Public Service Pension Plan
Actuarial Valuation as at December 31, 2019

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1. Executive Summary

Going Concern Funded Status	December 31, 2017 ($ million)	December 31, 2019 ($ million)
Going concern assets		
Market value	13,426	15,418
Asset fluctuation adjustment	(735)	(565)
Total assets	12,691	14,853
Going concern liabilities		
Best estimate liabilities	11,860	12,307
Provision for adverse deviation (PfAD)	1,585	1,846
Total liabilities	13,445	14,153
Actuarial excess (unfunded liability)	(754)	700
Funded ratio	94.4%	104.9%

Minimum Contribution Requirements	December 31, 2017 % of pensionable earnings	December 31, 2019 % of pensionable earnings
Level Rate on All Earnings		
Normal actuarial cost	16.43%	14.23%
Provision for adverse deviation (PfAD)	2.77%	2.13%
Unfunded liability payments[1]	3.42%	0.00%
Provision for non-investment expenses	0.50%	0.50%
Total required contribution rate	23.12%	16.86%
Split Rates (Members and Employers, each)		
Earnings below YMPE	10.47%	7.71%
Earnings above YMPE	14.95%	11.02%

[1] *At December 31, 2017, the rate of 3.42% was slightly higher than the minimum required as the Board decided to maintain the split contribution rates at the levels set under the prior actuarial valuation report.*

Key Inputs	December 31, 2017	December 31, 2019
Discount rate	5.1%	6.0%
Margin for adverse deviation	1.0%, inherent in discount rate	n/a; explicit 15% provision of adverse deviation (PfAD)
Inflation rate	2.0%	2.0%
Interest rate used for lump sums upon termination	2.6% for 10 years, 3.4% thereafter	5.0%
Inflation rate used for lump sums upon termination	1.2% for 10 years, 1.8% thereafter	2.0%
Mortality	Males: 2014 CPM Private Table projected with Scale MI-2017 Females: 95% of 2014 CPM Private Table projected with Scale MI-2017	Males: 2014 CPM Private Table projected with Scale MI-2017 Females: 95% of 2014 CPM Private Table projected with Scale MI-2017
Number of active members	42,252	41,911
Average age of active members	44.2	44.5
Average PSPP service (actives)	9.6 years	9.8 years
Average annualized earnings (actives)	$71,746	$72,012

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2. Introduction

We have been retained by the PSPP Corporation, the "Administrator" of the Public Service Pension Plan (the "Plan"), to conduct an actuarial valuation of the Plan as at December 31, 2019. The last complete valuation that was filed with the appropriate authorities was conducted as at December 31, 2017.

This report was prepared for its intended users, the PSPP Corporation, the Sponsor Board, the Office of the Alberta Superintendent of Pensions ("Employment Pensions"), and the Canada Revenue Agency ("CRA"), for the following purposes:

- to determine the funded status of the Plan on a going concern basis;
- to determine the normal actuarial cost;
- to determine the acceptable range of contributions to the Plan under the *Employment Pension Plans Act* (the "Act") and the *Employment Pension Plans Regulation* (the "Regulation"), subject to exemptions granted in the *Act* and *Regulation*;
- to determine the funded status of the Plan on a solvency basis; and
- to provide the information and the actuarial opinion required by the *Act* and the *Income Tax Act (Canada)*.

While readers of this report may extend beyond the intended users noted above, notably Plan members, we shall not communicate the terms of our engagement or results of our work with other readers unless directed to do so by the Administrator. This report is not intended nor necessarily suitable for purposes other than those listed above.

Changes Since the Last Valuation

The last actuarial valuation of the Plan in which contribution rates were recommended was prepared as at December 31, 2017. Since the last actuarial valuation, the following changes have occurred:

1. On March 1, 2019, the Plan transitioned to a joint governance structure in accordance with the *Joint Governance of Public Sector Pension Plans Act*. Since then, the PSPP Corporation and Sponsor Board were established and have separate responsibilities; the President of Treasury Board and Minister of Finance no longer acts as the Trustee. Specifically, as responsibilities pertain to this report, it has been prepared at the direction of PSPP Corporation and the Sponsor Board will use the information contained herein to set contributions.
2. The Administrator adopted a revised Statement of Investment Policies and Procedures at its meeting of September 4, 2019 and the same was used to determine the discount rate.

3. The Sponsor Board adopted a revised Funding Policy Statement effective January 15, 2020. The material changes to the Funding Policy Statement included replacing the Margin for Adverse Deviation ("MfAD") in the discount rate assumption with an explicit Provision for Adverse Deviation ("PfAD"). The details of this change are noted throughout this report.
4. The going concern economic assumptions were updated to reflect the changes in expected future experience.
5. The solvency basis was updated to reflect market conditions as at the valuation date and to follow the Canadian Institute of Actuaries' *Guidance for Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates between December 31, 2019 and December 30, 2020*.

Details of the above changes that affect the funded status and/or future acceptable range of contributions are outlined in this report.

Subsequent Events

Plan Provision Changes

In accordance with the *Joint Governance of Public Sector Pension Plans Act*, Bill 27, the Plan transitioned to a joint governance structure effective March 1, 2019 (the "Transition Date"). Commencing on the Transition Date, the Plan was given a two-year window to develop and implement a Plan Text, which carries forward existing Plan rules in accordance with the *Joint Governance of Public Sector Pensions Plans Act* and subject to the following:

- any changes necessary to ensure the Plan Text is compliant with the *Act* and *Regulation*, subject to exemptions granted in the *Act* and *Regulation*, and
- changes approved by the Sponsor Board.

In addition, as a result of the coming into force of Bill 22 (*Reform of Agencies, Boards and Commissions and Government Enterprises Act, 2019*), we have reflected in this report the following changes which have material impacts on the results of this valuation:

- commuted value calculations must use the going concern basis effective April 1,2020, and
- excess member contributions based on the old "50% rule" have been replaced with a minimum refund rule whereby a member's termination benefits are, at a minimum, equal to a refund of the member's contributions with interest.

Economic Impact of COVID-19

The rapid spread of the COVID-19 virus around the world, commencing in North America in February 2020, and the economic implications of the same resulted in a significant decrease in Plan assets in the first quarter of 2020. Since March 31, 2020, the Plan's assets have recovered, but not fully. Coupled with the inherent volatility in capital markets, it is difficult to state broadly the effect on the Plan without significant analysis being conducted as of a certain date. That said, the intent of this report is to disclose the financial condition of the Plan as at December 31, 2019; to the extent that users of this report draw conclusions from its results about the future, such users should consider the decrease in assets at the time they are reaching said conclusions.

Other than the aforementioned changes, we have not been made aware of any other subsequent events nor any extraordinary changes to the Plan, membership or other data that would materially affect the results of this valuation.

Terms of Engagement

This report has been prepared in accordance with the Plan's Funding Policy Statement adopted January 15, 2020.

Filings

An actuarial valuation must be filed with Employment Pensions as at the effective date of the Plan and not more than three years after the last actuarial valuation. Unless the Plan specifies otherwise, the date of each actuarial valuation must be at the Plan's fiscal year-end. If an amendment to the Plan or a change in Plan membership materially affects the cost of benefits provided by the Plan or creates an unfunded liability, an actuarial valuation must be prepared. In the intervening period, contributions must be made in accordance with the last filed valuation.

As this is the first actuarial valuation completed for the Plan since its governance change which now includes oversight by Employment Pensions, should the Sponsor Board wish to have contributions be made in accordance with this report it must be filed with Employment Pensions. If it is not filed, the next actuarial valuation must be prepared and filed with Employment Pensions no later than as at December 31, 2020.

For an employer contribution to be eligible under a defined benefit provision, it must be recommended by an actuary in whose opinion the contribution is required to be made and the actuary's recommendation must be approved by the CRA. As such, in accordance with Section 147.2 of the *Income Tax Act (Canada)*, this entire valuation report must be filed with the CRA in support of eligibility of employer contributions should the Sponsor Board wish to have contributions be made in accordance with this report.

We will file this report with the appropriate authorities on the PSPP Corporation's behalf or as otherwise instructed.

3. Actuarial Opinion

This opinion is given with respect to the Public Service Pension Plan. We conducted a valuation of the Plan as at December 31, 2019. The administrator has confirmed that, between December 31, 2019 (the effective date of the data provided) and the date of this report, no subsequent events nor any extraordinary changes to the membership that would materially affect the results of this valuation have occurred, except as indicated in this report.

In our opinion, for the purposes of this report:

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

We hereby certify that, in our opinion, as at December 31, 2019:

1. With respect to the purpose of determining the Plan's funded status on a going concern basis:
   a. The Plan has a going concern surplus (excess of liabilities over assets) of $700 million, based on going concern assets of $14,853 million and going concern liabilities of $14,153 million. The funded ratio is 104.9%. Going concern liabilities include the provision for adverse deviation of $1,846 million.
   b. There is no excess surplus as defined by Section 147.2(2) of the *Income Tax Act (Canada)*.
2. With respect to the purpose of determining the normal actuarial cost and acceptable range of contributions that are applicable to the Plan for years after the valuation date:
   a. The Plan's normal actuarial cost is estimated to be 16.86% of pensionable earnings. Of this cost, 14.23% is attributable to the cost of benefits accruing in the year following the valuation date, 2.13% is attributable to the provision for adverse deviation, and 0.50% is attributable to a provision for non-investment expenses that are paid from the fund.
   b. As the Plan is fully funded on the going concern basis, there are no additional, required contributions necessary to fund unfunded liabilities.
   c. If this minimum level of contributions is made until the next actuarial certification, the total contribution rate translates to the following for each member and their employer:
      - Contribution rate below YMPE: 7.71%
      - Contribution rate above YMPE: 11.02%
   d. Should the Sponsor Board wish to have contributions remitted at a rate higher than the minimum level outlined above, the Plan's normal actuarial cost on the basis outlined under the valuation for Maximum Contribution Determination (Appendix F) is estimated to be 18.45% of pensionable earnings. Of this cost, 15.61% is attributable to the cost of benefits accruing in the year following the valuation date, 2.34% is attributable to the provision for adverse deviation, and 0.50% is attributable to a provision for non-investment expenses that are paid from the fund.

e. Should the Sponsor Board wish to have contributions remitted at a rate higher than the minimum level outlined above, the Plan has an unfunded liability (excess of liabilities over assets) on the basis outlined under the valuation for Maximum Contribution Determination of $580 million, based on going concern assets of $14,853 million and liabilities of $15,433 million. The funded ratio on this basis is 96.2%. These liabilities include the provision for adverse deviation of $2,013 million. Additional contributions required to fund this unfunded liability over the three-year period covered by this report are 7.36% of pensionable earnings.

f. If this maximum level of contributions outlined under d. and e. is made until the next actuarial certification, the total contribution rate translates to the following for each member and their employer:

- Contribution rate below YMPE: 11.81%
- Contribution rate above YMPE: 16.87%

3. With respect to the purpose of determining the Plan's funded status on a solvency basis:

a. The Plan has a solvency deficit of $6,154 million, determined as solvency assets of $15,383 million less solvency liabilities of $21,537 million.

b. The solvency ratio is 71.4%.

c. The liabilities of the Plan would exceed the Plan's assets by $6,154 million if the Plan was terminated and wound-up on the valuation date.

4. We are not aware of any subsequent events, that have not already been taken into consideration, that could materially affect the results of this valuation.

5. The next valuation should be conducted no later than as at December 31, 2022.

This valuation was conducted in accordance with the *Employment Pension Plans Act* (the "Act") and the *Employment Pension Plans Regulation* (the "Regulation"), subject to exemptions granted in the *Act* and *Regulation*. Further, the calculations have been prepared in accordance with subsection 147.2(2) of the *Income Tax Act (Canada)*.

The content herein has been prepared exclusively from a financial viewpoint. This report does not constitute a legal opinion on the rights and duties of the Administrator, the Sponsor Board, or the members concerning the Plan.

Actuarial valuation results are estimates only and are based on assumptions and methods developed in accordance with actuarial standards of practice. Emerging experience differing from the assumptions used will result in gains or losses which will be revealed in future valuations, and which may affect future actuarial opinions.

This report has been prepared, and our opinions given, in accordance with accepted actuarial practice in Canada.

We would be pleased to discuss any questions the user may have regarding the valuation.

[Original Signed By]	[Original Signed By]
Gregory M. Heise Fellow, Canadian Institute of Actuaries	Jian Zhang Fellow, Canadian Institute of Actuaries

George & Bell Consulting Inc.
June 11, 2020

4. Going Concern Valuation Results

4.1 Going Concern Funded Status

The following table describes the Plan's funded status on a going concern basis. The going concern liabilities are based on the benefits earned up to the valuation date assuming the Plan continues indefinitely.

