ÷ Total Liabilities</b>	<b>100.4%</b>	<b>105.3%</b>
5% of net liabilities <sup>2</sup>	2,055	2,466
<b>JTA-C Accessible Going Concern Excess</b>	<b>0</b>	<b>1,295</b>

<sup>1</sup> RSA = Rate Stabilization Account; GCRRA = Group Contribution Rate Rebalancing Account

<sup>2</sup> Net liabilities equals total liabilities minus the value of future entry age contributions

## 2. Change in Actuarial Position

The statement of actuarial position included in Schedule 1 indicates an increase of surplus from \$253 million to \$3,761 million since December 31, 2018. The increase in surplus is the net result of a number of items, the most significant being higher than assumed investment returns, partially offset by the excess investment return transfers from the Basic Account to the IAA and the changes made to the economic assumptions.

### Schedule 2 – Change in Actuarial Position

	Approximate effect on surplus (\$ millions)
<b>1. Surplus (Unfunded Liability) at December 31, 2018</b>	<b>253</b>
2. Interest on Surplus	50
3. Change in new entrant profile	45
4. Experience gains / (losses)	
a. Smoothed investment return greater than assumed	5,489
b. Excess investment returns transferred from Basic account to IAA	(1,618)
c. Actual payroll increases greater than assumed on the value of contributions in excess of entry age rates from 2018-2021	38
d. Expenses higher than assumed	(4)
e. Salary increases lower than assumed	243
f. YMPE increases higher than assumed	3
g. Retirements later than assumed	214
h. Less terminations than assumed (net of rehires)	(76)
i. Mortality experience <sup>1</sup>	(92)
j. Disability rates higher than assumed	8
5. Gains / (losses) due to changes in valuation assumptions	
a. Economic assumptions	(1,306)
b. Assumed retirement age for Group 1 disabled members increased	75
c. Withdrawal rates changed (net reduction)	(3)
d. Retirement rates reduced	104
e. Mortality rates changed (net reduction)	(22)
f. Assumed retirement age for members terminating in future increased	257
6. Miscellaneous	103
<b>7. Surplus (Unfunded Liability) at December 31, 2021</b>	<b>3,761</b>

<sup>1</sup> There were more deaths than assumed among older pensioners, resulting in a gain, but fewer than assumed among younger pensioners (who tend to have higher liabilities), resulting in a loss. The net effect was a loss of \$92 million.

### 3. Adequacy of Contribution Rates

As discussed previously in Section 3, the required contribution rate consists of the normal cost plus an adjustment to amortize any surplus or unfunded liability. These components of the required contributions are discussed in more detail below.

#### a. Normal Cost Rate

The average current service contribution, including contributions by the members, required to finance the basic pensions of new entrants (i.e. the entry age normal cost) has increased from 15.05% of salaries as at December 31, 2018 (after the Plan redesign) to 15.49% of salaries as at December 31, 2021. The reasons for this 0.44% increase in normal cost rate are shown below, with the most significant being the changes in economic assumptions.

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

% of salaries	Group 1	Group 2	Group 5	Groups 1 / 2 / 5 average
<b>Entry age normal cost at 2018 valuation</b>	<b>14.67</b>	<b>17.48</b>	<b>21.19</b>	<b>15.05</b>
Changes in demographic profile of new entrants	(0.01)	0.14	0.18	(0.02)
Assumption changes:				
• Economic assumptions	0.48	0.53	0.64	0.49
• Assumed retirement age for members terminating in future increased	0.04	(0.07)	(0.08)	0.03
• Assumed retirement age for Group 1 disabled members increased	(0.01)	-	-	(0.01)
• Withdrawal rates changed	(0.02)	-	-	(0.02)
• Retirement rates reduced	(0.02)	(0.05)	(0.06)	(0.02)
• Mortality rates changed	0.01	0.02	0.02	0.01
• Administration expense allowance reduced	(0.02)	(0.02)	(0.02)	(0.02)
<b>Total change</b>	<b>0.45</b>	<b>0.55</b>	<b>0.68</b>	<b>0.44</b>
<b>Entry age normal cost at 2021 valuation</b>	<b>15.12</b>	<b>18.03</b>	<b>21.87</b>	<b>15.49</b>

The current contribution rates, prior to any adjustment for the results of this valuation, compare to these normal costs as follows:

	%	Entry Age Normal Cost at 2021 Valuation	Current Contribution Rates
1	Group 1	15.12	14.68
2	Group 2	18.03	17.98
3	Group 5	21.87	21.87
<b>4</b>	<b>Average</b>	<b>15.49</b>	<b>15.08</b>

In addition to the above entry normal cost, Group 2 and 5 must pay amortization amounts of 0.50% and 0.68% of pay respectively until 2036.

**b. JTA-C Minimum Contribution Rate**

The minimum permissible contribution rate in accordance with the JTA-C requirements is equal to the normal cost of 15.49% less the 5-year amortization of the accessible going concern excess (surplus in excess of 5% of the net liabilities). Amortizing the accessible going concern excess of \$1,295 million over five years, commencing one year after the valuation date, results in a maximum permissible reduction of 2.12%. The minimum required contribution rate per JTA-C, prior to other JTA required uses of surplus, is therefore 13.41%.

		Entry-age normal cost rates	Maximum permissible JTA-C amortization (all groups)	Additional amortization (to 2036)	Minimum Permissible JTA-C Contribution Rate
1	Group 1	15.12	(2.12)	0.00	13.00
2	Group 2	18.03	(2.12)	0.50	16.41
3	Group 5	21.87	(2.12)	0.68	20.43
<b>4</b>	<b>Average</b>	<b>15.49</b>	<b>(2.12)</b>	<b>0.04</b>	<b>13.41</b>

This is prior to other considerations of the JTA which are discussed below.

**c. JTA and Funding Policy Requirements**

The JTA and the funding policy permit the use of surplus, or actuarial excess, to first maintain the current contribution rates, amortizing the actuarial excess over 15 years, or based on the JTA-C requirements if this produces a higher rate. In this case, amortizing over 15 years would permit a reduction of 2.32%, and hence the maximum permissible amortization is the JTA-C amortization.

In order to maintain the current rates, an amount equal to 5% of the net liabilities has to be maintained in the Basic account and the balance, or Accessible Going Concern Excess, must cover the difference between:

- i. The average entry-age normal cost rate (15.49%) plus the value of the Group 2 and Group 5 additional amortization (0.04%), ie a total of 15.53%; and
- ii. The current average contribution rate of 15.08%.

The amount of Accessible Going Concern Excess required to amortize this difference of 0.45% over 5 years is \$277 million.

Unless the Plan Partners direct the Board otherwise within 6 months of receiving this valuation report, the remaining Accessible Going Concern Excess of \$1,018 million must be split 50/50 between the IAA and the RSA.

Assuming these actions are taken, the balance sheet position is as follows:

**Schedule 4 – Statement of Actuarial Position as at December 31, 2021 – after implementing JTA provisions**

Assets	(\$ millions)	
	2021 prior implementing JTA provisions	2021 after implementing JTA provisions
<b>Smoothed Value of Basic Fund including RSA and GCRRA</b>	<b>56,245</b>	<b>56,245</b>
RSA (capped at \$2,500 million prior to 2022)	(2,500)	(2,500)
RSA from 2018 surplus	(685)	(685)
Transfer of 2021 surplus to RSA	n/a	(509)
Transfer of 2021 surplus to IAA	n/a	(509)
GCRRA	(42)	(42)
<b>Smoothed Value of Fund net of RSA and GCRRA</b>	<b>53,018</b>	<b>52,000</b>
Actuarial present values of:		
• Future contributions at entry-age rates	21,049	21,049
• Present value of existing amortization (Groups 2 and 5)	63	63
<b>Total Assets</b>	<b>74,130</b>	<b>73,112</b>
<b>Liabilities</b>		
<b>Total Liabilities</b>	<b>70,369</b>	<b>70,369</b>
<b>Surplus (Unfunded Actuarial Liability)</b>	<b>3,761</b>	<b>2,743</b>
<b>Funded Ratio: Total Assets ÷ Total Liabilities</b>	<b>105.3%</b>	<b>103.9%</b>
5% of net liabilities <sup>1</sup>	<b>2,466</b>	<b>2,466</b>
<b>JTA-C Accessible Going Concern Excess</b>	<b>1,295</b>	<b>277</b>

Amortizing the revised accessible going concern excess of \$277 million over five years, commencing one year after the valuation date, results in a maximum permissible reduction of 0.45%, which is lower than the reduction based on amortizing the full surplus over 15 years. The table below confirms that the above use of surplus while maintaining the contributions rates results in contributions that comply with the JTA.

<sup>1</sup> Net liabilities equals total liabilities minus the value of future entry age contributions

	Entry-age normal cost rates	Revised maximum permissible JTA-C amortization after allocating surplus to the RSA and IAA (all groups)	Additional amortization (to 2036)	Minimum Permissible JTA-C Contribution Rate after allocating surplus to the RSA and IAA
<b>Average</b>	<b>15.49</b>	<b>(0.45)</b>	<b>0.04</b>	<b>15.08</b>

The Plan Partners may direct other uses of surplus, subject to the requirements of the JTA, the Plan rules and regulatory requirements. Alternative uses of surplus could result in changes to the required contributions set out in this report.

**4. Required Contribution Rates**

**Contribution Rate Imbalance**

Whilst the current contribution rates in aggregate are sufficient, it is necessary to consider whether each Group is paying their correct share of the overall required rate. To the extent that they are not, an imbalance arises, which the Board may choose to eliminate by adjusting the rates for each group, while leaving the average rate unchanged. Funds in the GCRRA will be used to mitigate the impact of any contribution increases resulting from an imbalance for Groups 2 and 5. The JTA requires that the effects of contribution rate rebalancing be shared equally between members and employers.

The table below shows the theoretically required contribution rate for each individual group and compares it to their current contribution rates to obtain the required rebalancing adjustment for each group. The theoretically required contribution rate is calculated as the sum of the Group’s entry age normal cost, the amortization reduction to keep the overall contribution rate at its current level, and the amortization for Groups 2 and 5 as a result of the plan redesign.

**Schedule 5 – Imbalance in Contribution Rates**

	<b>Group 1 %</b>	<b>Group 2 %</b>	<b>Group 5 %</b>	<b>Groups 1 / 2 / 5 Average %</b>
1. Theoretical rate = normal cost less 0.45% adjustment to keep aggregate rate unchanged (plus amortization of 0.50% for Group 2 and 0.68% for Group 5)	14.67	18.08	22.10	15.08
2. Current basic contribution rates	14.68	17.98	21.87	15.08
3. Net imbalance by group = (2) - (1)	0.01	(0.10)	(0.23)	0.00

The above table indicates that the contribution rates are "out of balance" in the sense that, while the average contribution rate is unchanged, the theoretical cost for Group 1 has decreased marginally, while the theoretical costs for Group 2 and 5 have increased. Therefore, if the current rates are not adjusted, Group 1 will be paying more than their theoretically correct share of the total costs, while Groups 2 and 5 will be paying less.

Given the requirement in the JTA that employers and members will equally share the effects of group contribution rate rebalancing, the contribution rates for Group 1 should continue at the current rates without adjustment for rebalancing, as the net imbalance rounds to zero when shared equally (a 50/50 share of 0.01% rounds to nil adjustment each).

For Groups 2 and 5, in the absence of the GCRRA the required contribution rates would increase by 0.10% and 0.24% respectively, when rounded to reflect the equal cost sharing. The Board’s funding policy states that, in such a case, then the actuary will calculate whether the balance in the GCRRA is sufficient to amortize this

increase over 15 years as a percentage of the Group 2 or 5 payroll on an open group basis. The value of the unrounded additional Group 2/5 rebalancing contributions, amortized over 15 years as a percentage of the Group 2 and Group 5 payroll on an open group basis, is \$20.3 million. Since this is less than the balance of \$42 million in the GCRRA at December 31, 2021, the Group 2 and Group 5 contribution rates will not be increased for rebalancing. Annually an amount equal in value to the otherwise required percentage of payroll increase (0.10% of pay and 0.23% of pay for Groups 2 and 5 respectively) will be transferred from the GCRRA to the Basic Account until the 2024 valuation, at which point the imbalance will be reassessed and required contributions from the GCRRA reassessed.

**Required Contribution Rates**

As discussed above, the current Basic contribution rates can be maintained, with no rebalancing at the group level, and are in line with the requirements of the JTA, including JTA-C. The IAA contribution rates are not revised as a result of the valuation and therefore may continue unchanged at their current, January 1, 2022, level.

The following table summarizes the current and required contribution rates.

**Schedule 6 – Required Total Contribution Rates**

	Current (%)			
	Basic	Net IAA	Benefit Trust	Total
<b>Members</b>				
Group 1	7.34	1.27	0.00	8.61
Group 2	7.14	1.78	0.00	8.92
Group 5	9.08	2.04	0.00	11.12
<b>Employers</b>	<b>Basic</b>	<b>IAA</b>	<b>Benefit Trust</b>	<b>Total</b>
Group 1	7.34	1.37	0.60	9.31
Group 2	10.84	0.98	0.60	12.42
Group 5	12.79	1.28	0.60	14.67
<b>From GCRRA</b>				
For Group 2	0.10	0.00	0.00	0.10
For Group 5	0.23	0.00	0.00	0.23

**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  $\frac{1}{2}$  of the amount that is required to fund the aggregate benefits in respect of which those contributions are made".

For Groups 1 and 2, the required member contribution rate of 8.61% and 8.92% of salary are below the 9% limit, and the \$1,000 plus 70% of the pension credit rule which may affect high paid members is applied by the Pension Corporation (with excess contributions going through the Supplemental Benefits Account) so it will not be necessary to apply to the Minister for an exemption.

The member contributions for Group 5 of 11.12% of salary exceed the 9% limit (and thus a waiver is required for these contributions. The corresponding Group 5 employer contribution rate of 14.07% is higher than the current member rate. IAA contribution rates are fixed and, per the Joint Trust Agreement, the employer contributions to Group 5 can never be less than the member contributions. It is therefore reasonable to conclude that the requirement that the member contributions will not exceed half the amount required to fund the aggregate benefits is met.

