New Brunswick
Public Service Pension Plan

Actuarial Valuation Report as at January 1, 2020

Registration number: Canada Revenue Agency: #0305839
NB Superintendent of Pensions: #0305839

Report prepared July 2020

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Introduction

The Public Service Superannuation Act ("Former PSSA") was converted to the Public Service Shared Risk Plan ("PSSRP") effective January 1, 2014. As of April 2016, the PSSRP has been renamed the New Brunswick Public Service Pension Plan ("Plan" or "NBPSPP").

This report, conducted as at January 1, 2020, was prepared for the NBPSPP Board of Trustees ("Trustees"), the Canada Revenue Agency ("CRA") and the Superintendent of Pensions ("Superintendent") for the following purposes:

- To document the results of a funding policy valuation, as required under subsection 100.61(1) of the New Brunswick Pension Benefits Act ("PBA") and subsections 14(5) to 14(7) of Regulation 2012-75, and provide the related actuarial opinion;
- To document the results of a going-concern actuarial valuation required under subsection 14(1) of the Regulations to the PBA in order to determine the maximum eligible employer contribution to the NBPSPP under subsection 147.2(2) of the Income Tax Act (Canada) ("ITA") and provide the related actuarial opinion;
- To document the results of the risk management procedures as required under paragraph 100.7(1)(e) of the PBA; and
- To document the results of a hypothetical wind-up valuation of the NBPSPP as required under the Canadian Institute of Actuaries' Standards of Practice, and provide the related actuarial opinion.

The Board of Trustees is also seeking the approval of the Superintendent for the following items, as required under the PBA and Regulations:

- Approval of the generational mortality table used in the funding policy valuation as required under sub-paragraph 14(7)(c)(ii) of Regulation 2012-75;
- Approval of the asset liability model used, as described in Appendix C, including the stochastic projection assumptions found under Appendix C, as required under subsection 15(1) of Regulation 2012-75; and
- Approval of the economic assumptions used in the asset liability model, as described under Appendix C, as required under subsection 15(3) of Regulation 2012-75.

The Trustees for the NBPSPP retained the services of Morneau Shepell Ltd ("Morneau Shepell") to prepare this report.

The last actuarial valuation report prepared for the NBPSPP was performed as at January 1, 2019.

The hypothetical wind-up basis has been updated to reflect market conditions as at the valuation date.

The funding policy valuation assumptions have been updated as follows:

- The long-term inflation assumption is 2.10% per annum, which is 0.15% per annum lower than the assumption used for the actuarial valuation as at January 1, 2019. Correspondingly, the assumed future salary increases are 2.60% per annum plus merit and promotional increases which is also 0.15% per annum lower than the assumption used for the actuarial valuation as at January 1, 2019.

These changes are described in more detail in Section 1 of this report

The next actuarial valuation report for the NBPSPP will be due no later than one year following the effective date of this report in accordance with the requirements of subsection 100.61(1) of the PBA.

Subsequent Events

On March 11, 2020, the World Health Organization declared that COVID-19 was a pandemic. This public health crisis caused significant economic and social disruptions worldwide.

- The COVID-19 pandemic resulted in higher deaths for the population in general as measured by public health officials. The effect of the outbreak on the mortality incidence for the Plan is unknown at this time and no adjustments to the mortality assumption have been made in this report. The effect on the Plan if any, will be recognized in the gains or losses of future reports as the experience emerges.
- Economic conditions have also changed with a significant reduction in asset values and strained liquidity occurring in the month of March. Sustained lowered economic activity could also impact the Plan's economic assumptions. No adjustments on the Plan assets nor to any of the economic assumptions have been made or anticipated in this report.

We understand that there are a number of legal actions against the Province of New Brunswick (including one in which the NBPSPP Board of Trustees is named as a defendant) related to the conversion of the Former PSSA to the PSSRP (now the NBPSPP). The outcomes of those various legal actions are not yet known and they may or may not ultimately impact the results of the calculations found in this report. At this time, no special provision is made in this report with respect to any potential outcome related to these legal actions.

On January 24, 2020, the Actuarial Standards Board of the Canadian Institute of Actuaries ("CIA") released its changes to the standards of practice for calculating the commuted values of pension plans. The revised standards are to take effect on December 1, 2020 for calculating commuted values for plans that are not target pension arrangements. These changes do not impact the financial situation of the Plan other than potentially the hypothetical wind-up liability..

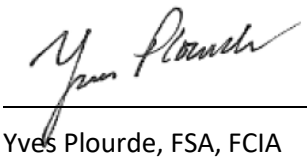
To our knowledge, there are no other events subsequent to the valuation date, which would materially impact the results of the valuation.

The recommendations and opinions are given exclusively from a financial viewpoint. This valuation report does not constitute a legal opinion on the rights and duties of the Trustees or the members of the NBPSPP over the pension fund.

Actuarial valuation results are only estimates. Actuarial valuations are performed based on assumptions and methods that are in accordance with sound actuarial principles. Emerging experience differing from these assumptions will result in gains or losses, which may affect future open group funded ratios of the Plan, which in turn will impact the types and timing of any actions to be taken by the Trustees in accordance with the Funding Policy. These gains and losses will be revealed in future actuarial valuations.

The undersigned is available to provide supplementary information and explanation as appropriate, concerning this report.

Respectfully submitted,



Yves Plourde, FSA, FCIA

July 31, 2020

Date

This report was peer reviewed by Don Charlton, FSA, FCIA.

Section 1 – Funding Policy Valuation

A funding policy valuation is required under subsection 100.61(1) of the PBA and subsections 14(5) to 14(7) of Regulation 2012-75. The results of the funding policy valuation of the NBPSPP as at January 1, 2020, are found below.

The funding policy valuation results presented in this section are based on asset information found in Appendix A, membership data found in Appendix B, Plan provisions summarized in Appendix D, and provisions of the Funding Policy summarized in Appendix E of this report. The methods and assumptions used in the funding policy valuation are described later in this section.

Funding Policy Valuation Funded Status

The funding policy valuation funded status of the NBPSPP is determined by comparing the fair market value of the assets to the funding policy actuarial liabilities. The funding policy actuarial liabilities are based on the benefits earned up to the valuation date assuming the Plan continues indefinitely. The funding policy valuation funded status of the NBPSPP as at January 1, 2020, along with the results in the previous valuation as at January 1, 2019, are found below:

Table 1.1 – Funding Policy Valuation Funded Status

	January 1, 2020	January 1, 2019
	$M	$M
Fair market value of assets (including receivables / payables)	$8,352.4	$7,632.7
Funding policy valuation actuarial liabilities		
Active members	$2,356.0	$2,312.1
Retirees and survivors	4,679.8	4,513.9
Deferred vested and suspended members	243.7	241.0
Outstanding refunds	1.2	2.4
Total funding policy valuation actuarial liabilities	$7,280.7	$7,069.4
Funding policy valuation excess (unfunded liability)	$1,071.7	$563.3
Termination value funded ratio [calculated in accordance with paragraph 14(6)(e) of Reg. 2012-75]	114.7%	108.0%

The termination value funded ratio is used in the calculation of the “termination value” of any individual’s pension benefits at termination of employment, death, marriage breakdown, or retirement, as the case may be, in accordance with the terms of the NBPSPP and subsection 18(1) of Regulation 2012-75. It is calculated in accordance with paragraph 14(6)(e) of Regulation 2012-75.

Funding Policy Valuation Normal Cost and Excess Contributions

The table below provides the funding policy valuation normal cost, being the value of the pension benefits being earned in the twelve-month period after the valuation date. It compares the funding policy valuation normal cost to the level of member and employer contributions in order to determine the level of contributions being made to the NBPSPP in excess of the funding policy valuation normal cost. Results for the year following January 1, 2020 are presented below, along with the results found in the previous actuarial valuation as at January 1, 2019.

Table 1.2 – Funding Policy Valuation Normal Cost and Excess Contributions

	Year Following January 1, 2020		Year Following January 1, 2019	
	$M	% of payroll	$M	% of payroll
A. Funding policy valuation normal cost	$158.2	12.25%	$153.7	12.26%
B. Contributions:				
Members	$106.6	8.25%	$103.4	8.25%
Employers' initial contributions	145.3	11.25%	141.0	11.25%
Employers' temporary schedule 2 (for 10 yrs after 1.1.2014)	9.7	0.75%	9.4	0.75%
Total	$261.6	20.25%	$253.8	20.25%
C. Excess contributions (B. – A.)	$103.4	8.00%	$100.1	7.99%
Estimated payroll for following year	$1,291.8		$1,253.4	

Determination of 15-Year Open Group Funded Ratio

The table below provides the 15-year open group funded ratio as calculated in accordance with the requirements of paragraph 14(6)(f) of Regulation 2012-75. This ratio is used extensively under the Funding Policy to determine the actions to be undertaken by the Trustees under the funding policy deficit recovery plan and the funding policy excess utilization plan. The 15-year open group funded ratio is calculated as follows:

Table 1.3 – 15-Year Open Group Funded Ratio

	January 1, 2020	January 1, 2019
	$M	$M
A. Market value of assets (including receivables / payables)	$8,352.4	$7,632.7
B. Present value of excess contributions over next 15 years [calculated in accordance with Reg. 14(6)(c)]	$1,233.5	$1,263.4
C. Funding policy valuation actuarial liabilities	$7,280.7	$7,069.4
D. 15-Year Open Group Funded Ratio [(A. + B.) / C.]	131.7%	125.8%

Reconciliation of Funding Policy Valuation Funded Status with Previous Valuation

The table below describes the change in the NBPSPP's funded status between the last funding policy valuation as at January 1, 2019 and this funding policy valuation as at January 1, 2020:

Table 1.4 – Reconciliation of Funded Status

	$M	$M
Funding policy valuation excess (unfunded liability) as at January 1, 2019		$563.3
Expected changes in funded status		
Interest on excess (unfunded liability)	$26.8	
Total contributions in excess of normal cost	105.8	
Impact of indexing for retirees and survivors as at January 1, 2020	(91.8)	
Impact of indexing for actives, deferreds and suspendeds as at January 1, 2020	(56.7)	
Total		($15.9)
Expected funding policy valuation excess (unfunded liability) as at January 1, 2020		$547.4
Experience gains (losses) due to the following factors		
Investment return on actuarial value of assets	506.2	
Incidence of mortality	13.8	
Incidence of retirements	(5.7)	
Incidence of terminations of employment	0.3	
Other miscellaneous factors	8.1	
Total		$522.7
Funding policy valuation excess (unfunded liability) as at January 1, 2020 (prior to changes in assumptions)		$1,070.1
Impact of changes in assumptions		1.6
Funding policy valuation excess (unfunded liability) as at January 1, 2020		$1,071.7

Reconciliation of Total Normal Cost

The factors contributing to the change in the total normal cost from the last funding policy valuation as at January 1, 2019 to this funding policy valuation as at January 1, 2020 are shown below:

Table 1.5 – Reconciliation of Total Normal Cost

	% of payroll
Total normal cost as at January 1, 2019:	12.26%
Impact of changes in demographics:	0.00%
Impact of changes to assumptions:	(0.01)%
Total normal cost as at January 1, 2020:	12.25%

Funding Policy Valuation Actuarial Methods

Asset Valuation Method

The assets used under the funding policy valuation are equal to the fair market value of the assets. This is a requirement of paragraph 14(6)(d) of Regulation 2012-75.

Actuarial Cost Method

The funding policy valuation actuarial liabilities and total normal cost were calculated using the accrued benefit (or unit credit) actuarial cost method in accordance with the requirements of paragraph 14(7)(a) of Regulation 2012-75.

The funding policy valuation actuarial liabilities are equal to the actuarial present value of benefits earned by members for services prior to the valuation date, taking into account the actuarial assumptions as indicated hereafter. For greater certainty, it does not take into account the impact of any future salary increases and the impact of any future increases in accrued pensions due to cost-of-living adjustments as may be granted from time to time by the Trustees in accordance with the Plan terms and the Funding Policy.

The funding policy valuation normal cost is equal to the actuarial present value of benefits expected to be earned by members in the year following the valuation date. A salary increase estimate has been made to calculate the estimated normal cost and estimated members and employers contributions for the year following the valuation date.

The ratio of the total normal cost to the covered payroll for the period will tend to stabilize over time if the demographic characteristics of the active and disabled members remain stable. All other things being equal, an increase in the average age of the active and disabled members will result in an increase in this ratio.

For valuation purposes, to determine eligibility for benefits and for any other use, the age used is the age on the date of the nearest birthday.

Funding Policy Valuation Actuarial Assumptions

The main actuarial assumptions employed for the funding policy actuarial valuation are summarized in the following table. Emerging experience differing from these assumptions will result in gains or losses, which will be revealed in future funding policy actuarial valuations. Experience gains and losses emerging in future funding policy actuarial valuations will impact, among other things, the open group funded ratio of the Plan, which in turn will impact the types and timing of any actions to be taken by the Trustees in accordance with the Funding Policy. All rates and percentages are annualized unless otherwise noted.

Table 1.6 – Funding Policy Valuation Actuarial Assumptions

									January 1, 2020
Discount rate									4.75% per annum
Salary increase for the year following valuation (normal cost purposes only)									2.60% per annum plus merit and promotion (2.75% per annum plus merit and promotion as of January 1, 2019)
YMPE increase for the year following valuation (normal cost purposes only)									2.60% per annum (2.75% per annum as of January 1, 2019)
Mortality									Males: 105% of CPM2014_PUBL with generational improvement using projection scale CPM-B
									Females: 110% of CPM2014_PUBL with generational improvement using projection scale CPM-B
Termination (membership)									None
Retirement Age*	Age at Conversion								
	Under 25 or joined Plan after conversion date	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
55	0%	0%	0%	0%	0%	0%	0%	0%	0%
56	0%	0%	0%	0%	0%	0%	0%	2.5%	5%
57	0%	0%	0%	0%	0%	2.5%	5%	5%	5%
58	0%	0%	0%	2.5%	5%	5%	5%	5%	5%
59	0%	0%	5%	5%	5%	5%	5%	12.5%	20%
60	2.5%	5%	5%	5%	5%	12.5%	20%	20%	20%
61	5%	5%	5%	12.5%	20%	20%	20%	20%	20%
62	5%	5%	20%	20%	20%	20%	20%	13.1%	6.25%
63	12.5%	20%	20%	20%	20%	13.1%	6.25%	6.25%	6.25%
64	20%	20%	20%	13.1%	6.25%	6.25%	6.25%	6.25%	6.25%
65	55%	45%	25%	21.9%	18.75%	15.65%	12.5%	9.4%	6.25%
Investment and administrative expenses assumed by the fund									Implicit in the discount rate
Proportion of members with a spouse or common-law partner									
Active males									85%
Active females									75%
Retirees									Varies by age
Spousal age difference									Males 2 years older than females

**Note: New members after conversion retire in accordance with the "Under 25" rates. If a member is older than age 55, retirement rates are adjusted proportionately to keep the same retirement pattern for the remaining rates at older ages. Members older than age 65 are assumed to retire in one year.*

Rationale for Material Actuarial Assumptions

The assumptions have been reviewed in light of current economic and demographic conditions.

Inflation

Given the historical increases in consumer prices in Canada, the rates expected by the market, the portfolio managers' expectation, the Bank of Canada policy and the long-term forecasts of the Conference Board of Canada, Morneau Shepell believes that the expected long-term annual rate of inflation should be between 1.75% and 2.25%.

The long-term inflation assumption is 2.10% per annum. Canadian inflation has remained near the Bank of Canada's target during a sustained period of economic growth and stimulus following the 2008 economic downturn which has provided some evidence of the Bank of Canada's ability to control inflation. This is a change from the previous valuation, in which the expected rate of inflation was 2.25% per annum.

Discount Rate Development

The elements considered in the development of the discount rate assumption for purposes of the funding policy valuation are summarized in the table below.

Table 1.7 – Development of Funding Policy Valuation Discount Rate

	%
Expected long-term nominal return based on the results of our stochastic analysis (using long-term target asset mix, and including impact of rebalancing and diversification)	5.82
Assumed margin for adverse deviation (originally set to achieve a high probability of exceeding the discount rate over the next 20 years)	(0.87)
Expected investment and administration expenses paid from the fund	(0.20)
Discount rate	4.75

The expected long-term nominal return by asset class is provided in Appendix C. The target asset mix used in the calculations is found in the Statement of Investment Policies adopted by the Trustees, as summarized in Table A.4. It should be noted that the return assumptions for bonds have been determined mainly on current market conditions while the return assumptions for equities and alternative investments are based more on long-term expectations.

The Funding Policy mandated the discount rate to be used for funding policy actuarial valuations up to and including January 1, 2017. A change in discount rate could be considered for actuarial valuations on or after January 1, 2018. The Trustees considered the issue and decided to continue at this time to use a discount rate of 4.75% per annum.

Expenses

The allowance for investment management and administrative expenses paid from the Plan built into the discount rate is 0.20% of assets based on recent Plan history and our expectation for future expenses. This assumption is consistent with the expense assumption used for the previous valuation.

Rate of Salary Increase

Salary increases consist of a combination of inflation, productivity growth (i.e. real increase in average employment earnings in excess of inflation) and merit and promotional increase.

The basic salary increase assumption is 2.60% per annum (based on assumed inflation of 2.10% per annum and productivity growth of 0.5% per annum). This is a change from the basic salary increase assumption of 2.75% per annum used for in the previous valuation, corresponding to the decrease in the long-term rate of inflation assumption. A merit and promotion scale is added to this salary increase assumption using five decreasing levels depending on age. A merit and promotion increase of 2.2% per annum is used for ages 29 and under, 1.3% per annum for ages 30 to 39, 0.7% per annum for ages 40 to 49, 0.2% per annum for ages 50 to 64 and 0% for ages 65 and above.

For example, a member at age 20 would receive a 4.80% salary increase each year up to age 29, at which time the annual increases would be reduced to 3.90% per annum until age 39, and so forth until expected retirement age. The average salary increase for this member's career would be approximately 3.60% per annum.

Mortality

In order to take into account the improvements in life expectancy substantiated by the Canadian Institute of Actuaries in its report on Canadian Pensioners Mortality (published on February 13, 2014), we used the CPM-2014Publ Mortality Table, and the CPM-B Improvement Scale, which varies by gender, age and calendar year. A mortality study was completed using Plan experience from 2004 to 2012. This study revealed that NBPSPP mortality rates were higher than those produced by the above standard mortality table and projection scale. As a result, and after considering the statistical credibility of the experience, we used adjustment factors of 105% for males and 110% for females. The same adjustments were used for all participants before and after retirement. This is the same mortality assumption as used in the previous valuation.