Going Concern Funded Status	December 31, 2017 ($ million)	December 31, 2019 ($ million)
Going concern assets		
Market value	13,426	15,418
Asset fluctuation adjustment	(735)	(565)
Total assets	12,691	14,853
Best estimate actuarial liabilities		
Active members	5,140	4,909
Retirees & beneficiaries	5,305	6,018
CPS suspended members	781	740
Deferred members	617	625
Hold on deposit members	17	15
Total best estimate liabilities	11,860	12,307
Best estimate funded status	**831**	**2,546**
Best estimate funded ratio	**107.0%**	**120.7%**
Provision for adverse deviation (PfAD)	1,585	1,846
Total going concern liabilities (including PfAD)	13,445	14,153
Actuarial excess (unfunded liability)	**(754)**	**700**
Funded ratio	**94.4%**	**104.9%**

4.2 Reconciliation of Going Concern Funded Status

The following table reconciles the change in the going concern funded status over the course of the inter-valuation period.

Reconciliation of Going Concern Funded Status (Best Estimate)	($ million)
Actuarial excess (unfunded liability) at December 31, 2017	831
Expected interest	104
Special payments	396
Expected actuarial excess (unfunded liability) at December 31, 2019	1,331
Gain / (loss) on investments	208
Asset Fluctuation Adjustment	263
Experience gains and losses	
Salary experience	85
Retirement experience	118
Termination experience	10
Mortality experience	25
Interest on employee contributions	41
Miscellaneous	1
Total	280
Plan changes	
Change in commuted value basis	176
Change in minimum refund rule	367
Total	543
Assumption changes	
Changes in economic assumptions	
Decrease in best estimate discount rate from 6.1% to 6.0%	(165)
Change in salary increase assumption	86
Total	(79)
Actuarial excess (unfunded liability) at December 31, 2019	2,546

4.3 Reconciliation of Normal Actuarial Cost Rate

The table below identifies the main components of the changes in the normal actuarial cost rate (the rate of pensionable earnings reflecting the cost of current service benefits accruing under the Plan) from the prior valuation to this valuation.

Reconciliation of Normal Actuarial Cost Rate (Best Estimate)	% of pensionable earnings
Normal actuarial cost rate at December 31, 2017	16.43%
New data and demographic changes	0.37%
Change in commuted value basis	(0.69%)
Change in minimum refund rule	(1.86%)
Change in best estimate discount rate	0.29%
Change in salary increase assumption	(0.31%)
Normal actuarial cost rate at December 31, 2019	14.23%

5. Solvency Valuation Results

5.1 Solvency Funded Status

A solvency valuation is required by the Act to assess the Plan's funded status should it wind-up on the valuation date; however, the Act does not require the Plan to be funded on the solvency basis. A hypothetical wind-up valuation measures the same funded status, with minor differences, and is required under accepted actuarial practice. Since all benefits have been valued under this solvency valuation and assuming that the asset liquidation value would be equal to the market value of assets, the hypothetical wind-up funded status would be the same as the solvency funded status shown below.

The solvency funded status of the Plan is determined by reducing the market value of the assets by an allowance for estimated wind-up expenses and comparing the result to the actuarial liability for benefits earned up to the valuation date. Liabilities are determined assuming the Plan is terminated on the valuation date, with immediate settlement of obligations.

Based on the Plan's provisions, membership data, asset information, and solvency assumptions and methods described in the Appendices, in conjunction with the requirements of the Act, the solvency funded status of the Plan is shown in the table below.

Solvency Funded Status	December 31, 2017 ($ million)	December 31, 2019 ($ million)
Solvency assets		
Market value of assets	13,426	15,418
Expense allowance	(26)	(35)
Total assets	13,400	15,383
Solvency liabilities		
Active members	8,112	9,764
Retirees & beneficiaries	7,970	8,999
CPS suspended members	1,254	1,506
Deferred members	1,007	1,253
Hold on deposit members	17	15
Total liabilities	18,360	21,537
Solvency excess (deficiency)	(4,960)	(6,154)
Solvency ratio	73.0%	71.4%

5.2 Incremental Cost

The incremental cost on the solvency basis represents the present value of the expected aggregate change in the solvency liabilities from the valuation date to the next valuation date, adjusted for expected benefit payments in the inter-valuation period. The present value of the incremental cost figures shown in the table below are as of the beginning of each period shown. These figures are required to be disclosed under accepted actuarial practice.

Incremental Cost	($ million)
January 1, 2020 to December 31, 2020	909
January 1, 2021 to December 31, 2021	965
January 1, 2022 to December 31, 2022	990

5.3 Solvency Sensitivity

The effect on the solvency liabilities of using discount rates 1% lower than those used for the solvency valuation would be an increase in the solvency liabilities of $4,625 million. All other assumptions and methods as used in this valuation were maintained.

6. Contribution Rates

6.1 Contribution Rate in Respect of Normal Actuarial Costs

The normal actuarial cost is the cost, on the going concern basis, of benefits accruing under the Plan as a result of service after the valuation date. Based on the Plan provisions, membership data, and going concern assumptions and methods described in the Appendices, the following table provides details on the breakdown of the normal actuarial cost, provision for adverse deviation, and provision for non-investment expenses, along with the resulting total normal actuarial contribution rate.

	December 31, 2017	December 31, 2019
Normal actuarial cost	$462,601,000	$400,015,000
Provision for adverse deviation (PfAD)	$77,857,000	$60,002,000
Provision for non-investment expenses	$14,075,000	$14,060,000
• Next year's expected pensionable earnings	$2,815,000,000	$2,812,000,000
Normal actuarial cost rate	16.43%	14.23%
PfAD rate	2.77%	2.13%
Provision for non-investment expenses	0.50%	0.50%
Total normal actuarial contribution rate	19.70%	16.86%

6.2 Contribution Rate in Respect of Unfunded Liability

The following table summarizes the amortization schedules that were established prior to the valuation date along with the present value at December 31, 2019 of the additional contributions for which each schedule was expected to account over its remaining lifetime.

Valuation Date at which Schedule Established	Commencement of schedule	Contribution Rate (% of pensionable earnings)	End Date for Schedule	Present Value at Dec. 31, 2019 ($ million)
December 31, 2011	January 1, 2013	3.42%	June 30, 2026	570

Between this valuation date and the last, actuarial/experience gains amounted to $751 million. These were further enhanced by gains due to changes to the Plan's provisions ($543 million), but slightly reduced by assumption changes, resulting in a funding surplus of $700 million at this valuation date. As a result, the amortization schedule has been eliminated as at this valuation date.

6.3 Actuarial Excess Usage

As defined in the *Regulation*, accessible going concern excess means the amount by which the going concern assets values exceed 105% of the going concern liabilities values. As at this valuation date, the Plan does not have an accessible going concern excess as the funded ratio is at 104.9%. Further, the Plan's Funding Policy Statement includes restrictions which would prohibit the use of actuarial excess, given the current funded status of the Plan.

6.4 Contribution Rate in Respect of Solvency Deficiency

The Act does not require additional contributions to fund the solvency deficiency.

6.5 Maximum Permissible Contributions

The *Income Tax Act (Canada)* limits the amount of employer contributions that can remitted to the defined benefit provision of a registered pension plan to contributions recommended by an actuary as being required to fund the benefits provided under the Plan in respect of service rendered prior to the end of the contribution year. In making the recommendation, the actuary may ignore a certain amount of excess funding, and may include an allowance for cost-of-living increases that are reasonable to expect will be provided, whether or not those increases are stipulated in the Plan's provisions.

In general, the maximum is defined as 25% of the going concern actuarial liability (with allowances for cost-of living, if applicable).

As at the valuation date, the Plan does not have an excess surplus on the valuation for Maximum Contribution Determination basis, nor the going concern basis; therefore, employer contributions are not affected by the prescribed excess surplus limit.

As the Plan has no excess surplus, the maximum permissible contribution is 25.81% of pensionable earnings, as described in the valuation for Maximum Contribution Determination. The detailed funded position, contribution information, and valuation assumptions with respect to the valuation for Maximum Contribution Determination, for determining the maximum eligible contributions, are outlined under Appendix F.

6.6 Total Contribution Rate

The following table outlines the acceptable range of contributions required under the Act and the Regulation and permitted under the *Income Tax Act* (*Canada)* based on this valuation.

Total Contribution Rates (% of pensionable earnings)	Minimum Required	Maximum Permitted
Level Rate on All Earnings		
Total Normal actuarial cost rate	16.86%	18.45%
Unfunded liability special payments	0.00%	7.36%
Required application of excess surplus	0.00%	0.00%
Total contribution rate	16.86%	25.81%
Split Rate Below/Above YMPE (Members and Employers, each)		
On earnings below YMPE	7.71%	11.81%
On earnings above YMPE	11.02%	16.87%

Contributions for the period until the next actuarial valuation must fall between the minimum and maximum contributions permitted above and in accordance with the Funding Policy Statement. The Plan's current contribution rates are:

Total Contribution Rates (% of pensionable earnings)	Members	Employers	Total
Split Rate Below/Above YMPE (Members and Employers, each)			
On earnings below YMPE	10.47%	10.47%	20.94%
On earnings above YMPE	14.95%	14.95%	29.90%

The Plan's current contribution rates are within the acceptable range formed by the requirements of the Act and Regulation and the *Income Tax Act (Canada)*. Should the Sponsor Board wish to continue contributions at the existing rates, these contributions will satisfy the requirements of applicable legislation.

7. Funding Policy Considerations

7.1 Provision for Adverse Deviation

In accordance with the Funding Policy Statement, an explicit provision for adverse deviation ("PfAD") has been added to liabilities and normal actuarial costs, replacing the previous implicit margin for adverse deviation (that was built into the discount rate assumption). The purpose of the PfAD is to reduce the potential adverse effect of the uncertainty inherent in going concern assumptions. If the future unfolds in accordance with the best estimate assumptions (that is, the assumptions without margin), then the PfAD will be released into surplus.

The target amount of PfAD to use for the going concern valuation is 15%. The policy mandates that the PfAD must be within the range of 5% to 25%. In the last valuation, the margin for adverse deviation in the discount rate was 1.0%. In other words, the discount rate was 1.0% lower than the best estimate long-term rate of return assumption.

To aid the reader in the assessment of the level of the PfAD, the following table illustrates the discount rates, including margins, that would produce liabilities and normal actuarial costs equivalent to the best estimate liabilities and normal actuarial costs plus the 15% PfAD.

	PfAD %[1]	Best Estimate Value ($ million)	PfAD ($ million)	Discount Rate that would generate PfAD	Resulting Margin in Discount Rate
Liabilities	15%	$12,307	$1,846	5.0%	1.0%
Normal actuarial cost	15%	14.23%	2.13%	5.3%	0.7%

[1] *At the last valuation, the effect of the margin on the resulting liabilities and normal actuarial cost resulted in a PfAD of 13.4% and 16.9%, respectively.*

Commuted Values

In accordance with Bill 22, commuted value calculations must use the actuarial assumptions used in the current actuarial valuation report (to determine the going concern liabilities value of the Plan) or any simplified actuarial assumptions that reasonably reflect those actuarial assumptions.

Based on the above, the simplified actuarial assumptions to be used in preparing commuted value calculations should include a discount rate of 5.0%, which falls between the above calculated discount rates. At this valuation date, a discount rate of 5.0% reasonably reflects the Funding Policy Statement's 15% PfAD.

Transfer Agreements

As a result of the change in approach to use best estimate assumptions in conjunction with an explicit PfAD, the Administrator may wish to consider reviewing inter-plan transfer agreements and the actuarial assumptions used.

7.2 Long-Term Funding Test

In order to assess the long-term sustainability of the Plan, the Funding Policy Statement requires that a Long-Term Funding Test be performed in conjunction with each actuarial valuation and incorporated into the contribution rates-setting process. The test is conducted by comparing *Funds Available* to *Funds Required*, as follows:

Funds Available:
A. Actuarial value of assets
B. Present value of contributions (over the next 25 years)

Funds Required:
C. Going concern liabilities
D. Present value of normal actuarial costs (over the next 25 years)
E. Present value of non-investment expenses (over the next 25 years)

Long-Term Funding Ratio = (A + B)/(C+D+E)

Further, an allowance for new entrants is included in both B and D above. The number of new entrants may not result in growth in the number of members who are contributing towards accruing benefits (i.e., no growth in the active membership of the Plan may be included in the Long-Term Funding Test).