Similar exemptions were required, and obtained for all groups, following the 2018 valuation.

**5. Accrued Benefits – Funded Ratio**

The 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 7 – Accrued Benefits – Funded Ratio at December 31, 2021**

Basic Account – Non-Indexed Benefits

	(\$ millions)	
	2018 <sup>1</sup>	2021
<b>Fund (Basic Account): smoothed value of assets</b>	<b>43,565</b>	<b>56,245</b>
<b>Accrued Liabilities</b>		
– for pensions being paid	18,122	22,379
– for inactive members	2,708	3,593
– for active members	17,812	20,531
<b>Total Accrued Liabilities</b>	<b>38,642</b>	<b>46,503</b>
<b>Surplus (Unfunded Liability): for accrued service only</b>	<b>4,923</b>	<b>9,742</b>
<b>Funded Ratio: Fund ÷ Total accrued liabilities</b>	<b>112.7%</b>	<b>120.9%</b>
Assets in RSA and GCRRA	(2,485)	(3,227) <sup>2</sup>
Adjusted Surplus (Unfunded Liability) net of RSA and GCRRA	2,438	6,515

The above schedule indicates that the funded ratio for accrued benefits has increased from about 112.7% to 120.9%, including the funds in the RSA and GCRRA. This is largely for reasons similar to the items in the analysis in Schedule 2, excluding those items related to future contribution rates.

<sup>1</sup> Note that these figures are prior to plan redesign. The accrued liabilities would be slightly higher if plan redesign was reflected due to the amendments to Groups 2 and 5 to provide a 4 year averaging of salaries and a G10 normal form, which applies to accrued service for those active in Group 2 or Group 5 after December 31, 2021.

<sup>2</sup> Prior to implementation of JTA provisions on use of surplus following the 2021 valuation.

## 6. 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:

- The actuarial present value, at the calculation date, of projected benefits allocated to periods up to the calculation date, and
- 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, 2021 of a one percentage point drop in the discount rate assumption. All other assumptions were kept unchanged.

#### **Schedule 8 – Sensitivity – Impact of 1% drop in discount rate on Accrued Benefits and Normal Cost**

Impact on liabilities of 1% drop in discount rates	Going Concern 6.00% (\$ millions)	Going Concern 5.00% (\$ millions)	Increase (\$ millions)
Active members	20,531	24,601	4,070
Disabled members	1,834	2,184	350
Terminated members	1,759	2,057	298
Pensioners and beneficiaries	22,379	24,379	2,000
<b>Total</b>	<b>46,503</b>	<b>53,221</b>	<b>6,718</b>

  

Impact on normal cost rate of 1% drop in discount rates	Going Concern 6.00%	Going Concern 5.00%	Increase
Entry age normal cost	15.49%	19.75%	4.26%

### 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 i.e. before any consideration of use of surplus permitted by the JTA. These figures are summarized in the table below:

**Schedule 9 – Sensitivity – Impact of 1% Drop in Discount Rate on Plan Funding**

	(\$ millions)		
	6.00%	5.00%	Increase
Smoothed Value of Fund net of RSA and GCRRA	53,018	53,018	0
Actuarial present values of:			
• Future contributions at entry-age rates	21,049	28,312	7,263
• Present value of existing amortization for Groups 2/5	63	68	5
<b>Total Assets net of RSA and GCRRA</b>	<b>74,130</b>	<b>81,398</b>	<b>7,268</b>
Liability for Active and Disabled members	45,620	57,684	12,064
Liability for Terminated members	1,759	2,057	298
Liability for Pensioners and beneficiaries	22,379	24,379	2,000
Expense	611	657	46
<b>Total Liabilities</b>	<b>70,369</b>	<b>84,777</b>	<b>14,408</b>
Surplus/(Unfunded liability) on entry-age basis	3,761	(3,379)	(7,140)
Accessible Going Concern Excess	1,295	-	(1,295)
Entry Age Normal Cost – average	15.49%	19.75%	4.26%
JTA-C Amortization	(2.12%)	1.93%	4.05%
Additional amortization for Groups 2/5	0.04%	0.04%	-
<b>JTA-C Minimum rate</b>	<b>13.41%</b>	<b>21.72%</b>	<b>8.31%</b>

**7. Supplementary Valuations**

Results analogous to those in Schedules 1 and 7 i.e. before any consideration of use of surplus permitted by the JTA 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 (and consistent with the Plan Rules); this is done both for:
  - basic benefits only; and for
  - basic plus indexed benefits.

The adjustments to the assumptions are discussed in Appendix B. In the indexed calculations, we reduced the employer contributions to the IAA by the 0.6% of salaries allocated to the Municipal Retiree Benefit Trust.

Since the results show a surplus position, we have shown the amortization requirements, for illustrative purposes, as the maximum permitted by the JTA-C.

The key results are summarized below:

**Schedule 10 – Basic and Indexed Benefits (without tax limits)**

Funded position	Basic Only	Basic + Indexed
	(\$ millions)	(\$ millions)
Smoothed Value of Fund net of RSA and GCRRA	53,018	65,069
Actuarial present values of:		
• Future contributions at entry-age rates	21,049	29,254
• Existing amortization for Groups 2/5	63	63
<b>Total Assets net of RSA and GCRRA</b>	<b>74,130</b>	<b>94,386</b>
<b>Total Liabilities</b>	<b>70,369</b>	<b>93,319</b>
<b>Surplus (Unfunded Liability)</b>	<b>3,761</b>	<b>1,067</b>
<b>Accessible Going Concern Excess</b>	<b>1,295</b>	<b>-</b>
<b>Contribution Rates</b>	<b>%</b>	<b>%</b>
Member – current	7.43	8.75
Employer – current	7.65	9.01
<b>Total – current, average</b>	<b>15.08</b>	<b>17.76</b>
Entry-age normal cost – average	15.49	21.48
JTA-C amortization for all members	(2.12)	-
Additional amortization for Group 2/5 members	0.04	0.04
<b>Total – JTA-C minimum rate</b>	<b>13.41</b>	<b>21.52</b>

If assets and liabilities are restricted to accrued service only, i.e. analogous to Schedule 7 earlier, the 2021 surplus (unfunded liability) figures change as follows:

**Schedule 11 – Indexed Accrued Benefits (without tax limits) – Funded Ratio at December 31, 2021**

	(\$ millions)	
	Basic Only	Basic + Indexed
Assets	56,245	68,296
Liabilities	46,503	61,060
<b>Surplus (Unfunded Liability)</b>	<b>9,742</b>	<b>7,236</b>
Funded Ratio	120.9%	111.9%
Assets in RSA and GCRRA	(3,227)	(3,227)
Adjusted Surplus (Unfunded Liability) net of RSA and GCRRA	6,515	4,009

**Pensions Limited to ITA Maximums**

When the income tax limits on pensions are recognized, the above 2021 results change marginally. The key results are summarized below.

**Schedule 12 – Pensions Limited to ITA Maximums – Basic Only – Net of RSA and GCRRA  
(pre allocation of 2021 surplus)**

Basic Only	Without Tax Limit	With Tax Limit
Surplus (Unfunded Liability)	(\$ millions)	(\$ millions)
Entry Age Basis	3,761	3,888
Accrued Service Only	6,515	6,874
Contribution Rate	%	%
Entry-age normal cost	15.49	15.17
JTA-C Amortization	(2.12)	(2.34)
Additional amortization for Group 2/5 members	0.04	0.04
<b>Total JTA-C minimum rate (before surplus transfers)</b>	<b>13.41</b>	<b>12.87</b>

**Schedule 13 – Pensions Limited to ITA Maximums – Indexed Benefits – net of RSA and GCRRA  
(pre allocation of 2021 surplus)**

<b>Basic and Indexed</b>	<b>Without Tax Limit</b>	<b>With Tax Limit</b>
<b>Surplus (Unfunded Liability)</b>	<b>(\$ millions)</b>	<b>(\$ millions)</b>
Entry Age Basis	1,067	1,154
Accrued Service Only	4,009	4,479
<b>Contribution Rate</b>	<b>%</b>	<b>%</b>
Entry Age Normal Cost	21.48	21.04
JTA-C amortization	-	-
Additional amortization for Group 2/5 members	0.04	0.04
<b>Total JTA-C minimum rate</b>	<b>21.52</b>	<b>21.08</b>

## 8. 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 from January 1, 1982 to January 1, 2018 under the present Plan terms, and for many years before that under earlier Plan provisions. After the plan moved to a sustainable indexing basis, indexing is limited based on the financial position of the plan at the most recent valuation. Under this approach, if the contribution levels supported it, full indexing in line with increases in the cost of living would be provided. Thus, it is appropriate for purposes of testing the *ITA* 147.2(2) limits to recognize, in advance, the future indexing of pensions for the present Plan membership. Accordingly, the valuation results on the fully indexed basis, recognizing the income tax limits on benefits (and consistent with the requirements of the Plan Text), should be considered.

For the purpose of this test, the total assets should include the \$3,185 million in the RSA and \$42 million in the GCRRA.

**Schedule 14 – Pensions Limited to ITA Maximums – Maximum Surplus and Contributions Test**

<b>Basic and Indexed</b>	<b>With Tax Limit</b>
<b>Surplus (Unfunded Liability)</b>	<b>(\$ millions)</b>
Entry Age Basis, excluding scheduled amortization, net of RSA and GCRRA	1,154
Amount in RSA and GCRRA	3,227
Resulting surplus liability for ITA test	4,381
<b>Net liability</b>	63,978
25% of Net liability	15,995
<b>Contribution Rate</b>	<b>%</b>
Fully Indexed Entry Age Normal Cost	21.04

The fully indexed valuation, recognising the income tax limits and including the RSA and GCRRA, shows a surplus of \$4,381 million. The corresponding net liability (indexed liability less the present value of the indexed entry age normal cost) is \$63,978 million, so the 25% ITA surplus limit is \$15,995 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 the average fully indexed, income tax limited, entry-age normal cost rate of 21.04%. The current total contribution rate of 17.76% is less than the ITA limit and therefore is acceptable under the ITA.

We have commented previously (under section 4(4)) on the 9% limit that applies to individual member contributions.

## 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.

As noted above, the level of indexing that can be sustained may vary depending on the long term funding commitment to the Plan. For the purposes of this section, we have illustrated the impact on sustainable indexing if contributions to the Basic Account are maintained at the current average rate of 15.08% of salaries.

### 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	2021
Normal (entry-age) actuarial cost	15.49%
IAA contributions – current average	2.68%
<b>Long term funding commitment – excluding current amortization schedule</b>	<b>18.17%</b>

### 2. Results

Based on a long term funding commitment as above, we have calculated that indexing at 100% of CPI is fully sustainable based on the 2021 results. Previously, the level of sustainable indexing was limited to 2.15% per year, based on the results of the 2018 valuation. The position has therefore improved, and this is mainly due to the smoothed investment returns over the three year period being higher than assumed.

Allowing for indexing of 2.25% per year (ie 100% of assumed CPI inflation), and using the sustainable indexing assumptions discussed earlier, we obtain the following balance sheet and contribution requirements:

**Schedule 15 – Sustainable Indexing Valuation**

	2021
	(\$ millions)
<b>Sustainable Indexing Target</b>	<b>2.25%</b>
<b>Assets</b>	
Market Value of Fund	73,769
Asset Smoothing Adjustment	(3,688)
RSA (prior to any allocation of 2021 Basic surplus)	(3,185)
GCRRA	(42)
<b>Smoothed Value of Fund for Sustainable Indexing</b>	<b>66,854</b>
Actuarial present values of:	
– Contributions at Entry Age Normal Cost <sup>1</sup>	24,928
– Existing amortization for Groups 2/5	61
<b>Total Assets</b>	<b>91,843</b>
<b>Total Liabilities</b>	<b>84,976</b>
<b>Surplus (Unfunded Actuarial Liability)</b>	<b>6,867</b>
Present value of Basic account amortization if contributions maintained at current average rate	(250)
<b>Adjusted Surplus (Unfunded Actuarial Liability)</b>	<b>6,617</b>
<b>Contribution Requirements</b>	
Entry Age Normal Cost – based on sustainable indexing target	18.96%
Amortization of (surplus) / unfunded liability over infinite period	(1.54%)
<b>Required contribution</b>	<b>17.42%</b>
<b>Long term contribution commitment</b>	<b>18.17%</b>

The above results show that, at an indexing rate of 2.25% per year, the required contribution rate is 17.42% of pay, which is 0.75% less than the long term contribution commitment of 18.17%. Indexing is therefore sustainable at 100% of CPI.

These results are presented prior to any transfer of Basic Account surplus to the RSA. However, our conclusion that indexing is fully sustainable at 100% of CPI would not change if 50% of the remaining Accessible Going Concern Excess (\$509 million) were transferred to the RSA, as permitted by the JTA and the Board's funding policy. After the transfer the Required Contribution increases to 17.54%, which is still below the Long Term Contribution Commitment as required.

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.

<sup>1</sup> This allows for indexing at 2.25% and reflects a 6.25% discount rate.

## **Section 6. JTA / Funding Policy Requirements**

In line with the Joint Trust Agreement (JTA) and the the funding policy, \$2,466 million of surplus must be retained in the Basic Account and \$277 million of the Accessible Going Concern Excess can be used to maintain the current contribution rate, which is below the entry-age normal cost rate.

Unless the Plan Partners direct the Board otherwise within 6 months of receiving this valuation report, the remaining Accessible Going Concern Excess of \$1,018 million must be split 50/50 between the IAA and the RSA, as neither account has reached its funding target.

The Plan Partners may direct other uses of surplus, subject to the requirements of the JTA, the Plan rules and regulatory requirements.

## **Section 7. Subsequent Events**

To the best of our knowledge, there are no material subsequent events that would affect the results and recommendations of this valuation. Any investment experience occurring between the valuation date and the report date, which differs from the assumption made, is not reported on in this valuation report and will be reported on in future valuations.

## **Section 8. Actuarial Opinion**

In our opinion,

- a. the membership data on which the valuation is based are sufficient and reliable for the purposes of the valuation,
- b. the assumptions are appropriate for the purposes of the valuation, and
- c. the methods employed in the valuation are appropriate for the purposes of the valuation.