The mortality rates described above result in the following life expectancies for females and males:

Table 1.8 - Life Expectancy for Females and Males

Females					Life expectancy by Age in Year
Age	2020	2025	2030	2035	2040
55	33.6	33.9	34.1	34.4	34.6
60	28.8	29.0	29.3	29.5	29.7
65	24.1	24.3	24.5	24.8	25.0
70	19.6	19.8	20.0	20.2	20.4
75	15.3	15.5	15.7	15.9	16.0
80	11.3	11.5	11.7	11.8	12.0
Males					**Life expectancy by Age in Year**
Age	2020	2025	2030	2035	2040
55	31.9	32.1	32.4	32.7	32.9
60	27.2	27.4	27.7	27.9	28.2
65	22.6	22.8	23.1	23.3	23.5
70	18.1	18.4	18.6	18.8	19.0
75	13.9	14.2	14.4	14.5	14.7
80	10.1	10.3	10.5	10.6	10.8

For existing disability pensioners (this is a closed group of 107 retirees who retired under a disability provision which existed before January 1, 1993 under the Former PSSA), the mortality table adopted is the 1971 GAM Table. This table is the same as for the previous valuation for disabled pensioners and remains appropriate for this group of pensioners.

Rate of Increase in YMPE

We have continued to assume in this valuation that the YMPE will increase at the same rate as salary (before merit and promotional increase). As a result, we have used a rate of 2.60% per annum. The YMPE is automatically updated to its revised base level at each valuation date. This is a change from the YMPE increase assumption of 2.75% per annum used for in the previous valuation, corresponding to the decrease in the long-term rate of inflation.

Retirement

Given the changing early retirement subsidies for service after the Conversion Date, we estimate that plan members will slowly start to delay retirement as we move away from the Conversion Date. As a result, we adopted retirement assumptions that vary depending on the member's age at conversion as well as an ultimate retirement assumption for new members after conversion. A younger member at the valuation date will be expected to retire later on average than an older worker at the same date. This is the same assumption as the one used for the last valuation. We will continue to monitor this assumption for reasonableness.

Difference in Age Between Spouses

The assumed age difference between spouses is used for active, deferred and suspended members as well as some retirees. A review of recent Plan experience had indicated that the difference between the ages of spouses had been decreasing. Reflecting this analysis, the assumed spousal age difference is for males to be 2 years older than females. This is the same spousal age difference assumption as used in the previous valuation.

Proportion with a Spouse or Common-Law Partner

An assumption is required for the proportion of retirees who have a spouse at retirement as well as for the proportion of deceased retirees with a spouse or common-law partner at death when no spousal information is available. A review of recent Plan experience was conducted and used to update assumptions related to the proportion of retirees with a spouse or common-law partner at retirement and at death. The assumed proportion with a spouse or common-law partner at retirement is 85% for males and 75% for females which is consistent with the assumption used for the actuarial valuation as at January 1, 2019. The assumed proportion of deceased retirees with a spouse or common-law partner at death reflects recent Plan experience and can be found in Table 1.9. This table is the same as for the previous valuation and remains appropriate for the current valuation.

Table 1.9 – Proportion of Deceased Retirees With a Spouse or Common-Law Partner at Death

	January 1, 2020	
Ages	Males	Females
59 or younger	85%	75%
60-64	85%	75%
65-69	82.5%	70%
70-74	80%	65%
75-79	75%	57.5%
80-84	70%	45%
85-89	60%	30%
90-94	45%	10%
95 or older	25%	10%

Opinion on Funding Policy Valuation

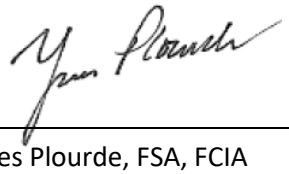
In our opinion, for the purposes of the funding policy valuation section of the report:

- 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.

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

The assumptions used under the funding policy valuation of this report were reasonable and consistent with the objectives of the NBPSPP at the time this actuarial valuation report was prepared. The funding valuation assumptions are consistent with the stochastic model inputs.

Respectfully submitted,



Yves Plourde, FSA, FCIA

July 31, 2020

Date

Section 2 – Going-Concern Valuation

The going-concern actuarial valuation is conducted in accordance with subsection 14(1) of the Regulations to the PBA in order to determine the maximum eligible employer contribution to the NBPSPP under subsection 147.2(2) of the ITA and provide the required actuarial opinion.

The going-concern actuarial valuation results presented in this section are based on asset information found in Appendix A, membership data found in Appendix B, and Plan provisions as summarized in Appendix D. The methods and assumptions used in the going-concern valuation are described later in this section.

Going-Concern Funded Status

The funded status of the Plan on the going-concern basis is determined by comparing the actuarial value of the assets to the actuarial liabilities. The actuarial liabilities are based on the benefits earned up to the valuation date assuming the Plan continues indefinitely. It also has a provision for future cost-of-living adjustments to be provided by the Trustees in accordance with the Plan terms and the Funding Policy. Such a provision is acceptable under paragraph 147.2(2)(c) of the ITA. The going-concern valuation funded status of the NBPSPP as at January 1, 2020, along with the results of the previous going-concern valuation as at January 1, 2017 are found below:

Table 2.1 – Going-Concern Funded Status

	January 1, 2020	January 1, 2017
	$M	$M
Assets		
Market value of assets	$8,352.4	$7,241.0
Going-concern liabilities		
Active members	$3,542.3	$3,582.6
Retirees and survivors	5,767.3	5,188.6
Deferred vested and suspended members	371.3	342.9
Outstanding refunds	1.2	1.7
Total	$9,682.1	$9,115.8
Going-concern funding excess (unfunded liability)	($1,329.7)	($1,874.8)
Going-concern funded ratio	86.3%	79.4%

Going-Concern Residual Normal Cost

The table below summarizes the estimated going-concern residual normal cost of pension benefits being earned in the twelve-month period after the valuation date (the normal cost), along with the residual normal cost at the previous valuation.

Table 2.2 – Going-Concern Residual Normal Cost

	January 1, 2020		January 1, 2017	
	$M	% of payroll	$M	% of payroll
Total going-concern normal cost	$252.7	19.56%	$236.2	20.12%
Less Member contributions	106.6	8.25%	96.9	8.25%
Residual going-concern normal cost	$146.1	11.31%	$139.3	11.87%
Estimated payroll for following year	$1,291.8		$1,174.0	

Maximum Eligible Employer Contribution under the Income Tax Act

The maximum eligible employer contribution in accordance with the ITA is equal to the residual normal cost, plus the greater of the going-concern unfunded liability and the hypothetical wind-up deficiency. Under a shared risk plan, the hypothetical wind-up liability will typically be nil. However, the anti-avoidance rule under Section 16 of Regulation 2012-75 may be triggered if a wind-up occurs in the first ten years following the conversion of the shared risk plan. For purposes of calculating the maximum eligible employer contribution, we have ignored the hypothetical wind-up deficiency that could exist for the first ten years after conversion.

On the basis of the methods and assumptions in this report, the maximum eligible employer contribution for the year following January 1, 2020 is equal to $1,475.8M (representing $146.1M of residual normal cost and $1,329.7M of going-concern unfunded liability).

When spreading the going-concern unfunded liability over the next three years (period for which this going-concern valuation is valid under the PBA), the maximum eligible employer contribution for the three years following January 1, 2020 (ignoring interest and salary increases) would be as follows:

Table 2.3 – Maximum Eligible Employer Contributions Spread Over Three Years

Year Following	Going-Concern Unfunded Liability ($M)	Residual Normal Cost ($M)	Total ($M)	Total (% payroll)
01-Jan-20	443.2	146.1	589.3	45.6%
01-Jan-21	443.2	146.1	589.3	45.6%
01-Jan-22	443.2	146.1	589.3	45.6%

Based on the above, the employer contribution requirements under the terms of the NBPSPP of 12.0% of earnings (comprised of 11.25% of earnings in initial contributions, and 0.75% of earnings in temporary contributions) are eligible contributions under the ITA. Furthermore, should employer contributions be increased by 1.5% of earnings as would be required under the Funding Policy if the 15-year open group funded ratio of the Plan dropped below 100% for two years in a row, those higher employer contributions would also be

eligible contributions under the ITA up to the date of the next going-concern valuation scheduled for no later than January 1, 2023.

Going-Concern Valuation Actuarial Methods

The asset valuation method and the actuarial cost method under the going-concern valuation are identical to the asset valuation method and the actuarial cost method under the funding policy valuation. The going-concern valuation assumptions are also identical, except for the addition of a provision for future cost-of-living adjustments.

Discount rate

In order to balance the need to fund intended benefits in a secure and responsible manner, while recognizing the necessity for CRA to monitor the impact of over-conservatism in assumptions, we developed a methodology to select an appropriate discount rate which we believe will balance those concerns. The discount rate selected is determined by using the nominal investment return expected from the long-term asset mix of the NBPSPP over the next 20 years at its 67th percentile (lower percentiles being higher investment returns), minus 1.0% (to account for inclusion of any margins for adverse deviation and any and all expenses to be paid from the fund), subject to the going-concern discount rate being not lower than the funding policy valuation discount rate. This leads to a nominal discount rate of 4.75% per year (the funding policy valuation discount rate).

Assumed contingent indexing on accrued pensions and pensions in payment

A provision for future cost-of-living adjustments on the amount of the accrued pensions of active members, and terminated deferred vested members, and on the amounts of current and future pension payments is made. This provision satisfies the requirements of paragraph 147.2(2)(c) of the ITA.

The funding policy excess utilization plan provides that indexing of benefits to full CPI is intended when and if the Plan can afford it. While this is by no means a guaranteed outcome, the contributions have been set at a level such that there is a high likelihood of achieving these benefit intentions, based on the results of our stochastic analysis presented in Section 4.

As a result, and in accordance with the PBA, we have conducted the going-concern valuation based on these benefit intentions, which would provide for indexing of accrued pensions both before and after retirement at 2.10% per year (reflecting the inflation assumption in our funding policy valuation).

Other going-concern actuarial assumptions

All other assumptions in our going-concern valuation are identical to the assumptions used under the funding policy actuarial valuation detailed in Table 1.6 of Section 1 of this report, and the rationale for the choice of those assumptions also applies for the going-concern valuation.