If the Long-Term Funding Ratio is greater or equal to 105%, the Plan passes the Long-Term Funding Test. The following table summarizes the results of the test, based on current contribution rates:

Long-Term Funding Test	December 31, 2017 $000s	December 31, 2019 $000s
Funds Available		
Going concern assets	12,691,000	14,853,000
Present value of 25 Years' Contributions	10,117,000	10,697,000
Total Funds Available	**22,808,000**	**25,550,000**
Funds Required		
Going concern liabilities	11,860,000	12,307,000
Present value of 25 Years' normal actuarial costs and non-investment expenses	7,985,000	7,522,000
Total Funds Required	**19,845,000**	**19,829,000**
Long-Term Funding Ratio	**115%**	**129%**

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8. Stress and Sensitivity Testing

Stress and sensitivity tests have been conducted to assess certain risks to which the Plan is exposed. The tests and their disclosure have been prepared with reference to applicable actuarial standards and guidance. At this valuation, the following risks have been assessed:

- interest rate risk,
- deterioration of asset values,
- public sector employment, and
- longevity risk.

The following sections provide the results of these tests on the going concern assets, going concern liabilities, going concern funded status, going concern normal actuarial costs, and resulting minimum contribution requirements.

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8.1 Asset-Liability Mismatch: Discount/Interest Rate Sensitivity

As the assumed discount rate has a significant impact on the Plan's liabilities, accepted actuarial practice requires that the impact on the going concern liabilities and normal actuarial cost of a 1.0% decrease in the assumed discount rate be disclosed.

The following table illustrates the effect of an immediate 1.0% decrease in the discount rate with a corresponding 1.0% decrease in interest rates (affecting fixed income assets), including a 1.0% decrease in the interest rate used for commuted values. The effect on fixed income assets is determined by estimating the immediate capital gain on such assets resulting from a 1.0% decrease in their yields.

Funded Status and Contribution Margin – December 31, 2019	Current Valuation	Discount & Interest Rate -1%
Going concern assets ($ million)		
Market value	15,418	15,731
Asset fluctuation adjustment	(565)	(816)
Going concern assets	14,853	14,915
Going concern liabilities ($ million)		
Best estimate liabilities	12,307	14,184
Best estimate funded status	2,546	731
Best estimate funded ratio	120.7%	105.2%
PfAD	1,846	2,128
Total going concern liabilities	14,153	16,312
Actuarial excess (unfunded liability)	**700**	**(1,397)**
Funded ratio	**104.9%**	**91.4%**
Contribution requirements (% of pensionable earnings)		
Normal actuarial cost	14.23%	17.79%
PfAD	2.13%	2.67%
Non-investment expense allowance	0.50%	0.50%
Unfunded liability special payments	0.00%	3.82%
Total minimum required	**16.86%**	**24.78%**
Split rates for members/employers (% of pensionable earnings)		
Earnings below YMPE	7.71%	11.34%
Earnings above YMPE	11.02%	16.20%

8.2 Asset-Liability Mismatch: Deterioration of Asset Values

Investment policy may create an asset-liability mismatch should one asset class not produce the actual returns necessary to match the liabilities.

The following table illustrates the effect on the Plan's funded status of an immediate 10% decrease in the Plan's assets as at December 31, 2019. This rate of return was chosen to mimic the Plan's actual net return of -11.85% in the first quarter of 2020.

Funded Status & Contribution Requirements – December 31, 2019	Current Valuation	Immediate 10% Drop in Market Value of Assets
Going concern assets ($ million)		
Market value	15,418	13,876
Asset fluctuation adjustment	(565)	668
Going concern assets	14,853	14,544
Going concern liabilities ($ million)		
Best estimate liabilities	12,307	12,307
Best estimate funded status	2,546	2,237
Best estimate funded ratio	120.7%	118.2%
PfAD	1,846	1,846
Total going concern liabilities	14,153	14,153
Actuarial excess (unfunded liability)	**700**	**391**
Funded ratio	**104.9%**	**102.8%**
Contribution requirements (% of pensionable earnings)		
Normal actuarial cost	14.23%	14.23%
PfAD	2.13%	2.13%
Non-investment expense allowance	0.50%	0.50%
Unfunded liability special payments	0.00%	0.00%
Total minimum required	**16.86%**	**16.86%**
Split rates for members/employers (% of pensionable earnings)		
Earnings below YMPE	7.71%	7.71%
Earnings above YMPE	11.02%	11.02%

To further assess the potential impact of asset value deterioration, this scenario has also projected over the three-year period from following the valuation date. The market value of assets has been projected assuming net annual investment returns of -10% in 2020 and 0% in each of 2021 and 2022. We have assumed that contributions, benefit payments, and expenses continue at the rate exhibited in 2019 in our development of the projected assets and liabilities and in conjunction with the normal actuarial cost shown in Section 6.1:

Funded Status & Contribution Requirements – December 31, 2022	**6.0% Rate of Return**	**-10% in 2020, 0% in 2021 & 2022**
Going concern assets ($ million)		
Market value	18,403	13,912
Asset fluctuation adjustment	(205)	1,391
Going concern assets	18,198	15,303
Going concern liabilities ($ million)		
Best estimate liabilities	13,930	13,930
Best estimate funded status	4,268	1,373
Best estimate funded ratio	130.6%	109.9%
PfAD	2,090	2,090
Total going concern liabilities	16,020	16,020
Actuarial excess (unfunded liability)	**2,178**	**(717)**
Funded ratio	**113.6%**	**95.5%**
Contribution requirements (% of pensionable earnings)		
Normal actuarial cost	14.23%	14.23%
PfAD	2.13%	2.13%
Non-investment expense allowance	0.50%	0.50%
Unfunded liability special payments	0.00%	2.09%[1]
Total minimum required	**16.86%**	**18.95%**
Split rates for members/employers (% of pensionable earnings)		
Earnings below YMPE	7.71%	8.83%
Earnings above YMPE	11.02%	12.61%

[1] *The amortization period used is 15 years*

8.3 Public Sector Employment

Given the economic challenges currently being experienced in Alberta, future employment levels in Alberta's public sector could be negatively impacted. It is conceivable that the Plan's active membership could decrease. This test contemplates an immediate 10% payroll reduction (as a result of fewer members, not lower salaries), resulting in lower future total contributions, with no changes to current contribution rates:

Funded Status & Contribution Requirements – December 31, 2019	Current Valuation	Immediate 10% Payroll Reduction
Going concern assets ($ million)		
Market value	15,418	15,418
Asset fluctuation adjustment	(565)	(565)
Going concern assets	14,853	14,853
Going concern liabilities ($ million)		
Best estimate liabilities	12,307	12,307
Best estimate funded status	2,546	2,546
Best estimate funded ratio	120.7%	120.7%
PfAD	1,846	1,846
Total going concern liabilities	14,153	14,153
Actuarial excess (unfunded liability)	**700**	**700**
Funded ratio	**104.9%**	**104.9%**
Contribution requirements (% of pensionable earnings)		
Normal actuarial cost	14.23%	14.23%
PfAD	2.13%	2.13%
Non-investment expense allowance	0.50%	0.50%
Unfunded liability special payments	0.00%	0.00%
Total minimum required	**16.86%**	**16.86%**
Split rates for members/employers (% of pensionable earnings)		
Earnings below YMPE	7.71%	7.71%
Earnings above YMPE	11.02%	11.02%

All components of the minimum funding requirements are expressed as a percentage of pensionable earnings, as there are no special payments. As such, immediately lowering pensionable earnings due to a reduction in active members has no effect on the contribution requirements at this valuation.

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8.4 Demographic Experience: Increased Longevity

This stress test illustrates the effect of members living longer than expected. The test offsets the mortality rates applicable to each member by one year, extending their life expectancies. The timing of all other decrements was unchanged. The following table illustrates the effect of this increased longevity.

Funded Status & Contribution Requirements – December 31, 2019	Current Valuation	Increased Longevity
Going concern assets ($ million)		
Market value	15,418	15,418
Asset fluctuation adjustment	(565)	(565)
Going concern assets	14,853	14,853
Going concern liabilities ($ million)		
Best estimate liabilities	12,307	12,547
Best estimate funded status	2,546	2,306
Best estimate funded ratio	120.7%	118.4%
PfAD	1,846	1,882
Total going concern liabilities	14,153	14,429
Actuarial excess (unfunded liability)	**700**	**424**
Funded ratio	**104.9%**	**102.9%**
Contribution requirements (% of pensionable earnings)		
Normal actuarial cost	14.23%	14.42%
PfAD	2.13%	2.16%
Non-investment expense allowance	0.50%	0.50%
Unfunded liability special payments	0.00%	0.00%
Total minimum required	**16.86%**	**17.08%**
Split rates for members/employers (% of pensionable earnings)		
Earnings below YMPE	7.71%	7.82%
Earnings above YMPE	11.02%	11.17%

Appendix A — Plan Provisions

A.1 Plan Provisions

The Plan is continued under the *Joint Governance of Public Sector Pension Plans Act*, Bill 27, in force December 11, 2018 (the "JGPSPPA"). In particular, subsection 34(2) and 34(3), under Part 4 of Schedule 2 of the JGPSPPA, describes a plan text document which references sections 5(1) and 8 of the *Public Sector Pension Plans Act*, the *Public Service Pension Plan* Regulation (AR 368/93), section 12 of the *Public Sector Pension Plans (Legislative Provisions) Regulation (AR 365/93)*, and sections 4.1 and 24.05 to 24.09 of Schedule 2 of that regulation, as those provisions read immediately prior to the transition date. The plan text also applies and shall be read with all modifications as are necessary to give effect to the record having regard to the continuation of the Plan in accordance with, and as amended by, the provisions of Schedule 2 of the JGPSPPA.

Further, the Plan provisions include the changes required as a result of the coming into force of Bill 22 (*Reform of Agencies, Boards and Commissions and Government Enterprises Act, 2019*), as described in the Introduction, as though those changes were in effect on December 31, 2019.

This summary contains the main provisions of the Plan as at the valuation date. For a complete description, reference should be made to the Plan text. The plan text document referenced under subsection 34(1) of the JGPSPPA is still currently in draft form.

This summary does not constitute a legal interpretation of the Plan. All pertinent documents, acts, and regulations should be referred to for an interpretation in any specific circumstance.

Provision	Detail
Effective date	The Plan was established effective April 1, 1947. In accordance with the *Joint Governance of Public Sector Pension Plans Act*, Bill 27 ("JGPSPPA"), the Plan is continued under the plan text effective January 1, 2021.
Eligibility	Full-time and part-time employees of the Government of Alberta, and of the agencies, boards and Provincial corporations identified in the section 28 of Schedule 2 of the JGPSPPA are eligible to participate in the Plan.
Current service contributions	With effect from January 1, 1992, the current service benefit accruals of the PSPP are funded in equal parts by contributions from employers and plan members which, in total, are equal to the normal actuarial cost of the benefit accruals attributable to the years for which the contributions are made. With effect from January 1, 2019, a higher contribution rate was paid by all employees and employers for the CPS provision.
Unfunded liability contributions	Any unfunded liability of the Plan arising after 1998 is to be funded over a period not exceeding 15 years from the applicable valuation date, in equal parts by contributions from PSPP members and their employers.
Solvency contributions	The JGPSPPA does not require funding of any solvency deficit.

Provision	Detail
Purchase of service	Members are entitled to contribute for the purchase of certain periods of service. The actuarial basis for determining the purchase price approximates the going-concern actuarial liability that will arise in respect of that service.
Credited interest	Prior to 1994, Plan member contribution accounts were credited with interest at the rate of 4% per annum. Effective January 1, 1994, the interest credited to accumulated member contributions is equal to the rate of return credited on 5-year term deposits by Canadian chartered banks as reported in CANSIM series V80691336 (formerly V122515) maintained by Statistics Canada.
Combined pensionable service (CPS)	Combined Pensionable Service ("CPS") affects members who transfer to (or from) employment covered by the Plan from (or to) employment covered by either the Management Employees Pension Plan ("MEPP") or the Universities Academic Pension Plan ("UAPP"). When a member of MEPP or UAPP transfers to PSPP, the member's PSPP pensionable service is the only service recognized for purposes of calculating the PSPP accrued pension. However, determination of eligibility to benefits from PSPP, such as vesting, early retirement, and the amount of early retirement reduction, is based on the member's CPS. In this case, the member's CPS is equal to his pensionable service under PSPP plus the pensionable service earned under the former plan. Similarly, when a PSPP member transfers to UAPP or to MEPP, the member's PSPP pensionable service up to the time of transfer is the only service used to calculate the PSPP accrued pension. However, the member's CPS is used to determine benefit eligibility as described above. In this case, the member's CPS is equal to the pensionable service under PSPP plus the pensionable service under the new plan. In either case, the member's accrued PSPP pension is based on the highest five-year average earnings over the member's entire CPS. The aggregate of the periods that are considered in determination the length of the CPS shall not exceed 35 years. CPS results in benefits that are higher than they otherwise would be in its absence, resulting in additional costs.
Commuted values	The lump sum present value of a member's accrued benefits; prior to April 1, 2020, commuted values were determined in accordance with accepted actuarial practice. Effective April 1, 2020, in accordance with Bill 22 (*Reform of Agencies, Boards and Commissions and Government Enterprises Act*, 2019), commuted values are determined based on simplified actuarial assumptions used in the current actuarial valuation report to determine the going concern liabilities of the Plan).
Normal retirement date	First day of the month coincident with or following the member's 65^{th} birthday.
Unreduced early retirement	A member who has attained age 55, and whose age and years of pensionable service total 85 or more, is entitled to an unreduced retirement pension commencing immediately.