This report has been prepared and our opinions given in accordance with accepted actuarial practice in Canada. Pursuant to the JTA and regulatory requirements, the next valuation should be completed no later than as of December 31, 2024.

## Section 9. 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,



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Richard Border  
Fellow of the Canadian Institute of Actuaries<sup>1</sup>  
Fellow of the Institute and Faculty of Actuaries



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September 23, 2022

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<sup>1</sup> Canadian Institute of Actuaries is the Primary Regulator.

## Appendix A: Summary of Plan and Amendments as at December 31, 2021

### 2022 Plan design changes

In 2021, the plan rules were substantially amended to implement design changes to member and employer contribution rates and the provision of retirement benefits, effective January 1, 2022. These changes are included in this summary of plan provisions.

### Other Changes to the Plan

The previous valuation was based on the provisions of the Plan as at December 31, 2018. Since then, the plan has been amended a number of times. The main changes are summarized below.

- **Transfer of locked-in pension credits:** Retroactively effective April 5, 2001, the plan rules were updated to remove a requirement that an authority participating in a pension transfer agreement from this plan agrees to administer the transfer of locked-in pension credits in accordance with the locking-in provisions of this plan.
- **Weighted-average contribution rates:** Retroactively effective January 1, 2014, references to the use of weighted-average contribution rates for purchasing service in multiple employee groups are removed from the plan rules. Since 2014, purchases are treated separately for each group.
- **Members who terminate employment within 90 days of earliest retirement age:** Retroactively effective September 30, 2015, the plan rules were amended to correct language in the plan rules and clarifies that a member who terminates employment within 90 days before (rather than after) earliest retirement age can elect to transfer their commuted value, subject to the guarantee period provided in the termination selection statement.
- **Employment Standards Act (ESA) housekeeping:** Retroactively effective May 17, 2018, the reference to pregnancy leave in the plan rules was replaced with maternity leave to be consistent with section 50 of the ESA.
- **New ESA leave types:** Effective May 30, 2019, the plan rules were amended to add two new ESA leave types — leave for critical illness or injury and leave for domestic or sexual violence — for which the employer is required to pay the employer share of contributions if the employee chooses to pay the employee share.
- **Further new ESA leave types:** Effective March 23, 2020, the plan rules were amended to add two further new ESA leave types — illness or injury leave (this leave applies in different circumstances than critical illness or injury leave) and COVID-19-related leave — for which the employer is required to pay the employer share of contributions if the employee chooses to pay the employee share.

- **Approval of late pension applications:** Effective March 25, 2020, the plan rules were clarified to state that the plan administrative agent may determine if a member has reasonable grounds to request a backdated retirement benefit due to being unable to apply for their pension on time. A member must usually apply for their pension no later than the end of the month in which they wish to commence their pension.
- **New purchase of service payment option for ESA leaves:** Effective May 1, 2020, the plan rules were amended to introduce a new purchase of service payment option allowing plan members to contribute to the plan while on a leave of absence under the ESA. If a member chooses to contribute during such a leave, the employer must also contribute during the leave.
- **Authority to approve new employer applications:** Effective July 1, 2020, the Municipal Pension Board of Trustees (board) delegated authority to the plan administrative agent to approve employer applications to join the plan that meet certain criteria.
- **Federally regulated employers in the plan:** Effective July 1, 2020, the plan rules were amended to remove the requirement for a federally regulated employer to apply individually for an exemption from the federal *Pension Benefits Standards Act* in order to join the plan. The plan is exempt from federal pension legislation.
- **Refund interest rates:** Following the Bank of Canada's discontinuance of Canadian Socio-Economic Information Management System (CANSIM) series V122515 and direction from BC Financial Services Authority to reference CANSIM series V80691336 (or its future equivalent), the plan rules were amended to incorporate this change, effective July 1, 2020
- **Gender-neutral language:** Effective November 19, 2020, binary gender-specific terms (e.g., he or she) in the plan rules were replaced with gender-neutral terms.
- **Employer contribution rates:** Effective January 1, 2021, blended employer contribution rates are calculated once every three years (instead of annually), or as directed by the board.
- **Post-retirement group benefit funding:** Effective March 11, 2021, the plan rules were amended to provide initial funding for the new Municipal Retiree Benefit Trust that took over the provision of group benefits for retired members as of January 1, 2022.
- **Canada Labour Code (labour code) compliance:** Effective June 24, 2021, the plan rules were amended to ensure compliance with the labour code for federally regulated employers in the plan, i.e., the same rights and options for purchasing BC ESA leaves apply to labour code leaves.
- **Obligations of plan employers and the board's power to revoke an employer's participation:** Effective November 17, 2021, the plan rules were amended to clarify the obligations of employers in the plan and the board's power to revoke any employer's plan participation.

## The Plan

The main provisions of the plan are summarized below and are provided as at January 1, 2022, except as otherwise noted. The section references are to the plan rules, except otherwise noted. The valuation is based on these provisions.

### Employer and Employee Eligibility

The plan applies to employers described under section 2: a municipality, a body designated under the *College and Institute Act*, teaching universities as designated under the *University Act*, and any other body designated as an employer on terms and conditions of eligibility specified by the board or former board. The board retains the authority to set additional terms and conditions limiting or expanding the employee enrolment requirements applying to an individual employer. In general, plan employers include municipalities, regional districts, health services organizations, school districts and regional colleges.

Participation is compulsory for all regular, full-time employees and for other employees who have been working in a continuous full-time capacity with the same employer for 12 months. Enrolment is optional for less than full-time employees who have completed at least 2 years of continuous employment and have earned at least 35 per cent of the Year's Maximum Pensionable Earnings (YMPE) under the Canada Pension Plan in each of two consecutive calendar years. Employees can be enrolled earlier than the plan requires or allows if the employer passes a resolution or if the terms of a collective bargaining agreement provide for it. Where an active member transfers from the service of one employer to another employer, with a break in service of less than one month, contributions must continue without interruption. [Section 3]

Effective January 1, 2019, employees are classified as follows [Section 96(1)]:

- a. Group 1: all members other than police officers or firefighters, including those employees who participated in Group 4 prior to January 1, 2019 — normal retirement age is 65;
- b. Group 2: police officers and firefighters other than those in Group 5 — normal retirement age is 60; and
- c. Group 5: police officers and firefighters who have higher contribution and benefit accrual rates than those in Group 2 — normal retirement age is 60.

**Member Contributions**

Section 5 defines the following contribution rates (effective January 1, 2022), which are deducted from a member's salary during a calendar year.

For members in Group 1:

- a. 7.34 per cent of the member's salary paid into the basic account; and
- b. 1.27 per cent of the member's salary paid into the inflation adjustment account (IAA).

For members in Group 2:

- a. 7.14 per cent of the member's salary paid into the basic account; and
- b. 1.78 per cent of the member's salary paid into the IAA.

For members in Group 5:

- a. 9.08 per cent of the member's salary paid into the basic account; and
- b. 2.04 per cent of the member's salary paid into the IAA.

Member contributions cease after 35 years of pensionable service have been accrued, with the exception of contributions made under certain special agreements entered into under Part 15.

**Employer Contributions**

Section 6 defines the following contribution rates (effective January 1, 2022), which are paid by the employer during a calendar year:

For members in Groups 1:

- a. 7.34 per cent of the member's salary paid into the basic account; and
- b. 1.97 per cent of the member's salary paid into the IAA.

For members in Groups 2:

- a. 10.84 per cent of the member's salary paid into the basic account; and
- b. 1.58 per cent of the member's salary paid into the IAA.

For members in Group 5:

- a. 12.79 per cent of the member's salary paid into the basic account; and
- b. 1.88 per cent of the member's salary paid into the IAA.

As of January 1, 2022, the above employer contributions to the IAA are reduced by a fixed 0.6 per cent of salaries and allocated to the new Municipal Retiree Benefit Trust. [Section 75]

Employer contributions cease in respect of a member's salary after the member has accrued 35 years of pensionable service, with the exception of contributions made under certain special agreements entered into under Part 15.

### **General Comment on Approach to Documenting Differences per Group**

There are different retirement ages for the different member Groups in the plan. The normal retirement age is 65 for members in Group 1, and 60 for members in Groups 2 and 5. In the following summaries of termination, retirement and other benefits, the various eligibility conditions and plan provisions, the age and/or service conditions are first shown for Group 1; the age and/or service conditions for Groups 2 and 5, if different, are shown in parentheses following the Group 1 conditions.

### **Termination Benefits**

Under sections 42(1)(b) and 45, a terminating member is entitled to a deferred retirement benefit equal to the full retirement benefit (normal pension and bridge) accrued to the date of termination. The date the benefit is payable depends on the service accruals to termination – see below "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 (50), subject to the commuted value being payable on a locked-in basis.

Under certain limited conditions (small retirement benefit, non-resident status) 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, increased to retirement or to December 31, 1980 if earlier, in accordance with changes in the pension index. Subsequent to 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 indexing described above is funded from the IAA.

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

Section 50 provides that an active member who terminates employment on or after September 30, 2015 is, on application, entitled to receive a retirement benefit calculated in accordance with sections 54 and 55 if the member has reached age 55 (50).

**Calculation of Unreduced Retirement Benefit**

Section 54 provides that the unreduced pension payable to a member is calculated as the sum of the following.

For service in Group 1:

- a. 1.3 per cent of the lesser of
  - i. the member's highest average salary, and
  - ii.  $1/12$  of the YMPE for the calendar year immediately before the effective date of the retirement benefit multiplied by the number of years of pensionable service accrued before January 1, 2022,
- b. 2 per cent 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, 2022, and
- c. 1.9 per cent of the member's highest average salary multiplied by the number of years of pensionable service accrued after December 31, 2021.

For service in Group 2:

- a. 1.3 per cent of the lesser of
  - i. the member's highest average salary, and
  - ii.  $1/12$  of the YMPE for the calendar year immediately before the effective date of the retirement benefit multiplied by the number of years of pensionable service, and
- b. 2 per cent 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.

For service in Group 5:

- a. 1.63 per cent of the lesser of
  - i. the member's highest average salary, and
  - ii.  $\frac{1}{12}$  of the YMPE for the calendar year immediately before the effective date of the retirement benefit multiplied by the number of years of pensionable service accrued before January 1, 2022,
- b. 2.33 per cent 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, 2022, and
- c. 2 per cent of the member's highest average salary multiplied by the number of years of pensionable service accrued after December 31, 2021. Note: Section 87 provides an additional retirement benefit of 0.12 per cent of the member's highest average salary multiplied by the number of years of pensionable service accrued after December 31, 2021, paid as a supplemental benefit due to *Income Tax Act* (ITA) requirements. In other words, the total benefit accrual on post-2021 service in Group 5 is 2.12 per cent.

If the member has, before April 1, 2002, purchased pensionable service for service before the date on which the plan first applied to the member's employer, and has not accrued 35 years of pensionable service after the date that the plan first applied to the employer, the percentages used in the formula referenced in paragraphs (a) and (b) above for all groups is 1.05 per cent and 1.75 per cent, respectively, for that purchased service.

In addition, the member may be entitled to a monthly bridge benefit payable until the earlier of the death of the member and the member reaching age 65 that is calculated as the sum of the following.

For service in Group 1 (pre-2022 service only):

- a. 0.7 per cent of the lesser of
  - i. the member's highest average salary, and
  - ii.  $\frac{1}{12}$  of the YMPE for the calendar year immediately before the effective date of the retirement benefit multiplied by
- b. the number of years of pensionable service accrued before January 1, 2022.

For service in Group 2:

- a. 0.7 per cent of the lesser of
  - i. the member's highest average salary, and
  - ii.  $\frac{1}{12}$  of the YMPE for the calendar year immediately before the effective date of the retirement benefitmultiplied by
- b. the number of years of pensionable service.

For service in Group 5:

- a. 0.7 per cent of the lesser of
  - i. the member's highest average salary, and
  - ii.  $\frac{1}{12}$  of the YMPE for the calendar year immediately before the effective date of the retirement benefitmultiplied by
- b. the number of years of pensionable service accrued before January 1, 2022, and
- c. 0.21 per cent of the lesser of
  - i. the member's highest average salary, and
  - ii.  $\frac{1}{12}$  of the YMPE for the calendar year immediately before the effective date of the retirement benefitmultiplied by
- d. the number of years of pensionable service accrued after December 31, 2021.

Highest average salary means one-twelfth of the average annual salary earned by a member during the 60 (48) months of pensionable service (not necessarily consecutive) in which the salaries were highest (or, if the member has accrued less than 60 (48) months of pensionable service, the total number of months of pensionable service). Note: For service in Groups 2 and 5, highest average salary is based on the 60 months of pensionable service in which salaries were highest if the member was not employed in Group 2 or Group 5 after December 31, 2021.

The pensionable service described in the pension and bridge benefit calculations above are limited to the first 35 years of pensionable service the member accrues. However, a member's highest average salary will consider all pensionable earnings, including earnings received after reaching 35 years of service.

A member who has made voluntary additional contributions in the past (these are no longer accepted) will be granted an increase to their pension or a refund, including interest at fund interest rates on those contributions.

Members who have contributed under a pre-2007 special agreement will be granted a retirement annuity or a lump-sum payment of the member's account balance. Members who have contributed under a post-2006 special agreement will be granted a lump-sum payment of the member's account balance.

### **Calculation of Reduced Retirement Benefit**

Section 55 provides that a retirement benefit calculated in accordance with section 54 is reduced under the following circumstances:

For members who do not have 2 years of contributory service:

- a. for service in Group 1 accrued before January 1, 2022, the retirement benefit is reduced by 3% per year that retirement age is less than 65,
- b. for service in Group 1 accrued after December 31, 2021, the retirement benefit is reduced by 5.2% per year that retirement age is less than 65, and
- c. for all service in Groups 2 and 5, the retirement benefit is reduced by 3% per year that retirement age is less than 60.