The additional assumptions detailed in Table 4.1 of Section 4 are not required under the going-concern actuarial valuation, and therefore do not apply.

Emerging experience differing from these assumptions will result in gains or losses, which will be revealed in future going-concern actuarial valuations.

Opinion on Going-Concern Valuation

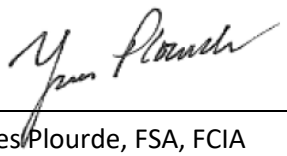
In our opinion, for the purposes of the going-concern valuation section of the report:

- 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.

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

The assumptions used under the going-concern valuation of this report were reasonable at the time this actuarial valuation report was prepared.

Respectfully submitted,



Yves Plourde, FSA, FCIA

July 31, 2020
Date

Section 3 – Hypothetical Wind-Up Valuation

A hypothetical wind-up valuation assumes that the Plan is wound-up on the valuation date and member's benefit entitlements are calculated as of that date. Although this type of valuation is not required under Part 2 of the *New Brunswick Pension Benefits Act* for a shared risk plan, the Standards of Practice of the Canadian Institute of Actuaries require that actuarial valuation reports provide information with respect to hypothetical wind-up situations.

Subsection 16(3) of Regulations 2012-75 under the PBA prescribes that if a shared risk plan is wound-up by the persons who established the plan within 5 years of its conversion date, the conversion of the plan is void and the plan has to be wound-up as a defined benefit plan under Part 1 of the PBA. In addition, effective January 1, 2018, subsection 16(3.1) of Regulation 2012-75 provides that if the wind-up occurs between 5 and 10 years after the plan conversion date, the Superintendent may determine that the conversion is void and may require that the plan be wound-up as a defined benefit plan under Part 1 of the PBA.

It is important to note that the Former PSSA was not subject to the PBA and the procedures to be followed if a wind-up occurred were not defined within the Former PSSA. As a result, the procedures for payments at wind-up were not defined. In conducting the hypothetical wind-up valuation as at January 1, 2020, we therefore made the assumption that the conversion to a shared risk plan would be void, and that the NBPSPP would be wound-up as at January 1, 2020 in accordance with rules found under Part 1 of the PBA. This assumption has been made solely on the basis that subsection 16(3.1) would apply on January 1, 2020, and does not represent a legal opinion on the validity of this scenario.

In order to estimate the accrued pensions of active members at the valuation date under a scenario in which the conversion would have been void, we increased the accrued pensions by the differential between cost-of-living granted since the conversion date and the salary increase assumption under the funding policy basis. No adjustments were made to retiree pensions for this purpose.

We have valued the hypothetical wind-up liability using discount rates consistent with the requirements of the PBA for plan wind-ups under Part 1. The PBA requires that benefits paid out to each member upon wind-up be not less than the cost to purchase an annuity for that member. Accordingly, we have followed the Canadian Institute of Actuaries' recommendations for the estimated cost of fully indexed annuity purchases as at January 1, 2020.

Hypothetical Wind-Up Funded Status

The hypothetical wind-up funded status under the scenario postulated above, including the results of the last hypothetical wind-up valuation, is as follows:

Table 3.1 – Hypothetical Wind-Up Funded Status

	January 1, 2020	January 1, 2019
	$M	$M
Assets		
Market value of assets	$8,352.4	$7,632.7
Provision for expenses	(3.0)	(3.0)
Total	$8,349.4	$7,629.7
Hypothetical wind-up liabilities		
Active members	$7,896.1	$7,116.0
Retirees and survivors	8,199.5	7,605.3
Deferred vested and suspended members	824.9	697.5
Outstanding refunds	1.2	2.4
Total	$16,921.7	$15,421.2
Assets less liabilities on the hypothetical wind-up basis	($8,572.3)	($7,791.5)

The hypothetical wind-up funded status is presented for information purposes. There is no requirement under the PBA to fund the hypothetical wind-up deficit of the NBPSPP while it is not in a wind-up state.

Incremental Cost on the Hypothetical Wind-Up Basis

The incremental cost on the hypothetical wind-up basis represents the present value of the expected aggregate change in the actuarial liabilities from January 1, 2020 to January 1, 2021, adjusted for benefit payments in the inter-valuation period. This incremental cost is estimated to be $525.5M as at January 1, 2020.

Hypothetical Wind-Up Asset Valuation Method

Wind-up assets are equal to the market value of assets less an allowance for wind-up expenses. This valuation method is the same as the one used in the last valuation.

Hypothetical Wind-Up Actuarial Cost Method

The hypothetical wind-up liabilities are determined using the accrued benefit (or unit credit) actuarial cost method. The hypothetical wind-up liabilities are equal to the actuarial present value of all benefits earned by members for services prior to the valuation date assuming the NBPSPP is wound up on the valuation date. This method is the same as the one used in the last valuation.

For valuation purposes, to determine eligibility for benefits and for any other uses, the age used is the age on the date of the nearest birthday. This method is the same as the one used in the last valuation.

Hypothetical Wind-Up Actuarial Assumptions

The main actuarial assumptions used in the hypothetical wind-up valuation correspond to those prescribed by the PBA.

Although the Former PSSA was not subject to the PBA before it was converted to a shared risk plan, in the absence of specific direction to the contrary in the Former PSSA, we have valued the hypothetical wind-up liability using discount rates consistent with the requirements of the PBA if the NBPSPP were to be wound up. The PBA requires that benefits paid out to each member upon wind-up be not less than the cost to purchase an annuity for that member. Accordingly, we have followed the Canadian Institute of Actuaries' recommendations for the estimated cost of fully indexed annuity purchases as at January 1, 2020.

The main actuarial assumptions employed for the hypothetical wind-up actuarial valuation are summarized in the following table. All rates and percentages are annualized unless otherwise noted. The rates below represent the estimated annuity purchase rates for fully indexed annuities.

Table 3.2 – Hypothetical Wind-Up Actuarial Assumptions

	January 1, 2020	January 1, 2019
Interest rate		
Interest rate for active, deferred vested and suspended members under age 55	- 0.29% per annum (rate net of inflation for fully indexed annuities)	0.08% per annum (rate net of inflation for fully indexed annuities)
Interest rate for retirees and survivors and all other members age 55 and over	- 0.29% per annum (rate net of inflation for fully indexed annuities)	0.08% per annum (rate net of inflation for fully indexed annuities)
Salary increases	None	None
Mortality	CPM14 generational using Scale CPM-B	CPM14 generational using Scale CPM-B
Termination (membership)	None	None
Retirement	Age which maximizes the value of the pension	Age which maximizes the value of the pension
Provision for expenses	$3,000,000	$3,000,000

The CIA collects data annually from insurance companies and annually determines interest rates suitable for estimating the cost of single premium group annuities in hypothetical wind-up valuations. For retirees and survivors and for active members and deferred vested and suspended members eligible for immediate retirement at the valuation date, the interest rate used in the hypothetical wind-up valuation is an estimate of the rate that would be used by insurance companies in pricing single premium fully indexed group annuities for annuitants already retired, based on the suggested rates for such annuitants published by the CIA.

The discount rate used for active members and deferred vested and suspended members not eligible for immediate retirement is the rate used for retirees and survivors without adjustment, as suggested by the CIA as an appropriate estimate of the cost of deferred annuities based on their survey data from insurance companies.

Emerging experience differing from these assumptions will result in gains or losses, which will be revealed in future hypothetical wind-up actuarial valuations.

Termination Scenario

The termination scenario used in the hypothetical wind-up valuation includes the following assumptions:

- Plan wind-up would not result from employer insolvency.
- All assets could be realized at their reported market value.
- NBPSPP conversion would be void and the Plan would be wound-up under Part 1 of the PBA.
- Fully indexed annuities would be purchased for all plan members.

Margin for Adverse Deviations

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

Provision for Fees

Allowance has been made for administrative, actuarial and legal costs which would be incurred if the NBPSPP were to be wound up, based on sufficient and reliable data. It is assumed that the wind-up date, the calculation date and the settlement date are coincident, and as such, expenses related to investment policy reviews, investment and custodial fees are not included. Expenses related to the resolution of surplus and deficit issues are not taken into account. The amount of expenses is only an approximation and may differ significantly from real expenses incurred on Plan wind-up, for example, in case of litigation, bankruptcy and eventual replacement by a third-party administrator.

Hypothetical Wind-Up Incremental Cost

The method used to calculate the hypothetical wind-up incremental cost may be described as follows:

1. Present value of expected benefit payments between January 1, 2020 and January 1, 2021, discounted to January 1, 2020;

   Plus

2. Projected hypothetical wind-up liabilities as at January 1, 2021, discounted to January 1, 2020;

   Less

3. Hypothetical wind-up liabilities as at January 1, 2020.

Opinion on Hypothetical Wind-Up Valuation

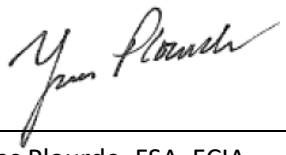
In our opinion, for the purposes of the hypothetical wind-up valuation section of the report:

- 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.

This hypothetical wind-up valuation report has been prepared, and our opinions given, in accordance with accepted actuarial practice in Canada.

The assumptions used under the hypothetical wind-up valuation of this report were reasonable at the time this actuarial valuation report was prepared.

Respectfully submitted,



Yves Plourde, FSA, FCIA

July 31, 2020

Date

Section 4 – Risk Management Goals and Procedures

Meeting Risk Management Goals

The NBPSPP was designed to achieve or exceed the risk management goals prescribed under the PBA and Regulation 2012-75. Certain procedures were developed to test whether these goals can be achieved given the contribution rules and benefits defined in the NBPSPP. These goals and procedures are described separately below, along with the relevant results of the stochastic analysis required under the PBA as at January 1, 2020.