Provision	Detail
Reduced early retirement	A member who has attained age 55, but whose age and years of pensionable service do not total 85, may elect to receive a pension commencing immediately that is reduced by an early retirement reduction. The early retirement reduction is 3% multiplied by the number of years the member is short of age 65 or 85 points, whichever is less (without recognition of potential service).
Postponed retirement	A member who is eligible for immediate retirement may defer pension commencement, up to the latest age permitted under the *Income Tax Act (Canada)*. An actuarial increase applies in the case of postponement beyond the later of termination of employment and attaining eligibility for an unreduced pension.
Normal form of pension	The normal form of pension is a 5-year guaranteed life annuity. Members can select an alternative form of pension that is actuarially equivalent to the normal form of pension.
Years of pensionable service	The number of complete years and any fraction of a remaining year of pensionable service, up to a maximum of 35 years, less any combined pensionable service.
Highest average salary	The member’s average annual pensionable salary in the 60 consecutive months in which such average salary was the highest (including during continuing employment after attainment of 35 years of pensionable service). The pensionable salary of part time employees is grossed up to an annual basis to determine average pensionable salary.
Average YMPE	The average of the Year’s Maximum Pensionable Earnings (as defined in the Canada Pension Plan) over the same period over which pensionable earnings are averaged.
Normal retirement benefit	The benefit payable at normal retirement age is an annual pension equal to the sum of: (a) 2.0% of average pensionable salary multiplied by years of pensionable service earned or credited in respects of periods prior to January 1, 1966, plus (b) 1.4% of average pensionable salary up to the average YMPE multiplied by years of pensionable service earned or credited in respect of periods after January 1, 1966, plus (c) 2.0% of average pensionable salary in excess of average YMPE, multiplied by years of pensionable service earned or credited in respect of periods after January 1, 1966.
Maximum pensionable earnings	Effective January 1, 1992, and only in respect of pensionable service after 1991, pensionable earnings for each calendar year are limited to the sum of: (a) 50 times the defined benefit annual maximum pension limit for the year under the *Income Tax Act (Canada)*, plus (b) 30% of the YMPE for the year.
Cost of living increases	Pensions payable to retired members, former members with deferred pensions and survivors will be increased annually to reflect 60% of the increase in the Consumer Price Index for Alberta. The Sponsor Board may approve additional ad hoc cost-of-living increases.
Vesting	Benefits vest on attainment of 2 years of combined pensionable service or age 65.
Termination benefits	(a) *Non-vested benefit:* A non-vested terminated member is entitled to payment of the member's contributions with interest.

Provision	Detail
	(b) *Vested benefit:* The vested termination benefit is a deferred pension, commencing at or after age 55 calculated to reflect the early retirement discount applicable at the actual date of retirement of the member (i.e., 3% per annum) and reflecting only pensionable service performed to the date of termination. Portability of the member's commuted value is permitted.
Death benefits	*Prior to retirement:* (a) *Non-vested benefit:* The non-vested death benefit is a refund of the member's required contributions with interest. (b) *Vested benefit:* The vested death benefit is payment of the commuted value of the member's termination/retirement benefit. However, a surviving pension partner has the option to elect a monthly pension in lieu of the commuted value. Such a monthly pension is determined as the survivor's pension as if the member had retired on an unreduced pension and elected a Joint-and-Survivor 100% optional form. *After retirement:* The post-retirement death benefit is dependent on the form of pension selected at retirement.
Disability benefits	A member, or a former member who remains entitled to a deferred pension, is entitled to receive an immediate unreduced pension, provided that he/she: (a) joined the Plan prior to July 1, 2007, (b) is totally disabled, (c) has completed two years of pensionable service, and (d) is not receiving benefits under an approved disability plan. A person who satisfies the above conditions, but is only partially disabled, is entitled to receive a pension commencing immediately that is reduced as for early retirement. A person who is receiving benefits from an approved disability plan is not entitled to receive, concurrently, a disability pension from the Plan. While in receipt of benefits from an approved disability plan, participation in the Plan continues. Salary, for the purpose of current service contributions or for the purpose of determining any pension to which the member may subsequently become entitled, is the salary that was being earned immediately before disability benefits commenced, increased by any subsequent general increases applicable to the pre-disability class of employment of the member.
Excess Employee Contributions	Upon a member's retirement or upon commuted value transfer upon termination or death, if the member's vested contributions with interest are greater than the commuted value of the benefit otherwise payable, then the member/spouse/beneficiary receives a refund of such excess.
Portability agreements – other public sector plans	Portability agreements have been established with other public sector pension plans, under which a member who transfers between the PSPP and such other plan has the option to transfer service credits from his former plan to his new plan, with a corresponding transfer of funds between the plans. The amounts of such service transfer and fund transfer are generally based on the estimated respective actuarial funding valuation liability for such member in each of the plans.
Plan termination	The Act does not contemplate termination of the Plan.

Appendix B — Plan Membership

B.1 Source of Data

Alberta Pensions Services Corporation (APSC) provides administration services to the Plan and maintains pension records of Plan members on behalf of the Administrator. The relevant information to carry out this valuation was provided by APSC. We have reviewed the data to ensure its sufficiency and reliability, and consistency with the data used in the last valuation. Specific tests included:

1. A member by member reconciliation of the membership group from December 31, 2017 to December 31, 2019.
2. Tests for reasonableness of the data elements of the record of each individual entitled to or potentially entitled to a benefit under the Plan, including, but not limited to:
   (a) Comparison of changes in age, salaries and pensionable service
   (b) Comparison of the terminated and retired members with the files used for the prior valuation and the retirements, terminations, and deaths that occurred during the inter-valuation period
   (c) Validation with APSC regarding all inconsistencies in comparison with the data used for the previous actuarial valuation, with adjustments made where necessary
   (d) Comparison of the data provided with information contained in the Plan's financial statements.

The results of the above tests demonstrate that the membership data is substantially complete; however, the 2020 salary rate was missing for 653 active/CPS members. To estimate this missing data, these members' 2020 salary rates were derived using:

- the highest of the member's annualized pensionable earnings from the last five years; or
- the average 2020 annual salary rate for the active group ($72,000), if no historical pensionable earnings were available.

In addition, manual adjustments have been made for pensionable service for about 1,900 active members due to incomplete 2019 year-end calculations. These estimates do not materially affect the results of the valuation. The membership data is sufficient and reliable for the purposes of this valuation.

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B.2 Summary of Membership Data

There were the following members as of the current and last valuation dates:

Active Members

Membership Summary	December 31, 2017	December 31, 2019
Number of members	42,252	41,911
Male	13,785	13,799
Female	28,467	28,112
Average age	44.2	44.5
Male	43.8	44.2
Female	44.3	44.7
Average Plan service (years)	9.6	9.8
Male	9.5	9.7
Female	9.6	9.9
Average annualized earnings	$71,746	$72,012
Male	$78,898	$78,303
Female	$68,283	$68,924

Retirees & Beneficiaries

Membership Summary	December 31, 2017	December 31, 2019
Number of members	26,187	27,744
Male	9,729	10,078
Female	16,458	17,666
Average age	72.6	73.0
Male	72.8	73.2
Female	72.5	72.8
Average current pension (including any coordination)	$16,319	$17,504
Male	$19,231	$20,386
Female	$14,597	$15,860

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CPS Suspended Members

Membership Summary	December 31, 2017	December 31, 2019
Number of members	4,473	4,478
Male	1,951	1,928
Female	2,522	2,550
Average age	47.6	48.0
Male	47.9	48.5
Female	47.3	47.7
Average Plan service (years)	8.6	8.4
Male	8.6	8.4
Female	8.6	8.4
Average CPS service (years)	7.3	7.7
Male	7.7	8.3
Female	7.0	7.2
Average annualized earnings	$110,811	$113,081
Male	$114,436	$115,921
Female	$108,009	$110,934

Deferred Members

Membership Summary	December 31, 2017	December 31, 2019
Number of members	9,817	10,300
Male	3,122	3,343
Female	6,695	6,957
Average age	47.7	48.0
Male	48.3	48.4
Female	47.5	47.8
Average deferred pension[1]	$6,183	$6,268
Male	$7,121	$7,183
Female	$5,746	$5,828

[1] *Includes cost of living adjustments to the January 1st following the valuation date.*

Hold-On-Deposit Members

Membership Summary	December 31, 2017	December 31, 2019
Number of members	4,936	4,624
Male	1,631	1,547
Female	3,305	3,077
Average age	47.8	50.1
Male	48.7	51.0
Female	47.4	49.7
Average contributions with interest	$3,450	$3,352
Male	$3,567	$3,426
Female	$3,393	$3,314

B.3 Changes in Membership Data

The following table shows the changes in the Plan membership since the last valuation date:

Reconciliation of Membership Data	Active Members	CPS Suspended Members	Deferred/ Hold-on-Deposit	Retirees and Beneficiaries	Total
As at December 31, 2017	42,252	4,473	14,753	26,187	87,665
New entrants	7,183	30	548	2	7,763
Return to active status	400	(86)	(314)	0	0
New CPS	(580)	702	(122)	0	0
Terminations - deferred	(2,292)	(209)	2,501	0	0
Paid out/transfers	(3,084)	(127)	(1,894)	0	(5,105)
Retirements	(1,962)	(304)	(529)	2,795	0
Deaths or expiry of guarantee	0	0	0	(1,239)	(1,239)
Data adjustments	(6)	(1)	(19)	(1)	(27)
As at December 31, 2019	41,911	4,478	14,924	27,744	89,057

B.4 Active Members — Detail

Distribution of Pensionable Service and Contribution Balances — All Active

Age	Under 5	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30 – 35	Total
Under 25	605	6						611
	$50,142	$51,816						$50,159
	$5,668	$26,634						$5,874
25 – 29	3,113	396	1					3,510
	$58,936	$66,105	*					$59,745
	$12,360	$42,265	*					$15,747
30 – 34	3,614	1,961	242					5,817
	$65,562	$72,803	$72,290					$68,283
	$16,838	$52,468	$77,113					$31,357
35 – 39	2,745	2,081	1,238	84	1			6,149
	$68,256	$76,159	$78,918	$79,571	*			$73,231
	$18,167	$58,120	$89,846	$109,954	*			$47,385
40 – 44	1,953	1,532	1,464	583	85	1		5,618
	$68,150	$76,758	$81,141	$82,944	$80,148	*		$75,614
	$18,584	$60,639	$96,449	$120,584	$127,637	*		$62,616
45 – 49	1,432	1,184	1,289	787	373	42	1	5,108
	$68,611	$74,343	$79,753	$82,990	$82,448	$70,247	*	$75,991
	$19,072	$59,743	$98,062	$124,799	$137,779	$128,776	*	$74,317
50 – 54	1,021	1,015	1,128	694	522	338	181	4,899
	$70,529	$72,883	$77,277	$80,843	$79,445	$78,119	$74,351	$75,647
	$19,934	$59,727	$95,803	$123,053	$134,740	$149,574	$154,447	$86,403
55 – 59	804	814	986	748	558	445	805	5,160
	$67,988	$72,451	$73,058	$75,489	$77,804	$76,015	$75,014	$73,598
	$19,081	$59,627	$90,782	$114,878	$134,711	$146,938	$159,203	$98,456
60 - 64	425	548	773	585	526	358	942	4,157
	$68,309	$70,882	$73,357	$73,633	$72,880	$74,419	$73,654	$72,653
	$19,223	$59,557	$93,069	$113,597	$126,663	$149,032	$153,067	$106,656
65 +	64	112	183	106	107	71	239	882
	$71,104	$65,886	$74,775	$72,820	$76,784	$73,065	$76,048	$73,596
	$21,384	$56,025	$94,243	$114,490	$135,301	$143,699	$152,936	$111,403
Total	15,776	9,649	7,304	3,587	2,172	1,255	2,168	41,911
	$65,269	$73,846	*	$79,096	*	*	*	$72,012
	$16,573	$57,254	*	$119,228	*	*	*	$65,304

** Not shown for confidentiality reasons.*

Each cell shows: Number of members
Average annual pensionable earnings
Average contributions with interest

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Distribution of Pensionable Service and Contribution Balances — Male Active