For members who have at least 2 years of contributory service:

- a. for service in Group 1 accrued before January 1, 2022, the retirement benefit is reduced by 3% per year that
  - i. retirement age is less than 60, or
  - ii. retirement age plus years of contributory service is less than 90,whichever results in the lowest reduction,
- b. for service in Group 1 accrued after December 31, 2021, the retirement benefit is reduced by 6.2% per year that retirement age is less than 60,
- c. for all service in Groups 2 and 5, the retirement benefit is reduced by 3% per year that
  - i. retirement age is less than 55, or
  - ii. retirement age plus years of contributory service is less than 80,whichever results in the lowest reduction, and

- d. the 3% per year described in paragraphs (a) and (c) is instead 5% per year if:
  - i. the member last terminated employment prior to age 50 (45), or
  - ii. the member last terminated employment on or after age 50 (45) and before age 55 (50) and has less than 10 years of contributory service.

All per year reductions listed above are prorated for fractions of a year. When contributory service is a factor in determining the reduction applied to a retirement benefit, a member's entire contributory service is considered, even when determining a reduction for service before or after a specific date.

### **Normal Form and Alternative Types of Pensions**

Section 56 provides that a pension calculated in accordance with section 54 is paid in the following form (normal form):

- a. For service in Group 1, single life option with no guarantee period,
- b. For service in Groups 2 and 5, single life option with no guarantee period if the member was not employed in Group 2 or Group 5 after December 31, 2021, and
- c. For service in Groups 2 and 5, single life option with a 10-year guarantee period if the member was employed in Group 2 or Group 5 after December 31, 2021.

A member may elect to receive their pension on the single life option with no guarantee period, single life option with a guarantee period (5, 10 or 15 years), joint life and last survivor option, temporary life annuity option (equal to 25%, 50% or 100% of the maximum Old Age Security pension), or a combination of these options upon 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.

Where a member has a spouse at retirement, the member is required, as a minimum, to elect that 60 per cent of the member's pension be paid on the joint life and last survivor option, unless the spouse waives this requirement in writing or there is a written agreement or court order filed with the plan administrative agent. This option provides for a reduced amount payable to the member, continuing to the spouse on death of the member at 60 per cent of the initial reduced amount. A spouse is defined in section 96(1).

### **Disability Benefits**

Section 60 provides that a member is entitled, upon application, to a disability benefit if the member, before reaching age 60 (55), is totally and permanently disabled, has completed 2 years of contributory service, is not eligible for a monthly income benefit from a group disability plan, has not accepted a lump sum payment in lieu of a continued monthly income benefit under a group disability plan, and has terminated employment.

An eligible member is entitled to receive a disability benefit calculated as the sum of the years of pensionable service accrued by the member to the date of termination of employment, and 50 per cent of the pension the member would have accrued between the disability benefit effective date and age 60 (55) based on their current salary with service, pro-rated for members who work less than full-time, with both portions not reduced for immediate (i.e. early) retirement. Part 6 outlines the provisions related to disability benefits.

Sections 12(6) and 99(2) provide that if a member is receiving a 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 a group disability 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. An active member receiving benefits from a group disability plan continues to accrue deemed service under a group disability plan when an employer withdraws from the plan or the group disability plan loses approved status.

### **Pre-retirement Death Benefits**

The pre-retirement death benefits for active and inactive plan members are covered in Part 7 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 member's contributions with interest at the refund interest rates and the full commuted value of the retirement benefit earned to the date of death. If a spousal waiver has been filed, the surviving spouse cannot be designated as beneficiary.
- b. If the member has not attained age 55 (50) 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 member's contributions with interest at the refund interest rates and the full commuted value of the retirement benefit earned to the date of death; or
  - ii. an immediate pension that is actuarially equivalent to the full commuted value of the retirement benefit earned to the date of death and payable as if the member had chosen the joint life and last survivor option.
- c. If the member has attained age 55 (50) 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 as though the member had terminated employment at the date of death and had chosen the joint life and last survivor option.

If a member terminated employment under the previous vesting and locking-in rules, left contributions on deposit and dies before taking a benefit from the plan, the contributory service requirement in place at the time of termination (i.e. 10 years, 5 years or 2 years) is used to determine benefit eligibility.

### Cost of Living Benefits (Indexing)

Section 73 sets out how cost of living benefits are to be administered. It provides for increases to retired members on January 1 of each year, with the benefits funded from the IAA. The portion of the indexable benefit (as defined in Section 96(1)) eligible for adjustment is the total amount of the indexable benefit, including any previous cost of living benefit, less any portion of the pension that is a result of voluntary contributions (which are no longer permitted). The maximum increase is equal to the percentage increase in the Consumer Price Index (CPI) over the 12 months ending on September 30 of the previous year.

Indexing is not guaranteed. Once granted, however, an indexing adjustment becomes part of the indexable benefit. The board annually considers all relevant factors to determine if indexing will be granted. Future indexing adjustments are granted at the discretion of the board.

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; and
- d. the capitalized value of all cost of living benefits granted annually is transferred from the IAA to the basic account.

### The Pension Fund

Section 75 provides that the Pension Fund is divided into the following four accounts:

- a. the **Basic Account**, consisting of all the assets in the fund other than assets in the IAA, the supplemental benefits account (SBA) and the retirement annuity account (RAA);
- b. the **Inflation Adjustment Account**, consisting of:
  - i. member contributions under section 5(1)(b) (Group 1: 1.27%; Group 2: 1.78%; Group 5: 2.04%; rates effective January 1, 2022);
  - ii. the employer contributions under section 6(1)(b) (Group 1: 1.97%; Group 2: 1.58%; Group 5: 1.88%; rates effective January 1, 2022) less amounts allocated to the Municipal Retiree Benefit Trust (0.6% of salaries effective January 1, 2022);
  - iii. the net investment income earned on the IAA;

- iv. 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 to the account from the RAA under section 75(5)

less:

- vi. amounts transferred to the Basic Account in respect of capitalized cost of living benefits granted under section 73 and 88;
- vii. refunds to plan members in respect of the contributions made to this account under section 5(1)(b), 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 a member's retirement benefit resulting from increases in highest average salaries under section 100; and
- x. amounts transferred to the SBA, if any, to cover inflation protection on benefits in excess of those registrable under the ITA;

Further, Article 10.3 of the Joint Trust Agreement (JTA) permits the board, subject to the funding requirements in Appendix C of the JTA, to transfer portions of any actuarial surplus 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 *ITA*, including amounts paid to the Municipal Retiree Benefit Trust to fund post-retirement group benefits; and
- d. the **Retirement Annuity Account**, consisting of voluntary contributions made under the previous statutes, contributions made under special agreements, and investment earnings thereon, less amounts transferred to the basic account and the IAA for the retirement annuity portion of the benefits paid.

### ***ITA* Limits**

The *ITA* 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 plan. To this end, the SBA covers the financing and payment of benefits in excess of those registrable under the *ITA*.

The excess benefits are paid on a current cash basis, by allocating from the regular employer contributions, the amounts necessary to maintain the SBA at a zero balance. Effectively, from a plan member's perspective, it is expected that these procedures will be invisible – 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/IAA are inclusive of the allocations to/from the SBA; in general, the allocations to/from the SBA 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 at December 31, 2021 (before application of any early retirement reductions, where applicable) is the lesser of:

- a. \$3,245.56 multiplied by the years of service; and
- b. 2 per cent multiplied by the years of service further multiplied by the average of the best 3 years of remuneration paid to the member.

The plan also imposes a 35 year cap on accruals at the above maximum rate. The 2022 maximum limit is \$3,420.00 which is increased annually by the increase in the average industrial wage.

### **Refund Interest Rates**

In accordance with section 96, for periods on and after January 1, 1993, and before January 1, 2004, interest credits are based on the average yields of 5 year personal fixed term chartered bank deposit rates, published in the Bank of Canada Review as CANSIM Series B14045. For periods on or after January 1, 2004, and before October 1, 2019, interest credits are based on the average yields of 5 year personal fixed term chartered bank deposit rates, published in the Bank of Canada Review as CANSIM Series V122515. For periods on or after October 1, 2019, interest credits are based on the average yields of 5 year personal fixed term chartered bank deposit rates, published in the Bank of Canada Review as CANSIM Series V80691336 or its future equivalent.

### **Special Agreements**

Under Part 15, a special agreement is an agreement entered into by the board with an employer that provides for employer and member contributions in excess of those required under sections 5 and 6 for the purpose of increasing the benefits of the members employed by the employer. Under the *ITA* the terms of each special agreement constitute a money purchase provision. [Sections 107 and 108]

Member and employer contributions are made at the rates set in each special agreement, subject to the maximum amounts allowable under the *ITA*. The contributions are paid into the RAA and credited to the member's account for whom they are made. The member's account holds the accumulated value of the special

agreement contributions made for the member, together with interest at the fund interest rates. Employer contributions immediately vest in the member for whom they are made. A special agreement may require that member and employer contributions continue to be paid after the member has accrued 35 years of pensionable service. Contributions to a special agreement must stop when he or she becomes a member in group 5.

[Sections 109 and 110]

Under section 112, a terminating member who elects to receive a commuted value as a termination benefit must be paid a lump sum payment of the member's account balance. If the member does not elect to receive a commuted value as a termination benefit, the member's account remains within the RAA until the member becomes entitled to a retirement benefit.

Section 113 provides that if a member elects to receive a retirement benefit, the member is entitled to:

- a. a lump sum payment of the member's account balance under a pre-2007 special agreement, or
- b. a monthly retirement annuity converted from the member's account balance under a pre-2007 special agreement commencing at the same time and payable under the same option and conditions as the retirement benefit granted under part 5, and
- c. a lump sum payment of the member's account balance under a post-2006 special agreement.

If a member qualifies for a disability benefit, section 114 provides that the member is entitled to:

- a. a lump sum payment of the member's account balance under a pre-2007 special agreement, or
- b. a monthly retirement annuity commencing at age 60 (55) converted from the member's account balance under a pre-2007 special agreement and payable under the same option and conditions as the disability benefit granted under Part 6, and
- c. a lump sum payment of the member's account balance under a post-2006 special agreement.

If the member elects to receive a monthly retirement annuity but dies before reaching age 60 (55) the member's beneficiary is entitled to a lump sum payment of the member's account balance under a pre-2007 special agreement. If the disability benefit continues to the member's spouse, the spouse may choose either the lump sum payment or an immediate monthly retirement annuity converted from the member's account balance under a pre-2007 special agreement.

Under section 115, if a member dies before taking a benefit from the plan, the member's beneficiary is entitled to a lump sum payment of the member's account balance. If there is a surviving spouse and he or she elects to receive a pension under Part 7, the spouse may choose either the lump sum payment or an immediate monthly retirement annuity converted from the member's account balance under a pre-2007 special agreement or a lump

sum payment of the member's account balance under a post-2006 special agreement. If a refund is payable, the payment may be transferred to an RRSP as permitted by the ITA.

Section 117 provides that if an inactive member elects to transfer the member's contributory and pensionable service to another pension plan under a transfer agreement entered into by the board, the member must be paid a lump sum payment of the member's account balance.

A monthly retirement annuity paid under this Part is paid from the basic account as a benefit with a capitalized value equal to the member's account balance at the end of the month preceding the commencement of the annuity. When a monthly retirement annuity commences payment under this Part, the member's account balance is transferred from the RAA to the basic account and the IAA and the member's account ceases to exist.

### **Other Items**

1. Article 3.2 of the Joint Trust Agreement provides that all expenses incurred in the administration of the plan are to be paid from the fund.
2. A maximum of 5 years taken to raise a child may be recognized as contributory service provided the member has a record of pensionable service immediately before and after the child-rearing period(s). [Section 13]
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. The SRIP must stipulate the eligible members, the period it will remain open, the conditions applicable to the incentives, the additional costs to the employer, the timing of these payments to fund the SRIP and restrictions under the *ITA*.
4. Effective April 1, 2010, reciprocal transfers between the College, Municipal, Public Service and Teachers' Pension plans are made exclusively under the National Public Service Pension Transfer Agreement (NTA). This replaced the Public Sector Transfer Agreement. Under the NTA, transfers under the agreement take into account the benefits under the transferring plans and pro-rate service if the importing plan's reserve requirements are higher than those available from the exporting plan. Members may pay for any shortfall, subject to Canada Revenue Agency approval, within certain deadlines. Members can choose to leave their entitlements with their respective plans and apply for the appropriate benefits available from each plan at termination and/or retirement.
5. Effective January 1, 2016, the board established a rate stabilization account (RSA) as a notional account within the basic account that may be drawn down to avoid otherwise required increases in basic account contribution rates.

## Funding Rules

These are covered in Article 10 and Appendices B and C of the JTA.

While the Plan is exempt from *PBSA* funding requirements, the JTA requires “voluntary compliance” with the *PBSA* requirements for a going-concern valuation as they existed prior to December 31, 2019 and confirmed in Appendix C of the JTA.

If an actuarial valuation indicates a requirement to increase contribution rates to the basic account, the increase must be shared equally by members and employers.

Appendix B of the JTA previously stated funding objectives for the use of actuarial excess during a “transitional period” since the plan entered joint trusteeship. The transitional objectives were either achieved or replaced through the 2022 Plan design changes and the application of the actuarial excess from the 2018 valuation. Therefore, the Municipal Pension Plan Partners amended Appendix B of the JTA on February 8, 2021, to implement the following funding arrangement for the use of future actuarial excess:

- a. First, retire any unfunded liabilities and then ensure the plan is funded at the entry age normal cost; surplus can also be used to maintain the current contribution rate where is it lower than the EANC.
- b. Then, split any remaining excess equally between the IAA and RSA
  - i. When the IAA has sufficient funds to provide full sustainable indexing without a cap, or the RSA has reached the targeted funding level, the share that would otherwise go to either the IAA or the RSA will go to the other account until both targets are met.

Further, a group contribution rate rebalancing account was established in the basic account using a portion of the actuarial excess from the 2018 valuation to provide rate stability for Groups 2 and 5 when group contribution rate rebalancing is required per the board’s funding policy.

## Appendix B: Actuarial Methods and Assumptions

The significant actuarial assumptions are summarized below. The assumptions used at the previous valuation are shown in brackets.