Risk Management Goals

The primary risk management goal under the PBA is to achieve a 97.5% probability that past base benefits at the end of each year will not be reduced over the 20 years following the valuation.

The goal is measured by taking into account the following funding management plans:

1. the funding deficit recovery plan except for reduction in past or future base benefits, and
2. the funding excess utilization plan excluding permanent benefit changes.

The funding deficit recovery plan and the funding excess utilization plan are described in Sections IV and V of the Funding Policy, respectively.

There are two secondary risk management goals under the PBA. These are:

- On average be expected to provide contingent indexing on base benefits (all members) in excess of 75% of the indexation provided under the Former PSSA over the next 20 years.
- On average be expected to provide at least 75% of the value of the ancillary benefits described in the Plan documents over the next 20 years.

For the purposes of meeting these goals, base benefits include the accrual of extra service of members and any contingent indexing provided based on the financial performance represented by each scenario tested.

If as a result, through the testing process, a scenario allows for indexing in a given future year, then this contingent indexing amount becomes part of the base benefits that the Plan is to strive to protect in accordance with Regulation 2012-75. In other words, the base benefit is dynamically adjusted based on the stochastic results for each economic scenario tested.

Risk Management Procedures

The risk management goals are measured using an asset liability model with future economic scenarios developed using a stochastic process.

The risk management goals were tested as at January 1, 2020, effective date of this report. The results of these tests combined with the results of the funding policy actuarial valuation at the same date will determine the actions the Board of Trustees is required to take, or can consider, under the terms of the Funding Policy.

The primary risk management goal must be achieved or exceeded:

- At January 1, 2014 (i.e. the Conversion Date);
- At the date a permanent benefit change as defined in the Regulations is made;
- At the date a benefit improvement as defined in the Regulations is made; or
- At the date contribution adjustments that exceed those provided under the Funding Policy are implemented.

The secondary risk management goals must be achieved or exceeded:

- At January 1, 2014 (i.e. the Conversion Date); or
- At the date a permanent benefit change as defined in the Regulations is made.

The definitions of permanent benefit change and benefit improvement are as follows:

- "permanent benefit change" means a change that is intended to permanently change the formula for the calculation of the base benefits or ancillary benefits after the date of the change, including a change made in accordance with the funding excess utilization plan.
- "benefit improvement" means an escalated adjustment for past periods or an increase in other ancillary benefits allowed under the Funding Policy.

Additional Assumptions on a Funding Policy Basis for Purpose of the Stochastic Analysis

Other assumptions are required for the stochastic analysis required under the risk management procedures for the Plan. These additional assumptions are used to establish future Plan membership as well as future earnings, as to determine the level of future cash flows to and from the Plan, such as member and employer contributions, normal costs, benefit payments and expenses for the next 20 years. These cash flows are calculated on a deterministic basis for each year following the valuation date for a period of 20 years, and allow the determination of the funding policy actuarial liability and assets at each future date, as well as the determination of the present value of 15-year excess contributions in accordance with paragraph 14(6)(c) of Regulation 2012-75.

Table 4.1 – Additional Funding Policy Actuarial Valuation Assumptions for Purpose of the Stochastic Analysis

	January 1, 2020			
New entrants	Each active member is replaced at death or retirement by a new entrant, resulting in a stable active membership			
Distribution of new entrants and salary at entry:	Age	Distribution	Average Salary at Entry	Work Percentage
	25	25.0%	$53,352 ($53,430 as of January 1, 2019)	95%
	35	35.0%	$63,612 ($63,705 as of January 1, 2019)	95%
	45	25.0%	$63,612 ($63,705 as of January 1, 2019)	95%
	55	15.0%	$63,612 ($63,705 as of January 1, 2019)	95%
Inflation	2.10% per annum (2.25% per annum as of January 1, 2019)			
Salary increases	2.60% per annum plus merit and promotion (2.75% per annum plus merit and promotion as of January 1, 2019)			
YMPE increases	2.60% per annum (2.75% per annum as of January 1, 2019)			

Results of Stochastic Analysis as At January 1, 2020

The stochastic analysis undertaken as at January 1, 2020, took into account the main following items:

- Membership Data as at January 1, 2020 summarized in Appendix B;
- Economic and demographic assumptions as at January 1, 2020 for the funding policy valuation summarized in Section 1;
- NBPSPP target asset mix as summarized in Table A.4 of Appendix A;
- Stochastic projection assumptions as summarized in Appendix C;
- Risk management procedures described above;
- NBPSPP provisions, summarized in Appendix D;
- Funding deficit recovery plan found under Section IV of the NBPSPP's Funding Policy (except for reduction in past or future base benefits);
- Funding excess utilization plan found under Section V of the NBPSPP's Funding Policy (excluding permanent benefit changes).

Based on the above, the results of the stochastic analysis for the various risk management goals as at January 1, 2020 are as follows:

Table 4.2 – Results of Stochastic Analysis for the Various Risk Management Goals

Risk Management Goal	Goal under PBA	Results for NBPSPP as at January 1, 2020
Primary Goal [Regulation 7(1)] - There is at least a 97.5% probability that the past base benefits at the end of each year will not be reduced over a 20-year period	97.5%	**99.35%** **PASSED**
Secondary Goal 1 [Regulation 7(3)(a)] - Expected contingent indexing of base benefits of active members for service before the conversion date shall, on average over the next 20-year period, exceed 75% of the increase in the Consumer Price Index; or Expected contingent indexing of base benefits of retirees and deferred vested members for service rendered before the conversion date shall, on average over the next 20-year period, exceed 75% of the escalated adjustments specified in the pension plan immediately before it was converted to a shared risk plan (i.e. Full CPI subject to a maximum increase of 5.0% or 6.0% per year depending on the date of retirement.)	75.0% of the assumed increase in CPI	**88.6%** of the assumed increase in CPI **PASSED**
Secondary Goal 2 [Regulation 7(3)(b)] - The amount of ancillary benefits (other than contingent indexing) that are expected to be provided shall, on average over the next 20-year period, exceed 75% of the value of the ancillary benefits specified in the plan text	75.0% of the value of ancillary benefits will be provided	Above **98.9%** of the value of ancillary benefits is expected to be provided (See Note below) **PASSED**

Note: The Funding Policy provides for the reduction of one type of ancillary benefit under the Funding Deficit Recovery Plan at actions 1 and 2. This is the replacement of early retirement reductions for post conversion service under action 1, and for pre-conversion service at action 2, by a full actuarial reduction for members not yet eligible to receive an immediate pension. We expect these two ancillary benefits would be reduced in about 1.1% of our 10,000 20-yr scenarios. If those were the only two ancillary benefits reduced, and they were eliminated completely, then we could expect that 98.9% of the value of ancillary benefits would be provided over the 20-year period. Given that there are other ancillary benefits under the Plan that will not be touched (because they are not mentioned as a benefit that can be reduced under the Funding Policy), the percentage for this test is expected to be higher than 98.9%, which is well above minimum required under the PBA of 75%.

Section 5 – Plausible Adverse Scenarios

Effective for funding valuations on or after March 31, 2019, the plan actuary is required to select Plausible Adverse Scenarios for various risks underlying the Plan, and disclose in the report the impact such scenarios would have on the funded status and risk management test results of the Plan. The results of this analysis are contained in this Section 5.

The Standards of Practice of the CIA continue to require that valuation reports disclose the sensitivity of the liabilities to changes in the discount rate assumption. Previously, the discount rate sensitivity results for the funding policy, going concern, and hypothetical wind-up bases would have been found in Sections 1, 2, and 3 of the actuarial valuation report, respectively. As these sensitivities are also a form of stress test, we have included them in this Section 5 for completeness.

Description of the Plausible Adverse Scenarios

The Standards of Practice of the CIA require valuation reports to disclose the results of stress tests on Plausible Adverse Scenarios. A Plausible Adverse Scenario would be a scenario of adverse but plausible assumptions relative to the best estimate assumptions outlined in Section 1 of this report. As a result, these scenarios are stress tests on a selection of risks to which the Plan is subject. This selection is not meant to consider all of the risks to which the Plan is subject.

The following is a description of the four scenarios analyzed.

Scenario I - Interest Rate Risk

In this Scenario, we will model the impact of a sudden drop in fixed income yield, which will impact the level of the discount rate, and the value of the fixed income assets in the Fund. The magnitude of the drop will be such that there is a 1 in 10 likelihood of such a reduction happening in accordance with our economic model underlying our stochastic analysis.

Based on the outcome with a 1 in 10 likelihood of occurrence under our economic model, yields on fixed income assets are assumed to decrease by 0.90% immediately, leading to a 0.20% decrease in the expected return of the Plan's investments. We have not reflected any change of the assumed margin for adverse deviation to compensate for the decrease in expected return and have therefore reflected a decrease in the discount rate to 4.55% per annum for this valuation. While the Funding Policy states that intent of the discount rate is to remain stable over time, we have illustrated the impact should the Board of Trustees change the discount rate.

In valuing the effect of this change on the Plan assets, the impact of the interest rate risk was restricted to the asset classes deemed to be fixed income investments, and results in a 7.80% increase on the market value of the affected asset classes, which translates into a 3.10% increase on the market value of the Fund as a whole.

All other assumptions and methods used for this valuation were maintained, and no other compensating adjustments were made.

Scenario II - Deterioration of Asset Values

In this Scenario, we will model the impact of a sudden drop in the value of assets other than fixed income assets, with no change in the level of the discount rate or any other assumptions. The magnitude of the drop will be

such that there is a 1 in 10 likelihood of such a reduction happening for such asset classes in accordance with our economic model underlying our stochastic analysis.