Age	Under 5	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30 – 35	Total
Under 25	205	1						206
	$52,869	*						*
	$5,745	*						*
25 – 29	1,037	140						1,177
	$60,667	$70,696						$61,860
	$13,166	$47,480						$17,248
30 – 34	1,192	680	72					1,944
	$67,921	$74,729	$78,478					$70,693
	$17,171	$56,226	$88,475					$33,473
35 – 39	920	698	442	34				2,094
	$72,573	$79,974	$82,665	$83,827				$77,351
	$19,439	$64,314	$100,249	$122,501				$53,128
40 – 44	621	549	497	193	34	1		1,895
	$75,276	$81,997	$84,756	$88,791	$86,848	*		*
	$21,271	$68,798	$108,679	$135,367	$143,000	*		*
45 – 49	473	386	446	288	151	8		1,752
	$76,325	$82,128	$86,717	$87,760	$89,444	$78,263		$83,268
	$22,975	$69,454	$114,622	$138,634	$155,877	$149,225		$87,589
50 – 54	342	310	347	206	183	112	56	1,556
	$81,119	$82,504	$86,609	$91,752	$88,174	$83,921	$79,296	$84,993
	$23,650	$71,715	$113,660	$146,469	$155,624	$165,436	$169,564	$100,537
55 – 59	262	223	319	195	181	139	254	1,573
	$76,587	$84,750	$82,270	$90,890	$87,999	$85,709	$82,553	$83,752
	$22,294	$72,216	$107,883	$146,058	$158,776	$171,457	$184,525	$117,153
60 - 64	158	185	242	149	152	113	313	1,312
	$76,309	$82,373	$83,763	$86,978	$83,193	$84,924	$82,485	$82,769
	$21,007	$72,713	$112,554	$142,520	$151,816	$177,016	$180,823	$125,702
65 +	31	30	59	32	30	18	90	290
	$78,239	$69,645	$91,294	$81,235	$92,608	$96,684	$86,851	$85,640
	$22,930	$60,051	$115,329	$135,455	$166,952	$199,391	$179,645	$132,472
Total	5,241	3,202	2,424	1,097	731	391	713	13,799
	$69,949	*	$84,548	$88,829	$87,478	*	$82,810	$78,303
	$18,168	*	$108,792	$140,785	$155,543	*	$181,109	$74,756

** Not shown for confidentiality reasons.*

Each cell shows: Number of members
Average annual pensionable earnings
Average contributions with interest

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Distribution of Pensionable Service and Contribution Balances — Female Active

Age	Under 5	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30 – 35	Total
Under 25	400	5						405
	$48,744	$53,339						$48,801
	$5,629	$26,433						$5,886
25 – 29	2,076	256	1					2,333
	$58,072	$63,594	*					*
	$11,958	$39,413	*					*
30 – 34	2,422	1,281	170					3,873
	$64,401	$71,781	$69,670					$67,073
	$16,674	$50,474	$72,301					$30,295
35 – 39	1,825	1,383	796	50	1			4,055
	$66,079	$74,234	$76,842	$76,677	*			*
	$17,525	$54,994	$84,070	$101,422	*			*
40 – 44	1,332	983	967	390	51			3,723
	$64,836	$73,833	$79,282	$80,051	$75,681			$72,708
	$17,331	$56,082	$90,163	$113,268	$117,396			$57,900
45 – 49	959	798	843	499	222	34	1	3,356
	$64,806	$70,577	$76,069	$80,237	$77,689	$68,361	*	*
	$17,146	$55,047	$89,301	$116,814	$125,469	$123,964	*	*
50 – 54	679	705	781	488	339	226	125	3,343
	$65,188	$68,652	$73,125	$76,238	$74,733	$75,243	$72,135	$71,295
	$18,063	$54,456	$87,869	$113,168	$123,467	$141,713	$147,675	$79,824
55 – 59	542	591	667	553	377	306	551	3,587
	$63,831	$67,803	$68,652	$70,058	$72,909	$71,611	$71,539	$69,144
	$17,528	$54,877	$82,604	$103,883	$123,158	$135,800	$147,531	$90,257
60 - 64	267	363	531	436	374	245	629	2,845
	$63,605	$65,010	$68,614	$69,073	$68,688	$69,555	$69,259	$67,988
	$18,167	$52,853	$84,188	$103,713	$116,441	$136,125	$139,255	$97,873
65 +	33	82	124	74	77	53	149	592
	$64,402	$64,511	$66,915	$69,181	$70,619	$65,043	$69,523	$67,696
	$19,932	$54,552	$84,210	$105,424	$122,970	$124,785	$136,802	$101,082
Total	10,535	6,447	4,880	2,490	1,441	864	1,455	28,112
	$62,942	$70,952	*	$74,809	*	$71,450	*	$68,924
	$15,780	$53,432	*	$109,731	*	$136,297	*	$60,665

** Not shown for confidentiality reasons.*

Each cell shows: Number of members
Average annual pensionable earnings
Average contributions with interest

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B.5 Retirees & Beneficiaries — Detail

Distribution of Annual Pension

Age	Years Since Retirement[1]					
	Under 5	5 – 14	15 – 24	25 – 34	35 +	Total
Under 60	960	80	26	9	1	1,076
	$25,616	$12,966	$9,388	$5,536	*	*
60 – 64	1,895	1,651	55	23	1	3,625
	$25,333	$23,398	$11,337	$9,703	*	*
65 – 69	2,498	3,574	123	34	10	6,239
	$20,702	$21,276	$11,048	$6,711	$3,867	$20,737
70 – 74	656	3,905	1,392	78	20	6,051
	$20,994	$19,658	$13,244	$9,601	$5,213	$18,150
75 – 79	50	1,688	2,362	178	19	4,297
	$19,545	$17,502	$12,457	$11,039	$6,414	$14,436
80 – 84	2	186	1,674	1,213	34	3,109
	*	$15,870	$11,882	$10,862	$8,843	*
85 – 89		1	622	1,418	35	2,076
		*	$10,683	$10,402	$7,971	*
90 +			36	967	268	1,271
			$8,315	$10,347	$9,858	$10,186
Total	6,061	11,085	6,290	3,920	388	27,744
	*	*	$22,947	$22,947	*	$17,504

* *Not shown for confidentiality reasons.*

[1] *This table includes surviving spouses and beneficiaries; in their case, Years Since Retirement applies to the the former member.*

Each cell shows: Number of members
Average annual pension

Appendix C — Assets

C.1 Plan Asset Information

Plan assets are held in trust and managed by Alberta Investment Management Corporation. The fund is audited annually by the Auditor General of Alberta. The asset data required for the valuation in respect of the Plan's trust fund was taken from the Plan's audited financial statements at December 31, 2019 (dated May 22, 2020).

The asset value has been tested and reconciled with the value at the last valuation. The benefits paid from the fund have also been examined and tested against the membership data.

C.2 Statement of Plan Assets and Asset Mix

A breakdown of the market value of the fund as at the valuation date, with the last valuation shown for comparison, is shown in the following table:

	December 31, 2017		December 31, 2019	
Asset Class	Amount ($ millions)	Asset Mix (%)	Amount ($ millions)	Asset Mix (%)
Cash and Short-Term	78	0.6%	96	0.6%
Other Fixed Income	2,843	21.2%	3,061	19.9%
Equities	7,753	57.8%	8,663	56.3%
Alternatives	2,661	19.8%	3,509	22.8%
Strategic Opportunities	84	0.6%	66	0.4%
Subtotal	13,419	100.0%	15,395	100.0%
Adjustments				
Accounts Receivable	40		32	
Accounts Payable	(33)		(9)	
Subtotal	7		23	
Total	13,426		15,418	

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C.3 Changes to the Plan Assets

The following table shows the changes to the market/assigned value of the assets during the inter-valuation period:

Beginning of Period	January 1, 2018 ($ million)	January 1, 2019 ($ million)
Opening Asset Value	13,426	13,713
Contributions		
Employers	335	321
Employees	334	324
Past service	7	9
Transfers from other plans	16	9
Subtotal	692	663
Benefit Payments		
Pension payments	(431)	(462)
Disability payments	(2)	(2)
Termination benefits	(118)	(126)
Death benefits	(32)	(32)
Transfers to other plans	(18)	(14)
Subtotal	(602)	(636)
Expenses		
Investment expenses	(72)	(87)
Non-investment expenses	(14)	(15)
Subtotal	(86)	(102)
Investment Earnings	283	1,780
Closing Asset Value	13,713	15,418
End of Period	**December 31, 2018**	**December 31, 2019**

C.4 Long Term Asset Mix

The Board has adopted an investment policy that includes the following long-term asset mix:

Asset Class	Target %
Money market	0.5%
Long bonds	7.0%
Universe bonds	7.0%
Private mortgages	5.0%
Opportunistic Fixed Income	1.5%
Canadian equities	13.0%
Global equities (traditional)	22.0%
Global equities (low volatility)	11.0%
Emerging market equities	5.0%
Private equities	4.0%
Canadian real estate	13.0%
Foreign real estate	2.0%
Infrastructure	9.0%
Total	100.0%

C.5 Fund Rates of Return

The rate of return history of the market value of assets, net of investment management fees, is shown below.

Year	Market Value
2014	12.1%
2015	9.8%
2016	7.0%
2017	11.3%
2018	1.6%
2019	12.3%

C.6 Development of Actuarial Value of Assets

The actuarial value of assets is determined by adjusting for fluctuations in market value to moderate the effects of market volatility on the Plan's funded status. The projected asset values are calculated by starting with the market value of assets for the specific year and projecting forward with the assumed rate of return and actual cash flows for each year until the valuation date. The corridor approach is used so that if the calculated value is more than 10% above the market value, then 110% of the market value will be used as the actuarial value. Similarly, if the calculated value is less than 10% below the market value, then 90% of the market value will be used as the actuarial value.

	2015 $ millions	2016 $ millions	2017 $ millions	2018 $ millions	2019 $ millions
Market value at Dec. 31, 2015	10,937				
Net cash flow	204				
Assumed return (6.60%)	729				
Projected/Market value at Dec. 31, 2016	11,870	11,911			
Net cash flow	160	160			
Assumed return (6.50%)	777	779			
Projected/Market value at Dec. 31, 2017	12,807	12,850	13,426		
Net cash flow	76	76	76		
Assumed return (6.10%)	784	786	821		
Projected/Market value at Dec. 31, 2018	13,667	13,712	14,323	13,713	
Net cash flow	12	12	12	12	
Assumed return (6.10%)	834	837	874	837	
Projected/Market value at Dec. 31, 2019	14,513	14,561	15,209	14,562	15,418
	Five-Year Average of Projected / Market Values (rounded)				14,853
	Corridor Maximum (110% of Market Value of Plan Assets)				16,960
	Corridor Minimum (90% of Market Value of Plan Assets)				13,876
	Actuarial Value of Assets				**14,853**

C.7 Impact of Asset Fluctuation Adjustment

The historical actuarial and market values of assets, along with the resulting asset fluctuation adjustment and the year-by-year change in the adjustment, are shown below:

Year	Actuarial Value ($ millions)	Market Value ($ millions)	Asset Fluctuation Adjustment ($ millions)	Change in Asset Fluctuation Adjustment ($ millions)
2010	6,577	6,167	410	(139)
2011	6,739	6,481	258	(152)
2012	7,030	7,300	(270)	(528)
2013	7,988	8,559	(571)	(301)
2014	9,002	9,787	(785)	(214)
2015	10,087	10,937	(850)	(65)
2016	11,346	11,911	(565)	285
2017	12,691	13,426	(735)	(170)
2018	13,741	13,713	28	763
2019	14,853	15,418	(565)	593

Appendix D — Actuarial Methods

D.1 Actuarial Cost Method — Going Concern Valuation

The projected unit credit actuarial cost method has been used for this valuation, as was the case in the previous valuation. Under this method, the going concern liabilities at the valuation date are the actuarial present value of benefits in respect of service prior to the valuation date, but based on pensionable earnings projected to retirement. The normal actuarial cost is the present value, at the middle of the ensuing year, of benefits that accrue to active members in the ensuing year, again based on projected pensionable earnings.

Benefits in respect of excess contributions are determined as of the date the member's benefits are determined by comparing accumulated total service contributions with total service benefits and then the difference, if any, is allocated between past and future service periods on a pro-rata basis.

The pattern of future contributions necessary to pre-fund future benefit accruals for any one particular individual will increase gradually as a percentage of his or her pensionable earnings as the individual approaches retirement. For a stable population (i.e., one where the demographics of the group remain relatively constant from year to year), the normal actuarial cost will remain relatively level as a percentage of pensionable earnings.

An actuarial excess is the excess of the going concern assets over the going concern liabilities; an unfunded liability is the excess of the going concern liabilities over the going concern assets.

D.2 Actuarial Cost Method — Solvency Valuation

The *Act* requires disclosure of the Plan's financial position at the valuation date under the solvency valuation provision. The Plan is not required to fund any solvency deficit.