	Funding Valuation	Sustainable Indexing Valuation
<b>Investment Return</b>	6.00% p.a. (6.25%)	6.25% p.a. (6.50%)
<b>General Salary Increases</b>	3.25% p.a. (3.50%)	3.00% p.a. (3.25%)
<b>Seniority Salary Increases</b>	Annual percentages varying by age and sex (same)	Annual percentages varying by age and sex (Same)
<b>CPI Increases</b>	2.50% p.a. (2.75%)	2.25% p.a. (2.50%)
<b>Pension Indexing</b>	<ul style="list-style-type: none"> <li>• Future indexing of pensions and deferred pensions ignored, as will be covered by Inflation Adjustment Account</li> <li>• Future indexing (by inflation) of wage base for disability accruals assumed to be a charge to the Basic Account and to be 2.50% p. a. (2.75%)</li> <li>• Indexing to date is capitalized and forms part of pension liability</li> </ul>	<ul style="list-style-type: none"> <li>• Future indexing of pensions and deferred pensions at “Sustainable Indexing Rate” – This rate is calculated and is the primary output of this valuation</li> <li>• Future indexing (by inflation) of wage base for disability accruals assumed to be a charge to the Basic Account and to be 2.25% p.a. (2.50%)</li> <li>• Indexing to date is capitalized and forms part of pension liability</li> </ul>
<b>Asset Values</b>	<ul style="list-style-type: none"> <li>• Assets carried at smoothed market values</li> <li>• Smoothed value restricted to a range of 92% to 108% of Market Value (same)</li> </ul>	<ul style="list-style-type: none"> <li>• Assets carried at smoothed market values</li> <li>• Smoothed value restricted to a range of 95% to 105% of Market Value (same)</li> </ul>
<b>Costing Method</b>	<ul style="list-style-type: none"> <li>• Contributions are based on an entry-age funding approach</li> </ul>	<ul style="list-style-type: none"> <li>• Required contributions are based on an entry-age funding approach</li> <li>• Committed contributions are set equal to the funding valuation basic normal cost plus IAA contributions.</li> </ul>

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 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 these 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 partly as if they would continue to earn service credits and ultimately receive a pension from the Plan, and partly as if they would again become contributing members of the Plan.
- The liability for the inactive group (including those entitled to deferred vested pensions) was calculated on the assumption that a proportion (based on present working status, contribution balance, length of credited service and date of last contribution) would again become contributing members of the Plan, and a further proportion (based on similar, but different, criteria) would collect deferred vested pensions.
- The liability for the remaining inactive members was 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.

Groups 2 and 5 do not have enough new entrants in each group to base the normal cost on; we have therefore used the combined Group 2 and Group 5 new entrant profile in calculating the Group 5 normal cost. Given the very small size of Group 2 (0.2% of the total active population), we have calculated the Group 2 normal cost by applying the same percentage change as observed in the Group 5 normal cost since the last valuation to the Group 2 2018 normal cost. The impact on the Plan of this simplification will be negligible.

The valuation assets consist of:

- i. The Basic Account;
- ii. The present value of future member and employer contributions at the entry-age normal cost rates, for the closed active group, for the basic non-indexed benefits; and
- 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 amount required to amortize the unfunded actuarial liability/surplus.

Effective January 1, 2022, the required Basic account contributions for Group 2 and Group 5 include 0.5% and 0.68% of salaries respectively to amortize over 15 years the additional cost of the Group 2 and 5 2022 plan redesign benefit improvements which was not met from their share of surplus.

The contribution rates have to comply with 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.

The actuarial procedures applied in this valuation are substantially the same as those in the previous valuation.

**2. Treatment of Member and Pensioner Data**

Data as of December 31, 2021 were prepared by the Pension Corporation and the membership counts received are as follows:

	<b>Pension Corp. Data</b>
Pensioners	118,286
Active Members	217,408
Long Term Disability	10,037
Terminated Vested	39,106
Inactive	13,226
Leave of absence	48
Limited Data	257
<b>Total Membership</b>	<b>398,368</b>

The data also included 45,284 active member terminations and 7,071 pensioner terminations during the period January 1, 2019 to December 31, 2021. 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 gender or 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 36 months since the last valuation and no more than 12 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 salaries, we reduced the total salary base by 10% to reflect the part-time employment (the same adjustment was applied at the previous valuation).

The active member data included 11,098 persons who had no salary or service reported for 2021, or with a last-contribution-date prior to December 2021. We excluded them from the active member base, and have included them with the inactive data as follows:

- We treated the 4,590 of them who had at least 3 years of service, contributions after 2019 and basic employee contributions with interest balances of at least \$1,500, as if they were would be reactivated on January 1, 2022 (we set their salaries equal to the average salaries for active members in the same age-group category);
- We held a liability equal to twice the basic employee contributions with interest balance for the remaining 6,508 members.

A similar approach was used in the previous valuation. Salary details were inappropriate (missing, very low, or very high) for a further 303 active members. We assumed that these 303 members had the same average earnings as for other actives in the same age-group category.

We calculated the liability for 48 members on a leave of absence on the assumption that these members would be reactivated on January 1, 2022 (with assumed average salary equal to the average salary for active members in the same age sex category).

### **Members on Long-Term Disability**

The liability for 9,781 of the members on long-term disability was calculated in two steps. We first calculated a liability as if these individuals would ultimately collect deferred vested pensions starting at age 63 for Group 1 and age 57 for Group 2 and 5 with deferred pensions on the basis of service projected to retirement date (maximum 35 years) and the actual salaries indexed to the valuation date (where the actual salary detail shown for those members was inappropriate, we used the average salaries for active members in the same age-group category). We also calculated a liability as if these members would again become contributing members of the plan. In order to allow for the possibility of recoveries from disability we set the liability equal to 80% of the former figure plus 20% of the latter figure. This approach is unchanged from the previous valuation. We excluded 256 long-term disability members from the valuation because of missing, invalid or inconsistent detail. Liabilities of twice their basic employee contributions with interest balance were held for these members. A similar approach was used in the previous valuation, except that we assumed the deferred vested pensions would start at age 62 for Group 1 members.

### **Terminated Members**

We divided the 39,106 terminated members entitled to a vested pension into two classes:

- i. 992 who were those with missing, invalid or inconsistent detail, or whose accrued pension equalled zero, and
- ii. The remaining 38,114 inactive members.

We calculated liabilities for the second group on the assumption that 100% of these members would receive vested pensions. The liability for the first group was held as twice their basic employee contributions with interest balance. A similar approach was used in the previous valuation.

**Inactive Members**

We divided the 13,226 other inactive members into three classes:

- i. 13,225 who were those with missing, invalid or inconsistent detail, or whose basic employee contributions with interest balances were less than \$1,500, or who had less than 3 complete years of service, or who did not contribute in 2020 or 2021, or who were known to have taken a refund after the valuation date;
- ii. Members whose basic employee contributions with interest balances were at least \$1,500, and who are on leave of absence or who have returned to work after the valuation date (1 member at this valuation); and
- iii. All other inactive members (no members in this class at this valuation).

We calculated liabilities on the assumption that the first group would take immediate refunds and we held a liability equal to twice their basic employee contributions with interest balances, and that members in the second and third groups would be reactivated on January 1, 2022, with assumed average salaries equal to the average salaries for active members in the same age-group category. A similar approach was used in the previous valuation.

With respect to the 257 remaining non-retired members with limited data, we held a liability equal to twice their basic employee contributions with interest balance.

Of the total pensioner data, there were 234 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.

	Valuation Treatment							
	Pension Corp. Data	Pensioners with zero liability	Pensioners	Active Members	LTD	Vested	Re-activated	Refund 2 x CWI <sup>1</sup>
Pensioners	118,286	234	118,052					
Active Members	217,408			206,310			4,590	6,508
Long Term Disability (LTD)	10,037				9,781			256
Terminated Vested	39,106					38,114		992
Leave of absence	48						48	
Inactive members	13,226						1	13,225
Limited data	257							257
<b>Total membership</b>	<b>398,368</b>	<b>234</b>	<b>118,052</b>	<b>206,310</b>	<b>9,781</b>	<b>38,114</b>	<b>4,639</b>	<b>21,238</b>

<sup>1</sup> CWI = contributions with interest.

**3. Actuarial Assumptions**

**Investment Return and General Salary Increase Rates**

Our actuarial valuation 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. Funding Valuation – excess interest threshold**

The Funding Valuation investment return assumption is also significant for another reason. Since 1980, the provisions of the plan relating to the indexing of pensions provide that the income to be credited to the Inflation Adjustment Account in respect of pensions being paid is determined by reference to the amount in excess of the investment return anticipated in the most recent actuarial valuation. A decrease in the investment return assumption, and hence in the excess return threshold, would have at least two effects:

- i. It would increase the amount of excess investment return 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, takes on added significance.

The previous valuation used a long-term investment return assumption of 6.25% per annum. As noted earlier, this also becomes the threshold rate used to determine excess investment return transfers to the IAA during the post-retirement period; effectively, this is the same as saying that the Basic Account will earn no more than 6.25% per annum during the post-retirement period.

**b. Actual and long-term asset mix**

The actual asset allocations for the Basic Account and IAA at December 31, 2021 are as follows:

<b>Asset Class</b>	<b>Asset Mix at December 31, 2021</b>
Short Term	3.2%
Fixed Income	26.3%
Canadian Equities	5.4%
Foreign Equities	25.7%
Real Estate	16.2%
Private Equity	12.6%
Infrastructure and Renewable Resources	10.6%
<b>Total Portfolio</b>	<b>100.0%</b>

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	2.00%
Government Bonds	21.00%
Corporate Bonds	9.00%
Private Debt	9.00%
Mortgages	3.45%
<b>Total Fixed Income</b>	<b>44.45%</b>
Canadian Equities	2.50%
Global Equities	13.75%
Emerging Markets	8.75%
Private Equity	16.00%
<b>Total Equity</b>	<b>41.00%</b>
Real Estate	19.55%
Infrastructure and Renewable Resources	15.00%
<b>Total Real Assets</b>	<b>34.55%</b>
<b>Total Porfolio</b>	<b>120.00%</b>

**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 – e.g. the allocation of excess investment income to the Inflation Adjustment Account – we have concluded that a reasonable best estimate of the long term investment return on the plan's assets is 6.25% (reduced from 6.50% in 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 4% (no change from the previous valuation).

In setting the Funding 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 decreased our long-term investment return assumption from 6.25% to 6.00% per annum. We also continued with our previous valuation assumption for the real return of 3.5%. 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	6.36%
Diversification and rebalancing effect	0.25%
Passive investment management fees	(0.21%)
Active investment management fees	(0.70%)
Value added from active management	0.70%
Effect of transition from current strategy over 5 years	(0.05%)
Rounding	(0.10%)
<b>Estimated net investment return before margin</b>	<b>6.25%</b>
Margin for adverse deviations	(0.25%)
<b>Discount return assumption (rounded to nearest 0.25%)</b>	<b>6.00%</b>

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 long-term 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 0.91% and the allowance for passive investment management fees of 0.21% 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. The plan is currently in the process of transitioning its investment strategy to the long term target asset mix shown in section (b) above, and this transition is expected to be fully implemented by October, 2026. We reduced the discount rate by 0.05% to allow for the effect of this transition from the current asset mix. In addition, the long-term asset mix adds to 120% due to the ability to use up to 20% leverage. BCI are currently limited to 10% leverage. As a reflection of this limitation, and because it is unlikely in our view that all future market conditions will make it attractive to apply the full 20% when it can be applied, we have continued to reflect 10% leverage, and have adjusted the asset mix accordingly in determining the discount rate.

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 6.25% and real investment return of 4.0%.

**d. Real return and salary relationships – derive salary assumption**

The 6.25% investment return assumption used in the 2018 valuation was viewed as consisting of a real return component of about 3.50% per annum plus a long-term underlying inflation assumption of about 2.75% per annum. Continuing with the same real return component of 3.50% and applying it to the new 6.00% investment return assumption, we get a revised long-term underlying inflation assumption of 2.50% per annum (i.e. 6.00% - 3.50%). This can also be viewed as a best estimate of future inflation of 2.25% (derived from the best estimate nominal return assumption of 6.25% less the best estimate real return assumption of 4.0%), plus a margin for adverse deviations of 0.25%.

The general salary increase assumption used in the 2018 valuation was 3.50% per annum. This was viewed as consisting of the underlying inflation assumption of 2.75% per annum, plus a real salary increase component of 0.75% per annum. For this valuation, when the real salary increase assumption of 0.75% is added to the revised underlying inflation assumption of 2.50%, we get a revised 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 real salary increase 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 valuation**

During the **post-retirement period**, the excess investment return threshold is critical as this is the discount rate for the Basic Account post-retirement liabilities. It also sets the excess investment return threshold which puts a ceiling on the amounts the Basic Account can effectively earn on the portion of the assets that support post-retirement liabilities. For example, if the threshold is 6.00%, then, provided the long-term returns exceed 6.00% on average, all of the excess will be transferred to the IAA, i.e. the Basic Account will only retain 6.00% on these assets.

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. 6.00% investment return, 3.25% salary, 2.50% underlying inflation) would produce results similar to those using assumptions of 6.25% investment return and 3.50% salary, with 2.75% underlying inflation; or 5.75% investment return and 3.00% salary, with 2.25% underlying inflation, etc. Thus, the underlying inflation assumption is not material to the result.

#### 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 (%)		2021			2018
		Best Est.	Margin	Valn.	Valn.
1	Nominal Investment Return	6.25	(0.25)	6.00	6.25
2	Real Investment Return	4.00	(0.50)	3.50	3.50
3	<b>Implied Inflation (1) – (2)</b>	<b>2.25</b>	<b>0.25</b>	<b>2.50</b>	<b>2.75</b>
4	Real Salary Growth	0.50	0.25	0.75	0.75
5	<b>Nominal Salary Growth (3) + (4)</b>	<b>2.75</b>	<b>0.50</b>	<b>3.25</b>	<b>3.50</b>
	Resulting Net Rates				
6	Pre-retirement			2.75	2.75
7	Post-retirement			6.00	6.25

#### g. Salaries

The 2021 valuation data indicates that average annual earnings increased by about 9.6% from mid-2018 to mid-2021 (i.e. about 3.1% per annum), as compared with an expected increase of about 10.9% (i.e. about 3.50% per annum) on the basis of the assumptions used in the 2018 valuation.