Based on the outcome with a 1 in 10 likelihood of occurrence under our economic model, all assets other than fixed income assets were assumed to decrease by 10.55% immediately, resulting in a 6.30% decrease on the market value of the total Fund. No changes to funding valuation actuarial liabilities and normal cost were considered under this scenario. All assumptions and methods used for this valuation were maintained.

Scenario III - Longevity Risk

In this Scenario, we will model the impact of an increase in the average life expectancy of all plan members relative to our assumption used in our valuation. The magnitude of the increase will be such that the life expectancy is increased by 10% from the underlying mortality table assumption used in our valuation.

To test the impact of an average life expectancy increase of 10% for all ages over the current assumption on the funding policy actuarial liabilities and normal cost, a multiplier of 0.7 was applied to all mortality rates used for this valuation. All other assumptions and methods used for this valuation were maintained.

Scenario IV - Decrease in Contribution Base

In this Scenario, we will model the impact of a decrease in contribution base, where an undefined event triggers an immediate 10% reduction in active members contributing and accumulating benefits under the plan.

A decrease of 10% in payroll for the year following the valuation date is assumed. We assume that the demographic profile of the active membership is unchanged from the decrease in payroll. For purposes of this scenario, we assume that the market value of assets and funding policy actuarial liabilities are unchanged, and due to the decrease in payroll we assume a 10% reduction in contributions and normal cost for each year following the valuation date. All other assumptions and methods used for this valuation were maintained.

Plausible Adverse Scenarios - Funding Policy Valuation

The following table illustrates the impact of four plausible adverse scenarios on the funding policy liabilities and corresponding funded statuses and legislated risk management tests. The scenarios have been applied and reported on separately.

Table 5.1 – Plausible Adverse Scenarios Impact on the Funding Policy Valuation Results

	Funding Policy Valuation Results as at January 1, 2020	Plausible Adverse Scenario Results as at January 1, 2020			
		Scenario I Interest Rate Risk	Scenario II Deterioration of Asset Values	Scenario III Longevity Risk	Scenario IV Decrease in Contribution Base
	$M	$M	$M	$M	$M
Market value of assets	8,352.4	8,611.3	7,826.2	8,352.4	8,352.4
Funding policy actuarial liabilities	7,280.7	7,459.8	7,280.7	7,668.7	7,280.7
Funding policy valuation excess (unfunded liability)	1,071.7	1,151.5	545.5	683.7	1,071.7
Termination value funded ratio	114.7%	115.4%	107.5%	108.9%	114.7%
Present value of excess contributions over the next 15 years	1,233.5	1,161.3	1,233.5	1,186.6	1,109.9
Open group funded ratio	131.7%	131.0%	124.4%	124.4%	130.0%
Funding policy valuation normal cost	158.2	164.8	158.2	161.8	142.4
Results of stochastic analysis for risk management goal					
Primary Goal [Regulation 7(1)]	99.35% PASS	99.35% PASS	99.00% PASS	98.15% PASS	99.05% PASS
Secondary Goal 1 [Regulation 7(3)(a)]	88.6% PASS	89.3% PASS	83.9% PASS	82.0% PASS	87.4% PASS
Secondary Goal 2 [Regulation 7(3)(b)]	98.9% PASS	98.9% PASS	98.0% PASS	97.2% PASS	98.2% PASS

Discount Rate Sensitivity Results

The Standards of the CIA require that valuation reports disclose the sensitivity of the liabilities to changes in the discount rate assumption. The discount rate sensitivity results for the funding policy, going concern, and hypothetical wind-up bases are presented below.

Sensitivity Analysis on the Funding Policy Valuation Basis

The table below illustrates the effect of 1% decrease in the discount rate on the funding policy valuation actuarial liabilities. With the exception of the discount rate, all other assumptions and methods used for this valuation were maintained.

Table 5.2 – Sensitivity of Actuarial Liabilities on the Funding Policy Valuation Basis

	January 1, 2020	Discount rate 1% lower
	$M	$M
Actuarial liabilities		
Active members	$2,356.0	$2,826.2
Retirees and survivors	4,679.8	5,136.0
Deferred vested and suspended members	243.7	293.9
Outstanding refunds	1.2	1.2
Total	$7,280.7	$8,257.3
Increase in actuarial liabilities		$976.6

Sensitivity Analysis on the Funding Policy Valuation Total Normal Cost

The table below illustrates the effect on the total normal cost of using a discount rate 1% lower than the one used for the funding policy valuation. All other assumptions and methods, as used for this valuation, were maintained.

Table 5.3 – Sensitivity of Funding Policy Valuation Total Normal Cost

	As at January 1, 2020		Discount Rate 1% lower	
	$M	% of payroll	$M	% of payroll
Total normal cost	$158.2	12.25%	$195.4	15.13%
Increase in total normal cost			$37.2	2.88%

Sensitivity Analysis on the Going-Concern Basis

The table below illustrates the effect of 1% decrease in the discount rate on the going-concern actuarial liabilities. With the exception of the discount rate, all other assumptions and methods used for this valuation were maintained.

Table 5.4 – Sensitivity of Actuarial Liabilities on the Going-Concern Basis

	January 1, 2020	Discount rate 1% lower
	$M	$M
Actuarial liabilities		
Active members	$3,542.3	$4,378.9
Retirees and survivors	5,767.3	6,413.8
Deferred vested and suspended members	371.3	463.2
Outstanding refunds	1.2	1.2
Total	$9,682.1	$11,257.1
Increase in actuarial liabilities		$1,575.0

Sensitivity Analysis on the Going-Concern Residual Normal Cost

The table below illustrates the effect on the residual normal cost of using a discount rate 1% lower than the one used for the going-concern valuation. All other assumptions and methods, as used in this valuation, were maintained.

Table 5.5 – Sensitivity of Going-Concern Residual Normal Cost

	January 1, 2020		Discount rate 1% lower	
	$M	% of payroll	$M	% of payroll
Total going-concern normal cost	$252.7	19.56%	$319.3	24.7%
Less Member contributions	106.6	8.25%	106.6	8.25%
Residual going-concern normal cost	$146.1	11.31%	$212.7	16.45%
Increase in residual going-concern normal cost			$66.6	5.14%

Sensitivity Analysis on the Hypothetical Wind-Up Basis

The table below illustrates the effect on the actuarial liabilities of using discount rates 1% lower than those used for the hypothetical wind-up valuation. All other assumptions and methods, as used in this valuation, were maintained.

Table 5.6 – Sensitivity of Actuarial Liabilities on the Hypothetical Wind-Up Basis

	January 1, 2020	Discount rates 1% lower
	$M	$M
Actuarial liabilities		
Active members	$7,896.1	$10,218.9
Retirees and survivors	8,199.5	9,400.0
Deferred vested and suspended members	824.9	1,072.9
Outstanding refunds	1.2	1.2
Total	$16,921.7	$20,693.0
Increase in actuarial liabilities		$3,771.3

Appendix A – Assets

Description of Plan Assets

The assets of the NBPSPP are held in trust and are being managed by Vestcor Inc. ("Vestcor"). The information on Plan assets as at December 31, 2019 was taken from unaudited financial statements prepared by Vestcor for the Board of Trustees.

Statement of Market Value

The following table shows the asset mix as at December 31, 2019:

Table A.1 – Assets at Market Value

	December 31, 2019
Invested assets	$M
Canadian Equities	$1,041.2
Foreign Equities	1,864.3
Fixed Income	2,999.4
Inflation Linked Assets	1,262.4
Alternatives	1,096.6
Other investments and net amount receivable	88.5
Total assets	$8,352.4

Changes to Plan Assets

The following table shows changes to the NBPSPP's assets during the inter-valuation period, based on market values. The reconciliation from January 1, 2019 to December 31, 2019 is based on the unaudited financial statements prepared by Vestcor for the Board of Trustees.

Table A.2 – Reconciliation

	2019 ($M)
Assets at beginning of period	$7,632.7
Receipts	
Member contributions	$106.9
Employer contributions	154.7
Investment income plus realized and unrealized capital appreciation and depreciation	881.1
Total receipts	$1,142.7
Disbursements	
Pension and refunds	$407.2
Expenses	15.8
Total disbursements	$423.0
Assets at end of period	$8,352.4

Return on Assets

The Plan assets earned the following rates of return, net of investment management fees and other expenses charged to the Fund, based on our calculations which assume cash flow occurred in the middle of the period:

Table A.3 – Net Investment Return

Year	Net rate of return
	%
2019	11.4
2018	1.6
2017	7.6
2016	6.4
2015	7.2

Actuarial Value of Assets

We have used the market value of assets (including receivables / payables) without adjustment. The actuarial value of assets as at December 31, 2019 was $8,352.4M.

Target Asset Mix

The Statement of Investment Policies for the NBPSPP, as last modified by the Board of Trustees, effective March 18, 2020, provides for the following long term target asset mix:

Table A.4 – Target Asset Mix

Asset Classes	Target Allocation (%)
Fixed income:	
Short term assets	1.0%
Government bonds	17.0%
Corporate bonds	17.0%
Inflation linked:	
Real return bonds	5.0%
Real estate	6.0%
Infrastructure	5.0%
Public equity (market capitalization):	
Canadian equities	4.0%
Canadian small cap equities	1.0%
US equities	7.0%
Foreign small cap equities*	1.5%
EAFE equities	4.0%
Public equity (low volatility):	
Canadian low vol	4.0%
US low vol	6.5%
EAFE low vol	3.5%
Emerging market low vol	4.5%
Private equity	5.0%
Absolute return	8.0%
Total	100%

** Foreign small cap equities are comprised of a 1.0% US small cap allocation and a 0.5% EAFE small cap allocation.*

This target asset mix has been revised since the last valuation, and is used to determine the discount rate assumption under the NBPSPP, and to conduct the stochastic analysis required under the PBA to assess the various risk management goals.