As in the last valuation, the solvency liabilities have been calculated as the actuarial present value of the benefits to which a member would be entitled if participation in the Plan was terminated on the valuation date. It is further noted that the solvency liabilities do not take into consideration any benefit reductions that may be required in the event of actual Plan termination on the valuation date.

D.3 Asset Valuation Method — Going Concern and Solvency Valuations

The going-concern asset valuation method determines the value that will be assigned to the assets on the valuation date. The actuarial value of assets has been determined by applying a smoothing methodology to the Plan's market value of assets at the valuation date. The same method was used in the previous valuation.

The actuarial value of assets is based on the market value of Plan assets (adjusted for accrued contributions and payments), plus an Asset Fluctuation Adjustment. This adjustment is based on a five-year smoothing of market rates of return over the expected long-term rate of return, specifically:

- investment income is assumed to accrue each year at a rate equal to the expected long-term rate of return assumed in the most recent valuation as at the beginning of that year;
- actual market values of the Plan's assets from each of the four previous year-ends are then projected to the current valuation date, using actual annual net cash flows and imputed investment income at these assumed rates for each year;
- these four projected results at the current valuation date, together with the actual market value at the current valuation date, are then averaged;
- this averaged value is then constrained to be no less than 90%, and no greater than 110%, of the current market value;
- the Asset Fluctuation Adjustment is calculated as the excess (positive or negative) of this constrained averaged value over the market value.

The actuarial asset value is then determined as the market asset value at the valuation date, plus the Asset Fluctuation Adjustment. Calculation of the Asset Fluctuation Adjustment for the current valuation is detailed in Appendix C of this report.

For purposes of the solvency valuation, assets have been valued at market value.

D.4 Provision for Adverse Deviation

A provision for adverse deviation has been included in the going concern valuation. This acts as a funding target aimed at reducing the potential adverse effect of the uncertainty inherent in the going concern assumptions. If the future unfolds in accordance with what are considered to be best estimate assumptions (that is, assumptions with no such margins), then the provision will be released into surplus.

At the last valuation, a margin for adverse deviation was incorporated into the going concern discount rate assumption.

D.5 Incremental Cost Method for Solvency Valuation

The incremental cost represents the present value, at the beginning of each period shown (time t), of the expected aggregate change in the solvency liabilities between time t and time t+1, adjusted upwards for expected benefit payments between time t and time t+1.

The calculation methodology can be described as follows:

1. the present value at time t of expected benefit payments between time t and time t+1, discounted to time t; plus

2. the projected solvency liabilities at time t+1, discounted to time t, allowing for, if applicable to the pension plan being valued:
    - expected decrements and related changes in membership status between time t and time t+1,
    - accrual of service to time t+1,
    - expected changes in benefits to time t+1, and
    - a projection of pensionable earnings to time t+1; less
3. the solvency liabilities at time t.

The actuarial assumptions used to calculate the incremental cost can be described as follows:

- The assumptions for expected benefit payments in item 1. above and decrement probabilities, service accruals, and projected changes in benefits and pensionable earnings in the item 2. above are consistent with the assumptions used in the Plan's going concern valuation.
- The assumptions used to calculate the projected solvency liabilities at time t+1 would generally be consistent with the assumptions for the solvency liabilities at time t, assuming that discount rates remain at the levels applicable at time t, that the select period is reset at time t for discount rate assumptions that are select and ultimate, and that the Standards of Practice for the calculation of commuted values and the guidance for estimated annuity purchase costs in effect at time t remain in effect at time t+1.

Active and inactive plan members as of time t and assumed new entrants over the period between time t and time t+1 are considered in calculating the incremental cost.

Appendix E — Actuarial Assumptions

E.1 Actuarial Assumptions — Going Concern Valuation

The going concern valuation is based on the assumption that the Plan will continue to operate indefinitely into the future. At each valuation, past experience is compared to the assumptions made at the last valuation to determine if, together with known changes to plan provisions, investment policy, and expectations of future trends, the assumptions should be changed.

In this valuation, we reviewed the history of experience gains and losses and have provided a rationale for any assumption changes from the prior valuation which are described below. Emerging experience differing from these assumptions will result in experience gains and losses that will be revealed in future valuations.

The actuarial assumptions used in this and the last valuations are summarized in the following table. All rates and percentages are annualized unless otherwise noted.

Going Concern Assumptions	December 31, 2017	December 31, 2019
Economic		
Long-term rate of return	6.1%	6.0%
Margin for adverse deviation	1.0%, inherent in discount rate	n/a; explicit 15% PfAD
Discount rate	5.1%	6.0%
Inflation rate	2.0%	2.0%
Interest rate used for commuted values upon termination	2.6% for 10 years; 3.4% thereafter	5.0%
Inflation rate used for commuted values upon termination	1.2% for 10 years; 1.8% thereafter	2.0%
Increases in pensionable earnings		
• General earnings increase rates	0.0% for 2 years starting April 1, 2018; 3.2% thereafter	0.0% until March 31, 2021; 3.0% thereafter
• Merit and promotion increase rates	Age based rates on 2015 study	Age based rates on 2015 study
Initial salary increase rate for CPS members	15%	15%
YMPE and Maximum Pension Limit	3.2%	3.0%
Cost-of-living adjustments	1.2%	1.2%
Interest on member contributions	4.0%	4.0%
Expenses	0.5% of pensionable earnings	0.5% of pensionable earnings

Going Concern Assumptions	December 31, 2017	December 31, 2019
Demographic		
Mortality	Males: CPM Private Table projected with Scale MI-2017 Females: 95% of CPM Private Table projected with Scale MI-2017	Males: CPM Private Table projected with Scale MI-2017 Females: 95% of CPM Private Table projected with Scale MI-2017
Termination	5-year select, gender distinct, age-based table based on 2015 experience study	5-year select, gender distinct, age-based table based on 2015 experience study
Transfer to MEPP/UAPP under CPS provision	370 active members transfer to MEPP/UAPP per year	370 active members transfer to MEPP/UAPP per year
Retirement	Active: age and service-based, gender distinct table based on 2015 experience study Deferred: age 55	Active: age and service-based, gender distinct table based on 2015 experience study Deferred: age 55
Proportion of vested terminated members electing a lump sum	80% if service less than 5 years, 50% if service between 5 and 15, 60% if service between 15 and 20, 70% if service between 20 and 25, 75% if service greater than 25	80% if service less than 5 years, 50% if service between 5 and 15, 60% if service between 15 and 20, 70% if service between 20 and 25, 75% if service greater than 25
Proportion of members with spouses	100% married	100% married
Spousal age differential	Male spouse 3 years older	Male spouse 3 years older
Future Plan membership for funding the unfunded liability	Plan active membership will remain stable and the aggregate pensionable earnings base will increase at the rate of increase for general earnings	Plan active membership will remain stable and the aggregate pensionable earnings base will increase at the rate of increase for general earnings

Further detail concerning these assumptions is summarized below.

Economic assumptions

Inflation Rate

As the level of inflation influences the rate of increase in several economic factors that affect the Plan, it is necessary for a going-concern valuation to make an assumption regarding the future inflation rate. As at the last valuation, the inflation rate is assumed to be 2.0% per annum. This assumption is considered to be best estimate considering current economic and financial market conditions.

Long-term rate of return

The primary economic assumption used in the going concern valuation is the rate of return that the fund is expected to earn over the long term. In this valuation, we have used a long-term rate of return of 6.0% per year. At the last valuation, the assumed long-term rate of return was 6.1% per year.

Long-term rate of return	%
Expected inflation	2.0
Expected real return	3.6
Value added for rebalancing/diversification	0.4
Value added for active management	0.1
Expected investment expenses	(0.1)
Expected non-investment expenses	0.0
Rate of return	6.0

In deriving the long-term rate of return, we have assumed that the assets would be invested according to the Plan's Statement of Investment Policies and Procedures revised at September 4, 2019.

The expected returns for the fund were estimated using our expected returns for applicable asset classes taking into account the target asset mix as outlined under the Plan's investment policy. Return assumptions for all asset classes are based on long-term expectations of at least 25 years.

The frequency of rebalancing the fund's weight in each asset class to its target in the investment policy, the weights themselves, and the time horizon, will all influence the long-term return. The long-term return is also influenced by the diversification of the fund. The expected effect of rebalancing and diversification on the fund's return was estimated based on a log-normal distribution.

A provision has been considered in the discount rate to consider the added value associated with active management for traditional asset classes. This provision is less than the estimated fees corresponding to active management for those asset classes.

The rate of return has been adjusted to consider expected investment management expenses on traditional asset classes. No investment management expenses have been considered for non-traditional asset classes as the expected real returns for those classes are assumed to be net of investment management fees.

Discount rate

The discount rate equals the long-term rate of return assumption, or 6.0% per annum.

According to the Funding Policy Statement, the previous implicit margin for adverse deviation in the discount rate has been replaced with an explicit PfAD. The current target PfAD is 15%. We have estimated that a single discount rate at 5.0% per annum is an approximate discount rate which results in the same liability as using the combination of a best estimate discount rate of 6.0% per annum and an explicit PfAD of 15%.

The discount rate of 5% will be used for the determination of commuted values and the calculations required for a waiver of contribution limits under section 8503(5) of the *Income Tax Regulations*.

The discount rate used in the previous valuation was 5.1% per annum and reflected a MfAD of 1.0% per annum.

Interest rate and inflation rate used for lump sums upon termination

As it is assumed that a portion of vested terminated members will elect a lump sum settlement in lieu of a deferred pension, an assumption regarding the rate that will be used to determine the value of the lump sum amount is necessary. Given that legislation has changed the underlying basis for commuted values from the CIA basis to the going-concern basis effective on April 1, 2020, we have made appropriate changes to this assumption at this valuation date . The interest rate for determining commuted values is assumed to be 5.0%, which effectively mirrors the discount rate at 6.0% with a PfAD of 15%.

The previous valuation assumed the interest rate to be 2.6% for 10 years and 3.4% thereafter and the inflation rate was assumed to be 1.2% for 10 years and 1.8% thereafter.

Increases to average wages

As the rate of increase in average wages in the economy influences the rates of increase in the YMPE, member salaries, and other economic factors that affect the Plan, it is necessary for a going concern valuation to make an assumption regarding the future increases in average wages. Average wages are assumed to increase at 3.0% per annum. This assumption is considered best estimate and is comprised of an annual increase of 2.0% on account of inflation, plus a best-estimate assumed increase of 1.0% on account of productivity.

The previous valuation assumed average wages to increase 3.2% per annum.

Increases in pensionable earnings

As the benefits paid to a member from the Plan are dependent on the member's future pensionable earnings, it is necessary for a going concern valuation to make an assumption regarding the future increases in such earnings. A member's pensionable earnings are assumed to increase in line with the rate of general earnings increases, plus age-related merit and promotion increases as follows.

General Earnings Increases

The best estimate general earnings increase rate for pensionable earnings in the long-term is equal to the rate of average wage increase of 3.0% per annum. To reflect current expectations of near-term increases, pensionable earnings have been assumed to remain static until March 31, 2021. The previous valuation assumed general earnings increases of 0.0% for until March 31, 2020 and 3.2% per annum thereafter.

Merit and Promotion Increases

The assumed age-related merit and promotion increases used for this valuation are as outlined in the following table of rates. These rates are based on an experience study conducted in 2015 and are considered best estimate. The merit and promotion increases assumed for the previous valuation were based on the same experience study conducted.

2015 Experience Study

Age	Rate of Increase	Age	Rate of Increase
<23	7.75%	40	0.50%
23	7.25%	42	0.50%
24	6.75%	42	0.25%
25	5.75%	43	0.25%
26	5.00%	44	0.25%
27	4.25%	45	0.25%
28	3.75%	46	0.25%
29	3.25%	47	0.25%
30	3.00%	48	0.25%
31	2.50%	49	0.35%
32	2.25%	50	0.35%
33	2.00%	51	0.35%
34	1.75%	52	0.35%
35	1.50%	53	0.35%
36	1.25%	54	0.35%
37	1.25%	55	0.35%
38	1.00%	56	0.35%
39	0.75%	>56	0.00%

Initial salary increases for CPS members

As the accumulated number of CPS transfers is growing, the CPS effect on the Plan is material. For members who transfer from the Plan to either MEPP or UAPP, the members' salary rate is assumed to increase by 15% at the time of transfer. This assumption was developed based on an analysis of the historical earnings information for CPS transfers.

YMPE increases

As the benefits paid to a member from the Plan are dependent on the future YMPE, it is necessary to make an assumption regarding the future increases in the YMPE. The YMPE is assumed to increase, up until the time the member retires, dies or terminates from active employment, at the assumed increase in average wages or 3.0% per annum. The previous valuation assumed the maximum pension limit would increase at 3.2% per annum which was consistent with the increase in average wages assumed in that valuation.