The input data salaries provided to us for this valuation were the actual earnings during 2021. 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 2022 level of \$64,900. In the previous valuation we assumed that the YMPE would increase at the same rate of 3.50% per year for the Funding Valuation and 3.25% per year for the Sustainable Indexing Valuation from its 2019 level of \$57,400.

### Pension Indexing

#### a. Basic Funding Valuation

Indexing adjustments on and after January 1, 1982 are 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 1.27% of salaries (1.78% for group 2 and 2.04% for group 5) to be paid by the members and 1.97% of salaries (1.58% for group 2 and 1.88% for group 5) to be paid by the employers, effective January 1, 2022, less 0.6% of salaries allocated to the Municipal Retiree Benefit Trust. With respect to indexing adjustments granted through December 31, 2021, 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, the amounts of deferred pensions quoted to us include indexing during the deferred period to date. We understand that such transfers to the Basic Account from the Inflation Adjustment Account 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). The amounts of deferred pensions without indexing were also provided for this valuation, and we have used the non-indexed amounts so that the Basic Account liability is aligned with the allocation of assets between the Basic and IAA accounts. We adjusted the deferred pension amounts to remove indexing in the previous valuation, as the non-indexed pensions were not previously included in the data provided to us.

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 2.50% 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, 2019 to December 31, 2021.

Following the December 31, 2015 valuation, in line with the JTA, a Rate Stabilization Account (RSA) was established in the amount of \$1,927 million. Interest is applied to the RSA based on the smoothed one year fund return. The RSA funded from 2015 valuation surplus was initially capped at a maximum of \$2,500 million. This cap was removed effective December 31, 2021. Following the December 31, 2018 valuation, \$522 million of 2018 valuation surplus was transferred to the RSA with interest applied at the smoothed fund return. The portion of surplus was not capped and was not to be taken into consideration towards the \$2,500 million cap that applied to the 2015 RSA balance. The RSA is excluded from the Funding and Sustainable Indexing valuations. It can be drawn down as needed to stabilize the contribution rate.

Following the December 31, 2018 valuation, in line with the JTA, a Group Contribution Rate Rebalancing Account (GCRRA) was established in the amount of \$32 million. Interest is applied to the GCRRA based on the smoothed one year fund return. The GCRRA is excluded from the Funding and Sustainable Indexing valuations. Funds in the GCRRA may be used to mitigate the impact of contribution rate increases to Group 5 and Group 2 arising as the result of the need to rebalance contribution rates between the groups in the plan.

As in the previous valuations, 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 the dramatic swings in market value which 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 plus the year-over-year change in the consumer price index. The difference between the 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.

#### ***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. This lower constraint of 92% applied as at December 31, 2020.

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

**Total Fund Smoothing**

	2018	2019	2020	2021
1. Dec-over-Dec increase in CPI	2.0%	2.2%	0.7%	4.8%
2. Base return = (1) + 3.5%	5.5%	5.7%	4.2%	8.3%
<b>Year-end asset values – \$millions</b>				
3. Market value	52,784	59,440	66,481	74,165
4. Smoothed value	52,172	56,499	61,162	68,662
5. Ratio of (4) ÷ (3)	0.988	0.951	0.920	0.926
<b>Annual returns</b>				
6. Market value	2.1%	12.5%	11.7%	11.6%
7. Smoothed value	7.9%	8.2%	8.1%	12.3%

The annulized market value rate of return since last valuation is 11.9%.

Using the relationship between the market and adjusted 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**

<b>Basic Account including RSA and GCRRA</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
1. Market value	44,076	49,497	55,121	60,752
2. Smoothed value	43,565	47,048	50,711	56,245
3. Ratio of (9) ÷ (8)	0.988	0.951	0.920	0.926
<b>Retirement Annuity Account</b>				
4. Market value	411	411	402	396
5. Smoothed value	406	391	370	366
6. Ratio of (12) ÷ (11)	0.988	0.951	0.920	0.926
<b>Inflation Adjustment Account</b>				
7. Market value	8,297	9,532	10,958	13,017
8. Smoothed value	8,201	9,060	10,081	12,051
9. Ratio of (15) ÷ (14)	0.988	0.951	0.920	0.926
<b>RSA from 2015 surplus</b>				
10. Market Value and Smoothed Value	2,485	2,500	2,500	2,500
<b>RSA from 2018 surplus</b>				
11. Market Value and Smoothed Value	521	564	610	685
<b>GCRRA</b>				
12. Market Value and Smoothed Value	32	35	37	42
<b>Basic Account excluding RSA and GCRRA</b>				
13. Market value	41,038	46,398	51,974	57,525
14. Smoothed value	40,527	43,949	47,564	53,018

The Basic Account market value includes contributions receivable of \$82 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 stabilise 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 and December 31, 2021 where the smoothed assets for the sustainable indexing purposes were capped at 95% of market value.

## Mortality

The assumed incidence of mortality both before and after retirement was based on Club Vita Canada's CV21 VitaCurves, 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 CV21 VitaCurves have been calibrated based on Club Vita Canada's longevity dataset for the years 2017 to 2019 and thus an appropriate base year is 2018. Improvements in baseline mortality from 2018 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 registered pension plans across Canada, and includes plans covering a range of industries in both the private and public sector. Club Vita Canada's CV21 VitaCurves have been developed based on longevity experience consisting of 2.4 million exposure years and 62 thousand deaths over 2017 to 2019, 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 three pension bands for males and females, while there are four earnings bands for males and three for females; and
- Occupation type – currently or formerly employed in a blue or white collar occupation.
- 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 CV21 VitaCurves are calibrated based on different combinations of the factors outlined above, resulting in just over 1000 baseline mortality models. The best VitaCurve is assigned to each individual member based on the longevity factors available for that member.

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 for disabled pensioners, with generational projection using the CPM-B improvement scale.

In the previous valuation, the assumed rates of mortality were based on Club Vita Canada’s CV17 VitaCurves, also projected using CPM-B improvement scale.

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

**Withdrawal**

We examined the rates of withdrawal for reasons other than death, retirement or disability over the period January 1, 2019 to December 31, 2021 and compared this with the experience observed and the rates used for previous valuations. The observed rates for Group 1 females in the second year of service were slightly lower than those assumed in the previous valuation, while the observed rates for Group 1 males after 3 years of service were slightly higher than assumed in the previous valuation. As a result, we have made modest changes to the withdrawal rates used for the previous valuation, by adopting the following multiples of those rates.

***Multiples applied to 2018 Rates***

	In the first 3 years of service			After 3 years of service
	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	
Group 1 males	100%	100%	100%	105%
Group 1 females	100%	95%	100%	100%
Group 2 & 5	100%	100%	100%	100%

Sample withdrawal rates are shown in the following tables.

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

Age at entry	2018 valuation			2021 valuation		
	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year
<b>Group 1 Males</b>						
20	.155	.143	.119	.155	.143	.119
30	.103	.106	.090	.103	.106	.090
40	.074	.069	.056	.074	.069	.056
50	.067	.056	.041	.067	.056	.041
<b>Group 1 Females</b>						
20	.122	.122	.108	.122	.116	.108
30	.103	.106	.078	.103	.101	.078
40	.059	.054	.048	.059	.051	.048
50	.059	.054	.037	.059	.051	.037
<b>Group 2 &amp; 5</b>						
20	.026	.022	.019	.026	.022	.019
30	.019	.014	.011	.019	.014	.011
40	.009	.007	.006	.009	.007	.006

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

Attained age	2018 valuation			2021 valuation		
	Group 1 Males	Group 1 Females	Group 2 & 5	Group 1 Males	Group 1 Females	Group 2 & 5
23	.090	.115	.014	.095	.115	.014
33	.051	.049	.008	.054	.049	.008
43	.027	.029	.005	.028	.029	.005
53	.017	.018	-	.018	.018	-

The withdrawal rates we have used do not extend past 10 years below the normal retirement age for each group.

**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, overall, the assumed rates used in the previous valuation remained appropriate. The rates used for this valuation are 160% for Group 1 males, 155% for Group 1 females and 70% for Groups 2 and 5 of the respective rates used for the valuation of the Pension Plan for the Public Service of Canada as at March 31, 2020. The 2018 valuation used the equivalent disability rates, but applied the adjustments (180% for Group 1 males, 185% for Group 1 females and 75% for Groups 2 and 5) to the 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 63 for Group 1 and at age 57 for Groups 2 and 5 (or immediately, for those older than these ages). Commencement at age 62 for group 1 and 57 for group 2 and 5 were assumed in the 2018 valuation.

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

Age	2018 valuation			2021 valuation		
	Group 1 Males	Group 1 Females	Group 2 & 5	Group 1 Males	Group 1 Females	Group 2 & 5
25	.0003	.0001	.0001	.0002	.0001	.0001
35	.0003	.0012	.0001	.0006	.0014	.0003
45	.0021	.0040	.0009	.0023	.0043	.0010
55	.0069	.0109	.0029	.0065	.0110	.0028

**Retirement**

We examined the 2019-2021 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 slightly decreasing most of the assumed retirement rates.

The rates used in this and the previous valuation, are as follows, with the changes shown in bold:

**Normal Retirement Age = 65**

Age	Service	2018 valuation		2021 valuation	
		Group 1 Males	Group 1 Females	Group 1 Males	Group 1 Females
55-59	at least 10 years, but age plus service add to less than 80	.03	.06	.03	.06
55-59	age plus service add to at least 80	.09	.10	.09	.10
55-59	rule-of-90	.53	.48	.50	.45
60	10	.35	.41	.32	.39
61	10	.20	.22	.18	.20
62	10	.20	.23	.18	.20
63	10	.20	.22	.18	.20
64	10	.23	.22	.21	.22
65	0	1.00	1.00	1.00	1.00

**Normal Retirement Age = 60**

Age	Service	2018 valuation	2021 valuation
		Group 2 and 5	Group 2 and 5
50-54	at least 10 years, but age plus service add to less than 75	.04	.03
50-54	age plus service add to at least 75	.06	.06
50-54	rule-of-80	.24	.24
55	10	.24	.22
56	10	.23	.20
57	10	.28	.26
58	10	.31	.25
59	10	.55	.53
60	0	1.00	1.00

Although pensions (unreduced and reduced) are available with less than 10 years of service, we have continued to apply the retirement rates before age 65 (60) only to those with 10 or more years of service, on the assumption that those with fewer than 10 years would not retire until the normal retirement age. Adding an assumption allowing for retirement with less than 10 years based on observed experience would not have a material impact on the results.

We assumed that current deferred vested members and members terminating service in the future will retire at age 60 for Group 1 (55 for Group 2 and 5), or immediately if older than 60 for Group 1 (55 for Group 2 and 5), except for the current vested members with less than two years of contributory service, who were assumed to retirement at normal retirement age.

In the previous valuation, we made the same assumption for current deferred vested members, but we assumed that members terminating service in future would subsequently retire at age 55 for Group 1 (50 for Group 2 and 5).

**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, 2021 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.

Age	2018 and 2021 valuations			
	Group 1 Males	Group 1 Females	Group 2 & 5 Males	Group 2 & 5 Females
25	.019	.022	.026	.034
35	.014	.011	.011	.008
45	.005	.007	.009	.002
55	.002	.003	.008	.001
60	.000	.001	.000	.000
65	.000	.000	n/a	n/a

### **Proportion 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 this valuation. The same assumption was made in the previous valuation.

### **Growth of Active Municipal Population**

We assumed in all the actuarial projections that there would be no future growth or decline in the Municipal 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 90% of annualized salary from the valuation data. The same assumption was assumed in the previous valuation. The total payroll, capped with 35 years of service, for amortization purpose was assumed to be \$13,399 million.

### **Expenses**

Administration expenses premiums are paid out of the Municipal fund. These amounts (excluding the MSP premium allowance in 2019) totaled 0.42%, 0.41% and 0.44% of salaries for 2019, 2020 and 2021 respectively. The projected expenses provided by the Pension Corporation for the next three years anticipated that the administration expenses will continue at a similar rate. Therefore, we reduced the expense provision to 0.45% of payroll from 0.47% 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. This provision represents the average projected expenses, expressed as a percentage of projected payroll, over the next valuation period. We also include a provision for the present value of expenses in the statement of actuarial position. The same methodology was used in the previous valuation. Based on the projected payroll of \$13,399 million, the estimated expenses for 2022 are \$60 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 (Group 1 females for service earned prior to 2022; for Groups 2 and 5 females,

at ages 50 to 54, to a rule-of-78 for all service), 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 14.4, 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.

**Funding Valuation: Fully Indexed Valuations – Assumption Changes**

We made the following changes to the assumptions when doing the fully indexed valuations:

- We combined the assets in the Basic and Inflation Adjustment Accounts, using a smoothed asset value of \$65,069 million, net of the assets in the RSA and GCRRA;
- We applied an indexing assumption equal to the full assumed underlying inflation rate, i.e. 2.50% 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 2.1% to cover the actual January 1, 2022 indexing increase. The indexing is applied annually, in arrears; and
- We combined the contribution rates to Basic and IAA used to fund pension benefits i.e. net of the 0.6% of employer IAA contributions that are allocated to the Municipal Retiree Benefit Trust, which produces the following contribution rates:

	Current and Required (%)		
	Basic	IAA <sup>1</sup>	Total
<b>Members</b>			
Group 1	7.34	1.27	8.61
Group 2	7.14	1.78	8.92
Group 5	9.08	2.04	11.12
<b>Employers</b>			
Group 1	7.34	1.37	8.71
Group 2	10.84	0.98	11.82
Group 5	12.79	1.28	14.07
Total			

<sup>1</sup> Employer contributions to the IAA are shown net of the 0.6% of salaries allocated to the Municipal Retiree Benefit Trust.