Appendix B – Membership Data

Description of Membership Data

The data as at January 1, 2020 was extracted from Morneau Shepell's administration system and reviewed by Vestcor.

In developing the valuation membership data set as of January 1, 2020, the following adjustments were made following conversations with Vestcor:

- Accrued pensions for suspended UNB professors were adjusted to take into account an estimate of the salary progression that they would have experienced while actively employed but no longer active members of the Plan, up to conversion. The indexation granted following conversion was also applied, based on our understanding of their benefit.
- In very limited cases where the credibility of the data received this year for certain individuals was questioned in light of a comparison with data received as part of the previous valuation, the data from the previous valuation was used.

We have taken the following additional steps to review data for accuracy, completeness and consistency purposes:

- A reconciliation of data was performed in order to follow the changes concerning some of the active members, retirees and vested members.
- Basic data checks were performed to ensure that age, salary, service and pension accrual data were reasonable for the purposes of the valuation.

Summary of Membership Data

The following tables were prepared using data provided by Vestcor regarding its active members, retirees and former members. Accrued pensions, in payment or not, for all members reflect the cost-of-living adjustment granted by the Board of Trustees effective January 1, 2020.

These tables show the following:

- B.1 Summary of Membership Data
- B.2 Changes in Plan Membership
- B.3 Age/Service Distribution for Active Members as at January 1, 2020
- B.4 Distribution of Retirees and Survivors by Age Groups as at January 1, 2020
- B.5 Distribution of Deferred Vested and Suspended Members by Age Groups as at January 1, 2020

Table B.1 – Summary of Membership Data

		January 1, 2020	January 1, 2019
Active members	Number	18,896	18,502
	Average salary	$71,342	$70,659
	Average age	46.6 years	46.6 years
	Average accrued life benefit	$12,424	$12,380
	Average accrued bridge benefit	$4,071	$4,074
	Average pensionable service	11.9 years	12.1 years
Deferred vested and suspended members	Number	4,168	4,129
	Average age	47.0 years	47.0 years
	Average accrued life benefit	$5,917	$5,824
	Average accrued bridge benefit*	$2,408	$2,088
Retirees and survivors	Number	16,947	16,536
	Average accrued life benefit	$22,162	$21,701
	Average accrued bridge benefit*	$8,405	$8,441
	Average age	71.8 years	71.6 years

**Average for those entitled to receive a bridge benefit.*

Table B.2 – Changes in Plan Membership

	Active Members	Deferred Vested and Suspended Members	Retirees and Survivors	Total
Members at January 1, 2019	18,502	4,129	16,536	39,167
New members	1,679	--	--	1,679
Retirements	(568)	(144)	712	--
Members who returned to active	473	(472)	(1)	--
Terminations				
Paid lump sum	(200)	(94)	--	(294)
Outstanding	(166)	(16)	--	(182)
Deaths or cessation of pension	(22)	(37)	(511)	(570)
New survivor pensions	--	--	200	200
Became suspended members	(802)	802	--	--
Data adjustments	--	--	11	11
Members at January 1, 2020	18,896	4,168	16,947	40,011

Table B.3 – Age/Service Distribution for Active Members as at January 1, 2020

												Age
Years of Service		Under 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65 and Over	Total
0 - 4	Number	333	1,140	1,122	921	868	720	592	485	236	82	6,499
	Tot. Sal.	17,287,065	64,971,201	72,655,631	60,776,254	57,574,134	48,332,711	38,325,149	29,601,489	13,384,073	4,693,934	407,601,640
	Avg. Sal.	51,913	56,992	64,755	65,989	66,330	67,129	64,738	61,034	56,712	57,243	62,718
5 - 9	Number		109	504	624	611	527	449	343	231	46	3,444
	Tot. Sal.		7,609,914	34,322,348	44,111,729	45,283,056	38,550,554	31,160,908	22,363,853	15,052,405	3,068,647	241,523,414
	Avg. Sal.		69,816	68,100	70,692	74,113	73,151	69,401	65,201	65,162	66,710	70,129
10 - 14	Number			103	475	545	497	453	341	171	56	2,641
	Tot. Sal.			8,715,523	37,543,229	42,580,780	38,566,764	34,987,378	24,950,165	12,751,031	4,305,128	204,399,999
	Avg. Sal.			84,617	79,038	78,130	77,599	77,235	73,168	74,567	76,877	77,395
15 - 19	Number			1	91	485	533	490	425	182	53	2,260
	Tot. Sal.			***	7,788,667	39,103,100	42,432,202	38,250,069	31,793,736	13,069,510	4,456,614	176,919,395
	Avg. Sal.			***	85,590	80,625	79,610	78,061	74,809	71,810	84,087	78,283
20 - 24	Number					81	324	399	316	126	33	1,279
	Tot. Sal.					6,642,578	26,359,800	31,369,257	23,752,673	9,482,756	2,106,954	99,714,018
	Avg. Sal.					82,007	81,357	78,620	75,167	75,260	63,847	77,962
25 - 29	Number						106	569	455	148	28	1,306
	Tot. Sal.						8,579,428	47,325,456	34,593,275	10,945,363	1,804,338	103,247,860
	Avg. Sal.						80,938	83,173	76,029	73,955	64,441	79,057
30 - 34	Number						5	278	528	168	23	1,002
	Tot. Sal.						448,421	23,400,651	40,447,297	13,090,716	1,812,994	79,200,080
	Avg. Sal.						89,684	84,175	76,605	77,921	78,826	79,042
35 and over	Number							4	258	161	42	465
	Tot. Sal.							290,790	20,019,461	11,956,964	3,211,135	35,478,350
	Avg. Sal.							72,698	77,595	74,267	76,456	76,298
Total number		333	1,249	1,730	2,111	2,590	2,712	3,234	3,151	1,423	363	18,896
Total salaries		17,287,065	72,581,115	115,718,999	150,219,879	191,183,649	203,269,881	245,109,657	227,521,951	99,732,818	25,459,743	1,348,084,756
Average of salaries		51,913	58,111	66,890	71,161	73,816	74,952	75,791	72,206	70,086	70,137	71,342

Average age: 46.6 years

Average years of service: 11.9 years

Notes:

The age is computed at the nearest birthday. Years of service means the number of years credited for pension plan purposes.

Membership for active members is composed of 9,154 males and 9,742 females.

**** Certain cells are not shown to protect confidentiality*

Table B.4 – Distribution of Retirees and Survivors by Age Groups as at January 1, 2020

Age Group	Number	Total Annual Payments	
		Lifetime	Bridge
Under 60	923	$18,769,816	$5,605,821
60-64	3,005	73,933,576	24,810,790
65-69	4,206	102,547,819	0
70-74	3,460	77,317,630	0
75-79	2,274	46,380,215	0
80-84	1,524	30,009,059	0
85-89	914	16,245,973	0
90 and over	641	10,375,623	0
Total	16,947	$375,579,711	$30,416,611

Average age: 71.8 years

Notes: Age groups are based on exact age. The pension used is the pension payable as at January 1, 2020. Membership for retirees and survivors is composed of 8,326 males and 8,621 females.

Table B.5 – Distribution of Deferred Vested and Suspended Members by Age Groups as at January 1, 2020

Age Group	Number	Total Annual Payments	
		Lifetime	Bridge
Under 25	23	$15,603	$6,131
25-29	249	319,215	126,242
30-34	401	884,106	354,317
35-39	516	1,704,105	676,992
40-44	562	2,737,490	1,080,580
45-49	669	4,265,942	1,723,498
50-54	718	6,643,664	2,610,892
55-59	603	5,188,305	2,106,800
60-64	279	1,875,162	901,823
65 and over	148	1,029,418	0
Total	4,168	$24,663,010	$9,587,275

Average age: 47.0 years

Note: Age groups are based on exact age. Membership for deferred vested and suspended members is composed of 1,727 males and 2,441 females.

Appendix C – Stochastic Projection Assumptions and Disclosures

The model inputs for our stochastic analysis are built each year using Conference Board of Canada (CBoC) forecasts, internal research, inflation expectations and by surveying the asset manager universe. This ensures we are not using inputs that are out of touch with broader expectations. We strive for accuracy in our assumptions, as high or low expectations can lead to biased results. However, when deciding between equally reasonable modeling choices, we err on the side of conservatism.

The methodology used to develop key assumptions used within the model is described below.

Economic Assumptions

Economic stochastic projection assumptions are updated annually by Morneau Shepell Asset and Risk Management using a multi-stage process.

Inflation

We select a long-term inflation rate assumption based primarily on the current Bank of Canada Monetary Policy. Volatility for inflation is based on historical data since the early 1990's when the current monetary policy was introduced. Historical volatility is used to estimate consumer price index volatility for future years. We also develop an assumption for market implied inflation which is used to determine fixed-income yields in any given year. We use current market data for the initial rate and then use an autoregressive time-series model to determine the market implied inflation assumption rates over the first ten projection years, at which point the rate remains stable, such that the long-term implied market inflation is consistent with our assumption for the change in the consumer price index.