Increases in maximum pension limit

Pensions are limited to the maximum limits under the *Income Tax Act (Canada)*. Consistent with the provisions of the *Act,* it is assumed that the maximum pension limit will increase at the assumed increase in average wages or 3.0% per annum. The previous valuation assumed the maximum pension limit would increase at 3.2% per annum which was consistent with the increase in average wages assumed in that valuation.

Cost of living adjustments ("COLA")

As the Plan's benefits are increased after termination/retirement at 60% of inflation, it is necessary to make an assumption regarding the rate of COLA that will be applied in the future. As at the last valuation, it has been assumed that COLA will be applied at 60% of the assumed inflation rate of 2.0%, or 1.2% per annum.

Interest on Member Contributions

As the Plan's benefits are dependent to some degree on the member contribution account balances (due to the "excess contributions" test), it is necessary to make an assumption regarding interest that will be credited to member contribution account balances in the future. It has been assumed that member contribution account balances will be credited with interest at the assumed inflation rate plus 2.0%, or at 4.0% per annum. This assumption is based on the long-term expected spread of five-year term deposit rates over inflation and is considered best estimate. There is no change from the previous valuation.

Demographic assumptions

Members may cease active status as a result of death, retirement, termination of membership, or disability and may cease to be entitled to monthly pension payments as a result of death.

Mortality

For this valuation, the gender-distinct mortality rates have been assumed to be in accordance with:

- for males, 100% of the Canadian Pensioner Mortality (CPM) 2014 – Private Sector Males mortality table with future improvements in mortality in accordance with Scale MI-2017; and
- for females, 95% of the Canadian Pensioner Mortality (CPM) 2014 – Private Sector Females mortality table with future improvements in mortality in accordance with the Scale MI-2017.

This is consistent with the assumption used in the last valuation.

Retirement

A member's benefit entitlement under the Plan is dependent on when the member decides to commence, or is deemed to commence, to receive a pension from the Plan (referred to as "retirement" from the Plan). Accordingly, an assumption with respect to when a member is expected to retire from the Plan has been made.

The retirement rates used for active/CPS members in the valuation are shown in the following tables. These rates are based on the results of a study performed in 2015 on the Plan's retirement experience and are considered best estimate. The same retirement rates were used in the previous valuation.

For both this and the previous valuation, deferred vested members are assumed to retire at age 55, which is the age that maximizes the pension value for such members.

Male Retirement Rates – Active / CPS Members – 2015 Experience Study

	Age															
Service	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
2	2.5%	3.0%	3.0%	3.05%	4.5%	6.5%	5.0%	6.5%	7.0%	14.5%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
3	2.5%	3.0%	3.0%	3.5%	4.5%	6.5%	5.0%	6.5%	7.0%	15.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
4	2.5%	3.0%	3.0%	3.5%	5.0%	6.5%	5.0%	6.5%	7.0%	15.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
5	2.5%	3.0%	3.0%	3.5%	5.0%	6.5%	5.0%	6.5%	7.0%	15.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
6	2.5%	3.0%	3.0%	4.0%	5.0%	6.5%	5.0%	7.0%	7.0%	15.5%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
7	2.5%	3.0%	3.0%	4.0%	5.0%	7.0%	5.0%	7.0%	7.0%	15.5%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
8	2.5%	3.0%	3.0%	4.0%	5.0%	7.0%	5.0%	7.0%	7.0%	16.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
9	2.5%	3.0%	3.0%	4.0%	5.0%	7.0%	5.0%	8.0%	7.0%	16.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
10	2.5%	3.0%	3.0%	4.0%	5.0%	7.0%	5.0%	8.0%	7.0%	16.5%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
11	3.5%	3.5%	3.0%	4.0%	5.5%	7.0%	5.0%	8.0%	7.0%	16.5%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
12	3.5%	3.5%	3.0%	4.0%	5.5%	7.5%	5.0%	8.0%	7.0%	17.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
13	3.5%	3.5%	3.0%	4.0%	5.5%	7.5%	5.0%	8.0%	7.0%	17.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
14	3.5%	3.5%	3.0%	4.5%	5.5%	7.5%	7.0%	8.0%	7.0%	17.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
15	3.5%	3.5%	3.0%	4.5%	5.5%	7.5%	7.0%	8.0%	7.0%	17.5%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
16	3.5%	3.5%	3.0%	4.5%	5.5%	7.5%	7.0%	8.0%	7.0%	17.5%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
17	3.5%	3.5%	3.0%	4.5%	6.0%	7.5%	7.0%	8.0%	7.0%	18.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
18	3.5%	3.5%	3.0%	4.5%	6.0%	7.5%	7.0%	8.0%	7.0%	18.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
19	3.5%	3.5%	3.0%	4.5%	6.0%	7.5%	7.0%	8.0%	7.0%	18.5%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
20	4.5%	3.5%	3.0%	4.5%	6.0%	7.5%	7.5%	8.0%	7.0%	18.5%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
21	4.5%	3.5%	3.0%	4.5%	6.0%	7.5%	7.5%	8.0%	15.0%	20.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
22	4.5%	3.5%	3.0%	4.5%	6.0%	12.0%	7.5%	8.0%	10.0%	27.5%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
23	4.5%	3.5%	3.0%	5.0%	6.0%	12.0%	7.5%	20.0%	15.0%	28.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
24	4.5%	3.5%	3.0%	5.0%	6.5%	12.0%	15.0%	20.0%	15.0%	28.5%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
25	4.5%	5.0%	5.0%	5.0%	10.0%	20.0%	7.0%	20.0%	10.0%	28.5%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
26	4.5%	5.0%	5.0%	10.0%	10.0%	8.0%	8.0%	10.0%	10.0%	29.0%	35.0%	25.0%	25.0%	50.0%	50.0%	100.0%
27	4.5%	5.0%	15.0%	10.0%	7.5%	8.0%	9.5%	10.0%	10.0%	29.5%	45.0%	25.0%	25.0%	50.0%	50.0%	100.0%
28	4.5%	15.0%	15.0%	7.5%	7.5%	8.0%	8.5%	10.0%	10.0%	29.5%	45.0%	25.0%	25.0%	50.0%	50.0%	100.0%
29	5.0%	15.0%	10.0%	7.5%	7.5%	8.0%	9.0%	10.0%	10.0%	30.0%	45.0%	25.0%	25.0%	50.0%	50.0%	100.0%
30	15.0%	10.0%	10.0%	7.5%	7.5%	11.0%	12.0%	10.0%	10.0%	30.0%	45.0%	25.0%	25.0%	50.0%	50.0%	100.0%
31	15.0%	10.0%	10.0%	7.5%	7.5%	11.0%	12.0%	10.0%	10.0%	30.5%	45.0%	25.0%	25.0%	50.0%	50.0%	100.0%
32	15.0%	10.0%	10.0%	7.5%	15.0%	11.0%	12.0%	10.0%	10.0%	31.0%	45.0%	25.0%	25.0%	50.0%	50.0%	100.0%
33	15.0%	10.0%	15.0%	7.5%	15.0%	13.5%	13.0%	15.0%	20.0%	31.0%	45.0%	25.0%	25.0%	50.0%	50.0%	100.0%
34	15.0%	10.0%	15.0%	15.0%	15.0%	16.0%	15.5%	15.0%	20.0%	31.5%	45.0%	25.0%	25.0%	50.0%	50.0%	100.0%
35	30.0%	25.0%	15.0%	20.0%	15.0%	20.0%	22.5%	20.0%	20.0%	32.0%	45.0%	25.0%	25.0%	50.0%	50.0%	100.0%
36	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Rates are set at 100% for ages 70 and over and for service over 35 years.
Green shading indicates the earliest age/service combination at which unreduced retirement is available.

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Female Retirement Rates – Active / CPS Members – 2015 Experience Study

	Age															
Service	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**
0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	20.0%	30.0%	50.0%	50.0%	100.0%
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	20.0%	30.0%	50.0%	50.0%	100.0%
2	2.0%	2.0%	3.0%	3.5%	5.5%	7.5%	5.0%	6.5%	6.5%	10.0%	10.0%	20.0%	30.0%	50.0%	50.0%	100.0%
3	2.0%	2.0%	3.0%	3.5%	5.5%	7.5%	5.0%	6.5%	6.5%	15.0%	10.0%	20.0%	30.0%	50.0%	50.0%	100.0%
4	2.0%	2.0%	3.0%	3.5%	5.5%	7.5%	5.0%	6.5%	6.5%	15.0%	10.0%	20.0%	30.0%	50.0%	50.0%	100.0%
5	2.0%	2.0%	3.0%	3.5%	5.5%	7.5%	5.0%	6.5%	6.5%	15.0%	10.0%	20.0%	30.0%	50.0%	50.0%	100.0%
6	2.0%	2.0%	3.0%	3.5%	5.5%	7.5%	5.0%	6.5%	6.5%	15.0%	20.0%	20.0%	30.0%	50.0%	50.0%	100.0%
7	2.0%	2.0%	3.0%	3.5%	5.5%	7.5%	5.0%	6.5%	6.5%	15.0%	20.0%	20.0%	30.0%	50.0%	50.0%	100.0%
8	2.0%	2.0%	3.5%	3.5%	6.0%	7.5%	5.0%	6.5%	6.5%	15.0%	30.0%	20.0%	30.0%	50.0%	50.0%	100.0%
9	3.5%	3.0%	3.5%	3.5%	6.0%	7.5%	5.0%	6.5%	6.5%	15.0%	30.0%	20.0%	30.0%	50.0%	50.0%	100.0%
10	3.5%	3.0%	3.5%	3.5%	6.0%	7.5%	5.0%	6.5%	6.5%	25.0%	30.0%	20.0%	30.0%	50.0%	50.0%	100.0%
11	3.5%	3.0%	3.5%	3.5%	6.0%	7.5%	5.0%	6.5%	6.5%	25.0%	30.0%	20.0%	30.0%	50.0%	50.0%	100.0%
12	3.5%	3.0%	3.5%	3.5%	6.0%	7.5%	5.0%	6.5%	6.5%	25.0%	30.0%	20.0%	30.0%	50.0%	50.0%	100.0%
13	3.5%	3.0%	3.5%	3.5%	6.0%	7.5%	5.0%	6.5%	6.5%	25.0%	30.0%	20.0%	30.0%	50.0%	50.0%	100.0%
14	3.5%	3.0%	3.5%	3.5%	6.5%	7.5%	5.0%	6.5%	6.5%	25.0%	30.0%	20.0%	30.0%	50.0%	50.0%	100.0%
15	3.5%	3.0%	3.5%	3.5%	6.5%	7.5%	5.0%	6.5%	6.5%	25.0%	35.0%	20.0%	30.0%	50.0%	50.0%	100.0%
16	3.5%	3.0%	3.5%	3.5%	6.5%	7.5%	5.0%	6.5%	6.5%	25.0%	35.0%	20.0%	30.0%	50.0%	50.0%	100.0%
17	3.5%	3.0%	4.0%	3.5%	6.5%	7.5%	5.0%	6.5%	6.5%	25.0%	35.0%	20.0%	30.0%	50.0%	50.0%	100.0%
18	3.5%	3.0%	4.0%	3.5%	6.5%	7.5%	6.5%	6.5%	9.5%	25.0%	35.0%	20.0%	30.0%	50.0%	50.0%	100.0%
19	3.5%	3.0%	4.0%	3.5%	7.0%	7.5%	6.5%	6.5%	9.5%	25.0%	35.0%	20.0%	30.0%	50.0%	50.0%	100.0%
20	4.0%	3.0%	4.0%	3.5%	7.0%	7.5%	6.5%	6.5%	9.5%	25.0%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
21	4.0%	3.0%	4.0%	3.5%	7.0%	7.5%	6.5%	6.5%	15.0%	25.0%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
22	4.0%	3.0%	4.0%	3.5%	7.0%	7.5%	6.5%	12.5%	15.0%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
23	4.0%	3.0%	4.0%	3.5%	7.0%	11.0%	17.5%	17.5%	12.5%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
24	5.0%	3.0%	4.0%	5.0%	7.0%	20.0%	17.5%	12.5%	10.0%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
25	5.0%	3.0%	4.0%	7.5%	12.5%	20.0%	12.5%	12.5%	10.0%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
26	5.0%	3.0%	4.0%	12.5%	12.5%	11.0%	12.5%	12.5%	10.0%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
27	5.0%	3.0%	12.5%	12.5%	10.0%	10.5%	12.5%	12.5%	10.0%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
28	5.0%	12.5%	12.5%	10.0%	10.0%	13.5%	10.0%	10.0%	7.5%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
29	10.0%	12.5%	10.0%	10.0%	10.0%	13.5%	10.0%	10.0%	7.5%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
30	15.0%	10.0%	10.0%	10.0%	10.0%	14.5%	10.0%	10.0%	7.5%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
31	14.0%	10.0%	10.0%	10.0%	12.5%	16.0%	10.0%	10.0%	7.5%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
32	13.0%	10.0%	10.0%	10.0%	12.5%	14.5%	10.0%	10.0%	10.0%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
33	12.5%	10.0%	10.0%	10.0%	12.5%	13.5%	10.0%	15.0%	15.0%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
34	9.5%	10.0%	10.0%	10.0%	10.0%	11.0%	10.0%	15.0%	12.5%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
35	18.5%	15.0%	10.0%	19.5%	19.5%	20.5%	10.0%	20.0%	12.5%	27.5%	50.0%	20.0%	30.0%	50.0%	50.0%	100.0%
36	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Rates are set at 100% for ages 70 and over and for service over 35 years.
Green shading indicates the earliest age/service combination at which unreduced retirement is available.