	Current and Required (%)		
	Basic	IAA <sup>1</sup>	Total
Group 1	14.68	2.64	17.32
Group 2	17.98	2.76	20.74
Group 5	21.87	3.32	25.19

**Funding Valuation: ITA Maximum Pension Rule – Assumption Changes**

As noted earlier, we have not applied the *ITA* maximum pension rules when doing the primary Basic and Basic-plus-Indexed valuations. We have applied them, as described below, when doing the supplementary valuations with pensions limited to the *ITA* maximums.

The maximum annual pension currently permitted (in 2022) under the income tax rules is the lesser of:

- i. \$3,420.00 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 also imposes a 35 year cap on accruals at the above maximum rate, which we have applied.

For an individual in this Plan to be currently affected by the \$3,420.00 maximum the final average salary must be very high and 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 \$3,420.00 limit is automatically indexed each year after 2022 in accordance with increases in the average wage. Accordingly, we have applied a 3.25% per annum increase to the \$3,420.00 limit after 2022. (At the previous valuation the corresponding dollar limit was \$3,025.56 in 2019, and after 2019 was assumed to increase by the average wage increase of 3.5%.)

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 surplus requirements, the funds in the RSA and the GCRRA are included.

**Appendix C: Active Member Data as at December 31, 2021**

Age group <sup>1</sup>	Active members December 31, 2021 <sup>2</sup>			New entrants Jan 1, 2019 to Dec 31, 2021 and still active	
	Number	Average annual earnings <sup>3</sup> \$	Average service (years)	Number	Average annual earnings <sup>3</sup> \$
<b>Group 1 (males – normal retirement age = 65)</b>					
18-19	12	51,405	0.3	108	52,963
20-24	742	56,957	1.0	1,096	60,277
25-29	3,568	64,107	1.9	1,938	64,928
30-34	5,739	70,449	3.4	1,822	71,239
35-39	6,736	76,479	5.4	1,426	74,028
40-44	6,696	78,270	7.3	1,054	73,884
45-49	6,614	80,164	9.4	795	73,315
50-54	7,199	79,523	11.9	645	71,729
55-59	6,970	77,525	14.3	509	72,250
60 & over	6,698	73,943	14.2	262	70,121
<b>Total</b>	<b>50,974</b>	<b>75,597</b>	<b>8.9</b>	<b>9,655</b>	<b>69,451</b>
<b>Group 1 (females – normal retirement age = 65)</b>					
18-19	21	46,166	0.3	284	49,645
20-24	2,615	57,877	0.8	4,529	62,059
25-29	13,130	64,719	1.8	5,841	63,831
30-34	18,351	70,080	3.4	4,119	65,481
35-39	19,516	73,260	5.1	3,394	63,819
40-44	19,472	72,153	6.5	2,881	62,249
45-49	19,562	70,697	8.1	2,176	60,885
50-54	20,338	69,604	10.3	1,621	59,325
55-59	18,533	68,002	12.5	995	60,633
60 & over	16,022	65,188	13.3	409	60,515
<b>Total</b>	<b>147,560</b>	<b>69,302</b>	<b>7.7</b>	<b>26,249</b>	<b>62,760</b>
<b>Total Group 1</b>	<b>198,534</b>	<b>70,918</b>	<b>8.0</b>	<b>35,904</b>	<b>64,559</b>

<sup>1</sup> Age nearest birthday at December 31, 2021 for actives and at entry for new entrants.

<sup>2</sup> In total, 11,098 actives included with inactive data.

<sup>3</sup> Actual earnings in 2021 for those employed all year and annualized for others. Very low or very high earnings figures were replaced by the average earnings in the same age-group category.

Age group <sup>1</sup>	Active members December 31, 2021 <sup>2</sup>			
	Number	Average annual earnings <sup>3</sup> \$	Average service (years) with 2% benefit rate	Average service (years) with 2.33% benefit rate
<b>Group 5 (males – normal retirement age = 60)</b>				
20-24	45	71,932	0.1	1.1
25-29	465	83,826	0.2	2.2
30-34	862	94,341	0.5	4.4
35-39	1,129	101,668	1.8	6.9
40-44	1,060	108,943	4.6	8.3
45-49	1,101	117,440	8.3	8.8
50-54	1,126	125,968	12.4	8.9
55 & over	600	129,815	15.0	8.9
<b>Total males</b>	<b>6,388</b>	<b>110,024</b>	<b>6.2</b>	<b>7.3</b>
<b>Group 5 (females – normal retirement age = 60)</b>				
20-24	14	69,309	0.1	1.0
25-29	135	84,002	0.3	2.3
30-34	174	94,234	0.6	4.3
35-39	164	100,387	1.8	6.7
40-44	159	105,701	4.4	7.9
45-49	152	115,832	6.3	8.4
50-54	183	120,392	11.1	9.2
55 & over	43	121,799	10.7	9.2
<b>Total females</b>	<b>1,024</b>	<b>104,349</b>	<b>4.5</b>	<b>6.6</b>
<b>Total Group 5</b>	<b>7,412</b>	<b>109,240</b>	<b>5.9</b>	<b>7.2</b>

<sup>1</sup> Age nearest birthday at December 31, 2021 for actives and at entry for new entrants.

<sup>2</sup> In total, 11,098 actives included with inactive data.

<sup>3</sup> Actual earnings in 2021 for those employed all year and annualized for others. Very low or very high earnings figures were replaced by the average earnings in the same age-group category.

Age group <sup>1</sup>	Active members December 31, 2021 <sup>2</sup>			New entrants Jan 1, 2019 to Dec 31, 2021 and still active Groups 2 and 5 combined	
	Number	Average annual earnings <sup>3</sup> \$	Average service (years)	Number	Average annual earnings <sup>3</sup> \$
<b>Group 2 (males – normal retirement age = 60)</b>					
20-24	3	62,068	0.1	126	76,513
25-29	10	67,266	2.1	317	80,052
30-34	34	85,318	4.1	191	83,727
35-39	53	91,587	7.0	118	84,468
40-44	49	95,664	9.7	30	94,235
45-49	64	107,192	14.0	25	108,196
50-54	67	115,217	16.5	24	139,379
55 & over	51	112,209	15.6	7	128,048
<b>Total males</b>	<b>331</b>	<b>101,522</b>	<b>11.5</b>	<b>838</b>	<b>84,427</b>
<b>Group 2 (females – normal retirement age = 60)</b>					
20-24				34	76,789
25-29	4	67,375	1.9	75	77,872
30-34	5	70,879	1.4	32	81,606
35-39	6	84,372	6.2	9	80,041
40-44	4	85,974	5.4	11	87,108
45-49	7	87,614	12.3	8	138,148
50 & over	7	78,220	13.7	5	128,696
<b>Total females</b>	<b>33</b>	<b>79,844</b>	<b>7.7</b>	<b>174</b>	<b>83,275</b>
<b>Total Group 2</b>	<b>364</b>	<b>99,557</b>	<b>11.2</b>	<b>1,012</b>	<b>84,229</b>
<b>Total – All groups</b>	<b>206,310</b>	<b>72,345</b>	<b>8.2</b>	<b>36,916</b>	<b>65,098</b>

Average age of the 206,310 actives is 44.9.

<sup>1</sup> Age nearest birthday at December 31, 2021 for actives and at entry for new entrants.

<sup>2</sup> In total 11,098 actives included with inactive data.

<sup>3</sup> Actual earnings in 2021 for those employed all year and annualized for others. Very low or very high earnings figures were replaced by the average earnings in the same age-group category.

A comparison of the December 31, 2021 active membership with the December 31, 2018 active membership is as follows:

	<b>Group 1 Males</b>	<b>Group 1 Females</b>	<b>Group 2</b>	<b>Group 5</b>
<b>At December 31, 2021</b>				
– Number	50,974	147,560	364	7,412
– Proportion of total	24.7%	71.5%	0.2%	3.6%
– Average age (at 12.31)	45.8	44.7	44.9	42.3
– Average service	8.9	7.7	11.2	13.1
– Average salary	\$75,597	\$69,302	\$99,557	\$109,240
<b>At December 31, 2018</b>				
– Number	46,488	134,312	341	6,794
– Proportion of total	24.7%	71.5%	0.2%	3.6%
– Average age (at 12.31)	46.4	45.4	44.5	42.4
– Average service	9.5	8.1	11.2	13.5
– Average salary	\$69,086	\$62,926	\$90,320	\$104,575
<b>Change 2018 to 2021</b>				
– Number	9.6%	9.9%	6.7%	9.1%
– Proportion of total	No change	No change	No change	No change
– Average age	- 0.6 years	- 0.7 years	+ 0.4 years	- 0.1 years
– Average service	- 0.6 years	- 0.4 years	No change	- 0.4 years
– Average salary	9.4%	10.1%	10.2%	4.5%

The above comparison indicates an increase in the covered membership during the three year inter-valuation period of 9.8% in total. The proportion of males to females was unchanged. The average ages have increased for Groups 2 and decreased for Group 1 and Group 5.

A comparison of the new entrant subset used at December 31, 2021 with that used at December 31, 2018 in determining the entry-age normal costs, is as follows:

	Group 1 Males	Group 1 Females	Groups 2/5
<b>At December 31, 2021</b>			
– Number	9,655	26,249	1,012
– Proportion of total	26.2%	71.1%	2.7%
– Average age at entry	36.7	35.1	31.3
– Average salary	69,451	62,760	84,229
<b>At December 31, 2018</b>			
– Number	8,040	19,733	805
– Proportion of total	28.1%	69.1%	2.8%
– Average age at entry	36.6	34.9	30.3
– Average salary	\$64,460	\$57,463	\$76,764
<b>Change 2018 to 2021</b>			
– Number	20.1%	33.0%	25.7%
– Proportion of total	-1.9%	+ 2.0%	-0.1%
– Average age	+ 0.1 year	+ 0.2 year	+ 1.0 year
– Average salary	7.7%	9.2%	9.7%

There is a significant increase in the number of new entrants in the 2021 subset compared to the 2018 for all groups. For all Groups, the average salary of new entrants have increased, and the average age has also increased although only marginally for Group 1.

In determining the new entrant profile, we review the data received for any new employers to the plan over a certain threshold of number of members to ensure the new employer members have only been included in the new entrant profile based on their original hire date with the employer and not based on the date they, or the employer, joined the plan. This ensures that the entry age normal cost is not inappropriately increased by treating long serving new employer members as new entrants.

## Appendix D: Inactive Member Data as at December 31, 2021

### 1. Inactive Members Assumed Reactivated on Valuation Date

Age group <sup>1</sup>	Group 1 (males)			Group 1 (females)		
	Number	Average annual earnings <sup>2</sup>	Average service (years)	Number	Average annual earnings <sup>2</sup>	Average service (years)
29 and below	25	64,557	3.3	151	65,275	3.3
30-34	88	70,213	4.2	690	70,113	4.4
35-39	111	76,118	6.0	872	72,967	5.8
40-44	97	78,110	7.0	587	72,039	7.0
45-49	97	79,819	7.6	409	70,580	7.4
50-54	95	79,372	9.3	394	69,536	8.8
55-59	96	77,602	11.0	386	67,906	9.8
60 & over	105	72,991	12.3	402	64,837	12.8
<b>Total</b>	<b>714</b>	<b>75,932</b>	<b>8.1</b>	<b>3,891</b>	<b>70,082</b>	<b>7.2</b>

Group <sup>1</sup>	Number	Average annual earnings <sup>2</sup>	Average service (years) with all benefit rate	Average service (years) with 2.33% benefit rate
Group 2 / 5 males	29	111,593	13.2	6.8
Group 5 females	5	106,594	8.3	4.9

	Number	Average Age	Average annual earnings <sup>2</sup>	Average service (years)
<b>Total – All Groups</b>	<b>4,639</b>	<b>44.3</b>	<b>71,281</b>	<b>7.4</b>

<sup>1</sup> Age nearest birthday at December 31, 2021.

<sup>2</sup> Assumed same earnings as for active members in same age-group category.

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

Age group <sup>1</sup>	Males		Females	
	Number	Average annual deferred pensions <sup>2</sup>	Number	Average annual deferred pensions <sup>2</sup>
29 & below	11	39,994	104	40,454
30-34	30	38,684	219	39,588
35-39	58	38,064	439	38,110
40-44	113	35,217	661	34,227
45-49	165	30,703	910	28,804
50-54	217	27,823	1,357	24,324
55-59	408	24,710	2,041	20,762
60 & over	537	17,137	2,511	15,786
<b>Total</b>	<b>1,539</b>	<b>24,806</b>	<b>8,242</b>	<b>23,473</b>

	Number	Average age	Average annual deferred pensions <sup>2</sup>
<b>Total males &amp; females</b>	<b>9,781</b>	<b>53.7</b>	<b>23,683</b>

	Number	Average age	Average pensionable service	Average salary	Expected average remaining Service life
<b>Active and LTD Combined</b>	<b>216,091</b>	<b>45.3</b>	<b>8.4</b>	<b>71,916</b>	<b>10.5</b>

<sup>1</sup> Age nearest birthday at December 31, 2021.

<sup>2</sup> Basic lifetime portions assumed payable from age 63; males include 38 Group 2/5 members and females include 25 Group 2/5 members with pensions assumed to commence from age 57; additional temporary pensions are payable to age 65.

**3. Other Inactive Members Entitled to Vested Pensions and Not Assumed Reactivated**

Age group <sup>1</sup>	Males			Females		
	Average annual vested pensions			Average annual vested pensions		
	Number	Initial <sup>2</sup>	Offset at age 65	Number	Initial <sup>2</sup>	Offset at age 65
25-29	769	1,203	274	2,075	1,058	240
30-34	1,162	2,480	680	3,350	2,087	582
35-39	1,347	3,913	1,063	3,709	3,480	995
40-44	1,369	5,726	1,512	3,804	4,677	1,311
45-49	1,517	6,855	1,729	3,802	5,654	1,546
50-54	1,681	8,755	2,176	4,121	6,986	1,928
55-59	1,470	8,460	2,107	3,344	6,978	1,894
60 & over	1,360	6,357	1,177	3,234	5,111	1,078
<b>Total</b>	<b>10,675</b>	<b>5,912</b>	<b>1,450</b>	<b>27,439</b>	<b>4,739</b>	<b>1,267</b>

	Number	Average age	Average annual vested pension - initial	Average annual vested pension - Offset at age 65
<b>Total males &amp; females</b>	<b>38,114</b>	<b>45.9</b>	<b>5,068</b>	<b>1,318</b>

**4. Remaining Inactive Members**

	Number	Average age	Member contributions with interest
Valued at 2 x contribution with interest	21,238 <sup>3</sup>	51.1	\$101,052,031

<sup>1</sup> Age nearest birthday at December 31, 2021.