Termination

The termination rates used in the valuation are shown in the following tables. These rates are based on the results of a study performed in 2015 on the Plan's termination experience and are considered best estimate. These termination rates were also used in the previous valuation.

Male Termination Rates – 2015 Experience Study

Age	Less than 1 year	At least 1 but not 2	At least 2 but not 3	At least 3 but not 4	At least 4 but not 5	At least 5 years
<21	27%	26%	20%	12%	10%	9%
21	27%	26%	20%	12%	10%	9%
22	27%	25%	20%	12%	10%	9%
23	27%	20%	17%	12%	10%	9%
24	27%	20%	17%	12%	10%	9%
25	25%	20%	17%	12%	9%	8%
26	24%	20%	17%	12%	9%	8%
27	23%	20%	17%	12%	9%	8%
28	22%	18%	17%	12%	9%	8%
29	21%	18%	13%	12%	9%	8%
30	18%	16%	13%	11%	9%	7%
31	18%	16%	13%	11%	9%	7%
32	18%	16%	13%	11%	9%	7%
33	18%	16%	13%	11%	9%	7%
34	18%	16%	13%	11%	9%	7%
35	16%	13%	10%	11%	9%	5%
36	16%	13%	10%	9%	9%	5%
37	16%	13%	10%	9%	9%	5%
38	16%	13%	10%	9%	9%	5%
39	16%	13%	10%	9%	9%	5%
40	16%	12%	8%	9%	7%	4%
41	16%	12%	8%	9%	7%	4%
42	16%	12%	8%	9%	7%	4%
43	16%	12%	8%	9%	7%	4%
44	16%	12%	8%	7%	7%	4%
45	11%	12%	7%	7%	6%	3%
46	11%	12%	7%	7%	6%	3%
47	11%	12%	7%	7%	6%	3%
48	11%	12%	7%	7%	6%	3%
49	11%	12%	7%	7%	6%	3%
50	11%	11%	7%	6%	5%	3%
51	11%	11%	7%	6%	5%	3%
52	11%	11%	7%	6%	5%	3%
53	11%	11%	7%	6%	5%	3%
54	11%	11%	7%	6%	5%	3%

Female Termination Rates – 2015 Experience Study

Age	Less than 1 year	At least 1 but not 2	At least 2 but not 3	At least 3 but not 4	At least 4 but not 5	At least 5 years
<21	25%	23%	17%	14%	11%	10%
21	25%	23%	17%	14%	11%	10%
22	25%	22%	17%	14%	11%	10%
23	25%	21%	16%	14%	11%	10%
24	25%	20%	15%	13%	11%	10%
25	24%	20%	15%	13%	11%	9%
26	23%	20%	15%	13%	11%	9%
27	22%	20%	15%	13%	11%	9%
28	21%	19%	15%	13%	11%	9%
29	20%	18%	15%	13%	11%	9%
30	20%	17%	14%	11%	11%	8%
31	20%	16%	14%	11%	11%	8%
32	20%	15%	14%	11%	11%	8%
33	20%	15%	14%	11%	11%	8%
34	18%	15%	14%	11%	11%	8%
35	18%	15%	13%	11%	9%	7%
36	18%	15%	13%	11%	9%	7%
37	18%	15%	13%	11%	9%	7%
38	18%	15%	13%	11%	9%	6%
39	18%	15%	13%	11%	9%	6%
40	18%	14%	10%	10%	8%	5%
41	18%	14%	10%	10%	8%	5%
42	18%	14%	10%	10%	8%	5%
43	18%	14%	10%	10%	8%	4%
44	18%	14%	10%	10%	8%	4%
45	18%	14%	10%	10%	8%	4%
46	18%	14%	10%	10%	8%	4%
47	18%	14%	10%	10%	8%	4%
48	18%	14%	10%	7%	8%	4%
49	18%	14%	10%	7%	8%	4%
50	18%	12%	8%	7%	8%	4%
51	18%	12%	8%	7%	8%	4%
52	18%	12%	8%	7%	8%	4%
53	18%	12%	8%	7%	8%	4%
54	18%	12%	8%	7%	8%	4%

Transfer to MEPP/UAPP under CPS provision

We have assumed that 370 active members will transfer to MEPP/UAPP under the CPS provision each year. This assumption was developed based on an analysis of CPS member data for transfers that occurred from 2008 to 2016. This assumption has not changed from the previous valuation.

Disability

We have made no allowance for the occurrence of disability before retirement. To the extent that members do become disabled before retirement, there may be an experience gain or loss.

Proportion of vested terminated members electing a lump sum payment versus a deferred annuity

Given the additional cost to the Plan at the present time of a member electing a lump sum transfer, an assumption regarding the proportion of members electing a lump sum transfer in lieu of the deferred pension has been made. The proportion of future terminations electing a lump sum settlement is assumed to be in accordance with the following rates and is based on an experience study performed in 2015. This table was used in the previous valuation.

Years of Service at Termination	Proportion Assumed to Elect a Lump Sum Settlement
Less than 5	80%
Between 5 and 15	50%
Between 15 and 20	60%
Between 20 and 25	70%
More than 25	75%

Proportion of members with spouses and spousal age difference

Under the Plan terms, the value of pre-retirement death benefits depends on the existence and age of a surviving spouse. It has again been assumed that 100% of members are married to a spouse of the opposite gender, with the male spouse being 3 years older than the female spouse.

Future Plan membership for funding the unfunded liability

The Plan's unfunded liabilities are amortized in accordance with established amortization schedules as a level percentage of contributory payroll. For purposes of determining the applicable contribution rates, it has again been assumed that future new entrants will keep the active Plan membership stable following the valuation date, and that the total pensionable earnings of these active members will increase at the assumed rate of general wage increases for Plan members.

If the Plan salary base were to grow more rapidly than assumed, existing unfunded liabilities might be eliminated sooner than assumed. Conversely, if the Plan salary base were to grow less rapidly than assumed, contribution increases may be required in order to eliminate existing unfunded liabilities within the required timeframe.

Expenses

Expenses relating to investment management fees and certain administration and consulting fees incurred in relation to the Plan are paid from the Plan's assets. Consequently, it is appropriate that an assumption regarding such expenses be made.

Investment expenses expected to be paid from the fund in the future are considered in the long-term rate of return assumption. Administration and custodial expenses charged to the fund have been in the range of 0.4% to 0.5% of pensionable earnings over the past few years. A best estimate allowance for non-investment expenses of 0.5% of pensionable earnings has been included in the normal actuarial contribution rate. This expense assumption is unchanged from the previous valuation.

E.2 Actuarial Assumptions — Solvency Valuation

The following table provides the assumptions used in the solvency valuation. Further, the termination scenario used in the solvency and hypothetical wind-up valuations includes the following assumptions:

- Plan wind-up would not result from all participating employers' insolvencies.
- All assets could be realized at their reported market values.

The *Act* requires that a plan's solvency valuation liabilities be determined with the presumption that:

- the plan is terminated and wound up on the valuation date, and
- the plan's liabilities are settled immediately.

The following summarizes the prescribed assumptions, methods and benefits that make up the solvency basis for the Plan at the valuation date. Judgement must be exercised in setting certain assumptions, especially as related to determining:

- the proportion of the Plan's benefits expected to be settled by way of annuity purchase and by way of lump sum transfer; and
- the hypothetical annuity purchase rates at the valuation date.

Consequently, if the Plan was terminated and settled on the valuation date, these solvency liabilities may be different than the Plan's actual termination liabilities. Such differences may be attributed to:

- differences between the actual and assumed proportion of benefits being settled by annuity purchase and lump sum transfer; and
- an actual annuity purchase rate that is different than the rates assumed to be representative of the annuity market on the valuation date.

Solvency Assumptions	December 31, 2017	December 31, 2019
Discount Rates		
Lump sum transfers	1.9% for 10 years and 2.3% thereafter	n/a
Annuity Purchases	1.1%	1.0%
Mortality	2014 Canadian Pensioner Mortality Combined Table with fully generational projection using Scale CPM-B	2014 Canadian Pensioner Mortality Combined Table with fully generational projection using Scale CPM-B
Retirement	• Members who are entitled to retire from the Plan and commence an immediate pension on the valuation date are assumed to do so; • All other members are assumed to retire at age 55	• Members who are entitled to retire from the Plan and commence an immediate pension on the valuation date are assumed to do so; • All other members are assumed to retire at age 55
Termination	All members assumed to terminate and subsequently retire from the Plan in accordance with the retirement age assumption summarized above.	All members assumed to terminate and subsequently retire from the Plan in accordance with the retirement age assumption summarized above.
Wind-up expenses	$26,000,000	$35,000,000

Settlement Upon Plan Wind-up

It is assumed that all active and terminated members over age 55 will choose an immediate annuity, reduced accordingly for early retirement. Given the change in the commuted value basis (resulting in lower lump sum benefits), we assumed that active and inactive members who are under age 55 will choose a deferred annuity commencing at age 55 (with appropriate early retirement reductions). Those members that are currently in receipt of an immediate pension are assumed to have an immediate annuity purchased on their behalf.

Discount Rates and Mortality

We have assumed that no members elect a lump sum transfer and, as such, have made no assumptions regarding the discount rate and mortality to be applied.

The assumptions used to value the benefits of members and beneficiaries settled by the purchase of annuities with an insurance company are in accordance with the Canadian Institute of Actuaries in their *Guidance on Assumptions for Hypothetical Wind-up and Solvency Valuations with effective dates between December 31, 2019 and December 30, 2020*.

No Margin for Adverse Deviation

As specified by the Standards of Practice of the Canadian Institute of Actuaries, the solvency assumptions do not include a margin for adverse deviations.

Expenses

Allowance has been made for administrative, actuarial, investment and legal costs which would be incurred if the Plan were to be wound up. It is assumed that the all benefits would be fully settled one year after the valuation date. Expenses related to the resolution of any surplus and deficit issues have not been considered. The amount of expenses is only an approximation and may differ significantly from real expenses incurred on Plan wind-up.

Appendix F — Actuarial Valuation for Maximum Contribution Determination

In accordance with subsection 147.2(2) of the *Income Tax Act (Canada)*, we have conducted an actuarial valuation for determining the maximum eligible contribution for the Plan. The valuation is prepared using the plan provisions, membership data, assets, actuarial assumptions and methods disclosed in Appendices A through E of this report with one exception: including an allowance for a higher cost-of- living adjustment (COLA) rate. The COLA offered under the current Plan provisions is 60% of inflation, however, it is within the Sponsor Board's power to consider COLA at a higher rate. It is reasonable to assume for purposes of determining the maximum level of contributions that may be made to the Plan that the rate of COLA may be increased to 100% of inflation in the future, subject to sufficient funding.

For further clarification, we have applied a COLA at the rate of 100% of the assumed inflation rate (2.0% per annum) to the going concern basis to determine a maximum eligible contribution. The following summarizes the results at the current valuation date.

Going Concern Funded Status – Maximum Contribution Determination	December 31, 2019 ($ million)
Going concern assets	
Market value	15,418
Asset fluctuation adjustment	(565)
Total assets	14,853
Total best estimate actuarial liabilities	13,420
Best estimate funded status	**1,433**
Best estimate funded ratio	**110.7%**
Provision for adverse deviation (PfAD)	2,031
Total going concern liabilities (including PfAD)	15,433
Actuarial excess (unfunded liability)	**(580)**
Funded ratio	**96.2%**

Maximum Eligible Contributions	December 31, 2019 % of Pensionable Salary
Normal actuarial cost (with PfAD)	17.95%
Unfunded liability special payments*	7.36%
Required application of excess surplus	0.00%
Non-investment expense allowance	0.50%
Maximum eligible contributions	25.81%

** The amortization schedule for unfunded liability payment is 3 years (by the latest next valuation date).*