<sup>2</sup> These pensions are assumed to commence at the first age at which the member is entitled to an unreduced pension, assuming no earlier than age 60(55) i.e. at various ages between 60(55) and 65(60).

<sup>3</sup> Includes 256 disabled and 992 vested members with invalid data.

## Appendix E: Pensioner Data at December 31, 2021

### 1. Former Contributors

Age group <sup>1</sup>	Number of pensioners <sup>2</sup>	Annual Pensions (\$000's) <sup>3</sup>				
		Single life	Joint life & survivor	Joint life & survivor with guarantee	Single life with guarantee	Temporary life
<b>Male pensioners</b>						
Less than 55	98	17	1,517	2,017	903	1,041
55-59	1,739	665	20,871	17,063	11,135	18,535
60-64	5,438	6,712	68,885	36,726	30,987	60,739
65-69	7,891	23,476	98,296	28,650	35,095	6,791
70-74	7,218	38,165	95,200	12,641	19,196	-
75-79	4,589	34,210	65,078	1,908	4,812	-
80-84	2,490	25,058	29,742	32	145	-
85-89	1,321	15,072	10,884	-	-	-
90-94	596	7,213	3,500	-	-	-
95 & over	169	2,857	441	-	-	-
<b>Total</b>	<b>31,549</b>	<b>153,445</b>	<b>394,414</b>	<b>99,037</b>	<b>102,273</b>	<b>87,106</b>
<b>Female pensioners</b>						
Less than 50	19	32	2	-	147	-
50-54	91	84	267	531	1,274	361
55-59	3,720	1,550	18,449	12,090	21,383	28,526
60-64	12,717	14,186	58,142	40,587	76,081	102,494
65-69	20,630	62,859	87,479	36,977	110,574	13,333
70-74	18,380	115,143	70,075	11,883	57,930	-
75-79	11,837	104,195	35,426	1,411	13,262	-
80-84	6,157	62,878	11,784	19	554	-
85-89	3,133	30,666	2,766	-	-	-
90-94	1,366	12,413	480	-	-	-
95 & over	397	3,820	97	-	-	-
<b>Total</b>	<b>78,447</b>	<b>407,826</b>	<b>284,967</b>	<b>103,498</b>	<b>281,205</b>	<b>144,714</b>
<b>Grand Total</b>	<b>109,996</b>	<b>561,271</b>	<b>679,381</b>	<b>202,535</b>	<b>383,478</b>	<b>231,820</b>

Supplemental pensions included in the above amounts are as follows:

<b>Supplemental Pensions included</b>	<b>2,212</b>	<b>7,566</b>	<b>2,576</b>	<b>2,359</b>	<b>-</b>
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Average age of the 109,996 pensioners is 70.9.

<sup>1</sup> Age nearest birthday at December 31, 2021.

<sup>2</sup> These numbers include only those who were formerly contributors to the plan as well as pre-retirement limited members (i.e. divorced spouses with a pension interest). For the latter group, under the Family Relations Act, any temporary bridge benefit which is payable ceases at the date the original member reaches age 65 and, as a result, it is possible to have a bridge pension payable past the recipient reaching age 65.

<sup>3</sup> Including supplements to January 1, 2021.

**2. Beneficiaries**

Age group <sup>1</sup>	Number of beneficiaries <sup>2</sup>	Annual Pensions (\$000's) <sup>3</sup>	
		Single life	Single life with guarantee
<b>Male beneficiaries</b>			
Less than 50	44	208	-
50-54	33	283	12
55-59	85	702	99
60-64	204	2,013	278
65-69	296	2,741	397
70-74	457	4,856	321
75-79	475	4,554	271
80-84	409	3,843	-
85-89	246	2,115	20
90-94	116	1,093	21
95 & over	36	258	-
<b>Total</b>	<b>2,401</b>	<b>22,666</b>	<b>1,419</b>
<b>Female beneficiaries</b>			
Less than 50	40	380	-
50-54	70	841	101
55-59	156	2,072	371
60-64	340	5,391	452
65-69	588	10,232	706
70-74	738	13,837	286
75-79	870	14,699	13
80-84	853	13,573	14
85-89	796	12,265	-
90-94	547	7,785	-
95 & over	256	3,861	-
<b>Total</b>	<b>5,254</b>	<b>84,936</b>	<b>1,943</b>
<b>Remaining guarantees</b>	<b>401</b>	<b>-</b>	<b>5,657</b>
<b>Grand Total</b>	<b>8,056</b>	<b>107,602</b>	<b>9,019</b>

Supplemental pensions included in the above amounts are as follows:

<b>Supplemental Pensions included</b>	<b>532</b>	<b>20</b>
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Average age of the 7,655 beneficiaries is 76.9.

	Number	Average age	Average annual pension
Total Pensioners & Beneficiaries	118,052	71.3	16,461

<sup>1</sup> Age nearest birthday at December 31, 2021.

<sup>2</sup> These numbers include spouses (or estates) currently receiving benefits where the former contributor is deceased.

<sup>3</sup> Including supplements to January 1, 2021.

## Appendix F : Additional Results Detail

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

The results herein are analogous to those contained in Schedules 1, 7 and 10-13 in the body of the report, but in some cases expand on the details. The results are included for:

- Basic (i.e. non-indexed) benefits only, without tax limits;
- Basic plus Indexed, without tax limits;
- Basic only, with tax limits; and
- Basic plus Indexed, with tax limits.

The adjustments to the assumptions are discussed in Appendix B. In the indexed calculations, we reduced the employer contributions by the 0.6% of salaries allocated to the Municipal Retiree Benefit Trust.

Since the results show a surplus position, we have shown the amortization requirements, for illustrative purposes, as the maximum permitted by the JTA-C.

**Schedule F1 – Statement of Actuarial Position as at December 31, 2021**
**Present Plan – (\$ millions)**

	Without Tax Limits		With Tax Limits	
	Basic Only	Basic + Indexed	Basic Only	Basic + Indexed
<b>Assets</b>				
Market value of Fund net of RSA and GCRRA	57,525	70,542	57,525	70,542
Asset smoothing adjustment	(4,507)	(5,473)	(4,507)	(5,473)
<b>Smoothed Value of Fund net of RSA and GCRRA</b>	<b>53,018</b>	<b>65,069</b>	<b>53,018</b>	<b>65,069</b>
Actuarial present values of:				
future contributions at entry-age rates	21,049	29,254	20,643	28,640
existing amortization for Groups 2 and 5 to 2036 <sup>1</sup>	63	63	63	63
<b>Total Assets</b>	<b>74,130</b>	<b>94,386</b>	<b>73,724</b>	<b>93,772</b>
Actuarial present values for:				
• pensions being paid	22,379	28,573	22,196	28,335
• inactive members	3,593	5,174	3,593	5,174
• active members	43,786	58,961	43,436	58,498
• future expenses	611	611	611	611
<b>Total Liabilities</b>	<b>70,369</b>	<b>93,319</b>	<b>69,836</b>	<b>92,618</b>
<b>Surplus (Unfunded Actuarial Liability)</b>	<b>3,761</b>	<b>1,067</b>	<b>3,888</b>	<b>1,154</b>
<b>JTA-C Accessible Going Concern Excess</b>	<b>1,295</b>	<b>-</b>	<b>1,429</b>	<b>-</b>

<sup>1</sup> 0.50% for Group 2, 0.68% for Group 5.

**Schedule F2 (1) – Current and Required Contributions Rates – December 31, 2021 – Basic Only**

		Without Tax Limits			With Tax Limits		
	Current contribution rates	Member	Employer	Total	Member	Employer	Total
1	Group 1	7.34	7.34	14.68	7.34	7.34	14.68
2	Group 2	7.14	10.84	17.98	7.14	10.84	17.98
3	Group 5	9.08	12.79	21.87	9.08	12.79	21.87
4	<b>Average</b>	<b>7.43</b>	<b>7.65</b>	<b>15.08</b>	<b>7.43</b>	<b>7.65</b>	<b>15.08</b>
<b>Entry-age normal cost rates</b>							
5	Group 1			15.12			14.85
6	Group 2			18.03			17.98
7	Group 5			21.87			20.60
8	<b>Entry-age normal cost - Average</b>			<b>15.49</b>			<b>15.17</b>
<b>Amortization of unfunded actuarial liability (surplus)</b>							
9	Maximum permissible JTA-C amortization (all groups)			(2.12)			(2.34)
10	Additional Group 2 amortization (to 2036)			0.50			0.50
11	Additional Group 5 amortization (to 2036)			0.68			0.68
<b>Minimum Permissible JTA-C Contribution Rate<sup>1</sup></b>							
12	Group 1 (= 5+9)			13.00			12.51
13	Group 2 (= 6+9+10)			16.41			16.14
14	Group 5 (= 7+9+11)			20.43			18.94
15	<b>Minimum permissible JTA-C rate – Average</b>			<b>13.41</b>			<b>12.87</b>

<sup>1</sup> The total contribution rate to the plan needs to comply with the JTA-C requirements. JTA-C does not apply at the group level.

**Schedule F2 (2) – Current and Required Contributions Rates – December 31, 2021 – Basic + Indexed**

		Without Tax Limits			With Tax Limits		
	Current contribution rates	Member	Employer	Total	Member	Employer	Total
1	Group 1	8.61	8.71	17.32	8.61	8.71	17.32
2	Group 2	8.92	11.82	20.74	8.92	11.82	20.74
3	Group 5	11.12	14.07	25.19	11.12	14.07	25.19
4	<b>Average</b>	<b>8.75</b>	<b>9.01</b>	<b>17.76</b>	<b>8.75</b>	<b>9.01</b>	<b>17.76</b>
<b>Entry-age normal cost rates</b>							
5	Group 1			21.02			20.65
6	Group 2			24.18			24.11
7	Group 5			29.33			27.61
8	<b>Entry-age normal cost - Average</b>			<b>21.48</b>			<b>21.04</b>
<b>Amortization of unfunded actuarial liability (surplus)</b>							
9	Maximum permissible JTA-C amortization (all groups)			-			-
10	Additional Group 2 amortization (to 2036)			0.50			0.50
11	Additional Group 5 amortization (to 2036)			0.68			0.68
<b>Minimum Permissible JTA-C Contribution Rate</b>							
12	Group 1 (= 5+9)			21.02			20.65
13	Group 2 (= 6+9+10)			24.68			24.61
14	Group 5 (= 7+9+11)			30.01			28.29
15	<b>Minimum permissible JTA-C rate – Average</b>			<b>21.52</b>			<b>21.08</b>

**Schedule F3 – Accrued Liabilities and Funded Ratio – December 31, 2021**

(\$ millions)	Without Tax Limits		With Tax Limits	
	Basic Only	Basic + Indexed	Basic Only	Basic + Indexed
<b>Assets – smoothed value</b>	<b>56,245</b>	<b>68,296</b>	<b>56,245</b>	<b>68,296</b>
<b>Accrued Liabilities</b>				
• pensions being paid	22,379	28,573	22,196	28,335
• inactive members	3,593	5,174	3,593	5,174
• active members	20,531	27,313	20,355	27,081
<b>Total Accrued Liabilities</b>	<b>46,503</b>	<b>61,060</b>	<b>46,144</b>	<b>60,590</b>
<b>Surplus (Unfunded Actuarial Liability)</b>	<b>9,742</b>	<b>7,236</b>	<b>10,101</b>	<b>7,706</b>
<b>Funded Ratio – Fund ÷ Total Accrued Liabilities</b>	<b>120.9%</b>	<b>111.9%</b>	<b>121.9%</b>	<b>112.7%</b>
Assets in RSA and GCRRA	(3,227)	(3,227)	(3,227)	(3,227)
<b>Adjusted surplus (unfunded liability) net of RSA and GCRRA</b>	<b>6,515</b>	<b>4,009</b>	<b>6,874</b>	<b>4,479</b>

## 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.

(\$ millions)	Basic Account Results at December 31, 2021 (pre JTA provisions)	Plausible Adverse Scenario Results at December 31, 2021		
		Interest Rate Risk	Deterioration of Asset Values	Longevity Risk
Smoothed Value of Fund net of RSA and GCRRA	53,018	53,436	51,663	53,018
Actuarial present values of:				
future contributions at entry-age rates	21,049	22,995	21,049	21,322
existing amortization for Groups 2 and 5 to 2036 <sup>1</sup>	63	64	63	63
<b>Total Assets</b>	<b>74,130</b>	<b>76,495</b>	<b>72,775</b>	<b>74,403</b>
<b>Total Liabilities</b>	<b>70,369</b>	<b>74,324</b>	<b>70,369</b>	<b>71,407</b>
<b>Surplus / (unfunded liability)</b>	<b>3,761</b>	<b>2,171</b>	<b>2,406</b>	<b>2,996</b>
Funded Ratio: Total Assets ÷ Total Liabilities	105%	103%	103%	104%
<b>Entry-age normal cost rates</b>	<b>15.49%</b>	<b>16.66%</b>	<b>15.49%</b>	<b>15.69%</b>
Discount rate	6.00%	5.70%	6.00%	6.00%
Market value of assets (net of RSA and GCRRA)	57,525	58,363	50,678	57,525

<sup>1</sup> 0.50% for Group 2, 0.68% for Group 5.

## 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 0.30% to 5.70% as of December 31, 2021.

With respect to the impact on fixed income assets, the scenario results in a decrease in long term yields on fixed income investments of 0.63%.

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 smoothed value of fund assets i.e. the value including the RSA and GCRRA is decreased by 2.44% as of December 31, 2021. Note that the comparable market value of assets is assumed to decrease by 11.30%; 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 90% of those in the mortality table used for the going concern valuation as of December 31, 2021, that is, a more conservative mortality assumption than currently employed.