Table C.1 – Market Implied Inflation

December 31	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029 and after
Market implied inflation (%)	1.35	1.44	1.53	1.62	1.71	1.80	1.90	1.99	2.08	2.17	2.26

Interest Rates

We use a building block approach to estimate the long-term interest rates for government bonds and Canadian bond indices. The three components that make up the long-term interest rate estimate are: Inflation, real return, and credit spread. After careful consideration, we assume that both real yields and credit spreads revert to projected long-term rates. Although some research papers suggest that the possibility that interest rates follow a random walk process (that is, they do not mean-revert) cannot be rejected, mean reversion is intuitive and increases the likelihood that rates will remain within a reasonable range. Therefore, we assume each building block moves from the value in the market as of the valuation date towards its long-term level over a projected period of 10 years (and remains at the long-term level thereafter). Each of the building blocks follow a

modified discrete version of the Vasicek model, using an instantaneous volatility determined from historical data.

Canadian Bond Indices

We generate expected return levels and standard deviations for Canadian bond indices in a stochastic simulation approach. We assume that the only components needed to model the returns are: yield and variation of interest rates. We make the assumption that interest rates follow a Vasicek model. To determine the impact of yield variation on return we extract the duration and convexity as of the valuation date for the FTSE Canadian bond indices and assume that it will remain constant in the future. Using the Vasicek model, we simulate 10,000 interest rate paths which we use to create 10,000 return series for various Canadian bond indices. The geometric average of the 10,000 simulated returns is taken as the return level assumption. The mean annual standard deviation of returns is taken as the standard deviation of returns.

Fixed income asset classes that were used in our modeling include, but are not limited to Canadian federal, provincial, and corporate bond indices. The following initial and ultimate average credit spreads and average nominal yields were used as at January 1, 2020.

Table C.2 – Credit Spreads and Yields by Bond Index

Asset Class	Initial Credit Spread *	Ultimate Credit Spread *	Initial Yield	Ultimate Yield
FTSE Canada Federal Bonds	n/a	n/a	1.80%	3.17%
FTSE Canada Federal Short Term Bonds	n/a	n/a	1.77%	2.81%
FTSE Canada Federal Mid Term Bonds	n/a	n/a	1.85%	3.40%
FTSE Canada Federal Long Term Bonds	n/a	n/a	1.82%	3.90%
FTSE Canada Corporate Bonds	1.01%	1.14%	2.80%	4.31%
FTSE Canada Short Term Corporate Bonds	0.64%	0.83%	2.41%	3.64%
FTSE Canada Mid Term Corporate Bonds	1.14%	1.22%	2.99%	4.62%
FTSE Canada Long Term Corporate Bonds	1.57%	1.62%	3.39%	5.53%
FTSE Canada Universe Provincial Bonds	0.54%	0.86%	2.33%	4.02%
FTSE Canada Short Term Provincial Bonds	0.16%	0.23%	1.92%	3.04%
FTSE Canada Mid Term Provincial Bonds	0.38%	0.48%	2.24%	3.87%
FTSE Canada Long Term Bonds	0.72%	0.74%	2.54%	4.64%

** The credit spread reflects the excess average yield for the index over the federal bond index of similar maturity.*

Fixed income asset classes' returns and standard deviations must be consistent. We perform a check on the relationships between indices and sub-indices, and make adjustments if necessary.

Equity

The process for determining the nominal equity return assumptions uses a forward-looking building block approach. We utilize multiple sources of information, including our inflation assumptions, historical data, GDP and other economic data, growth forecasts and dividend information.

The building blocks are the change in the consumer price index assumptions determined above, the expected dividend yield for the index (adjusted for share issues and buy-backs), and Consensus Economics' GDP forecasts.

The building block approach results in equity return assumptions in the local currency of the asset classes. For foreign equity, we used Consensus Economics' estimates for purchasing power parity between the local currency and the Canadian dollars. We assume that the current exchange rate will trend linearly towards purchasing power parity over a period of 10 years.

Standard deviations and correlations of equity returns are mainly derived from historical data. To ensure consistency between indices covering different regions, we use an iterative calibration process.

We also consider differences in capitalization levels and investment styles. Small-cap equities and large-cap equities have different risk-return profiles. We use historical data to measure the return and volatility spreads between small-cap and large-cap equities.

Alternative Asset Classes

Alternative asset classes include real estate, infrastructure, hedge funds, private equity, foreign fixed income and high yield bonds.

Real estate indices do not include leverage; however, some real estate funds and strategies use leverage. Moreover, some real estate indices are only updated quarterly, resulting in an appraisal lag. Other indices are transaction based rather than appraisal based. Therefore, we must exercise some subjective judgement to estimate return levels, standard deviations and correlations.

Hedge fund indices usually include survivorship and backfill biases. Moreover, hedge fund strategies can differ from the index due to their characteristics. Most hedge funds have an absolute return target that can guide in the selection of the assumption.

Private equity may be viewed as public equity, adjusted with a liquidity risk premium. Private equity managers usually target a spread of 3% to 5% over public equities.

Infrastructure return level assumption is based on the 10-year Government of Canada bond returns, plus a spread. The spread varies on whether the investment is in infrastructure debt or in infrastructure equity.

For foreign fixed income, we utilize the same model used for Canadian fixed income except that the credit spread and real yield components are not separated due to a lack of reliable data.

Correlations & Standard Deviations

Correlations and standard deviations are mainly derived from historical data. However, recent trends and experience can potentially lead us to perform modifications on the historical correlations. Although exchange rates have little impact on long-term equity return levels, they do have an impact on correlations.

Correlations between certain pairs of asset classes are unstable through time, particularly for alternative asset classes. Historical correlations may show a large diversifying advantage for certain assets, which may not be properly supported by theoretical evidence. In cases of a strong negative correlation, we consider whether this correlation should be trended back towards zero.

The correlation matrix must be consistent. Consistency is required for theoretical accuracy and in stochastic simulations. We use an algorithmic approach to ensure consistency of the correlation matrix.

Returns, Volatility, and Correlations by Asset Class

The following expected return and volatility by asset class were used as at January 1, 2020. For reference, we have also included the return and volatility as at the date of the previous valuation, January 1, 2019.

Table C.3 – Expected Long-Term Return and Volatility (Standard Deviation) by Asset Class

	January 1, 2020		January 1, 2019	
	Expected Annualized Long-Term Return	Volatility of Annual Return	Expected Annualized Long-Term Return	Volatility of Annual Return
Inflation (change in the consumer price index)	2.10%	1.3%	2.25%	1.3%
Asset Classes				
Fixed income:				
Short term assets	2.10%	1.1%	2.20%	1.2%
Government bonds	2.75%	6.4%	3.00%	7.4%
Corporate bonds	3.60%	4.9%	3.95%	5.7%
Inflation linked:				
Real return bonds	2.30%	9.3%	2.65%	12.7%
Real estate	6.05%	9.0%	6.25%	9.9%
Infrastructure	6.30%	13.0%	6.85%	13.0%
Public equity (market capitalization):				
Canadian equities	6.80%	16.4%	7.25%	16.3%
Canadian small cap equities	7.05%	20.0%	7.50%	19.9%
US equities	6.45%	17.3%	6.70%	17.1%
Foreign small cap equities	6.95%	21.2%	n/a	n/a
EAFE equities	7.15%	15.2%	7.55%	15.1%
Public equity (low volatility)[1]:				
Canadian low vol	6.30%	13.1%	6.75%	13.0%
US low vol	5.95%	13.9%	6.20%	13.7%
EAFE low vol	6.65%	12.2%	7.05%	12.1%
Emerging market low vol	8.70%	18.6%	9.60%	19.5%
Private equity	9.85%	23.5%	10.25%	23.8%
Absolute return strategy	6.10%	10.1%	6.20%	10.3%

[1] For purposes of our stochastic analysis at January 1, 2020, specific assumptions were made for the public equities (low volatility) strategies. The methodology for deriving assumptions for such strategies was approved by the Superintendent of Pensions in a letter dated August 18, 2015. The conditions ultimately imposed by the Superintendent of Pensions for such strategies are as follows:

- *Expected long term rate of return of 0.25% to 0.5% lower than regular market capitalization index.*
- *Volatility of 80% of the regular market capitalization index*
- *Correlation of 30% lower than regular market capitalization index*
- *Maximum of 25% of the funds in such strategies for modeling purposes, with any excess modeled using the regular market capitalization index assumptions*

The following is the correlation among the various asset classes identified in Table C.3 used as at January 1, 2020:

Table C.4 - Simulation Correlations Among Asset Classes and Fixed Income Building Blocks

Asset Classes	Inflation	Short Term Assets	Real Return Bonds	Government Bonds	Corporate Bonds	Canadian Equities	Canadian Low Vol	Canadian Small Cap	US Equities	Foreign Eq. Small Cap	EAFE Equities	Real Estate	Infrastructure	Private Equity	Absolute Return	US Low Vol	EAFE Low Vol	EM Low Vol
Inflation	1.00	0.21	-0.36	-0.23	-0.09	0.08	0.06	0.02	-0.39	-0.35	-0.23	0.32	0.17	-0.16	0.08	-0.27	-0.16	0.02
Short Term Assets		1.00	0.06	-0.33	-0.24	0.06	0.05	-0.10	0.24	-0.02	0.25	0.54	0.00	0.16	0.17	0.17	0.18	-0.07
Real Return Bonds			1.00	0.35	0.20	-0.22	-0.15	-0.23	0.14	0.16	0.10	-0.22	0.27	-0.02	-0.04	0.10	0.07	-0.09
Government Bonds				1.00	0.86	-0.68	-0.48	-0.60	-0.31	-0.25	-0.41	-0.35	0.12	-0.45	-0.67	-0.22	-0.29	-0.36
Corporate Bonds					1.00	-0.72	-0.51	-0.67	-0.43	-0.49	-0.57	-0.36	0.08	-0.50	-0.73	-0.30	-0.40	-0.41
Canadian Equities						1.00	0.70	0.79	0.40	0.54	0.56	0.23	0.08	0.55	0.76	0.28	0.39	0.49
Canadian Low Vol							1.00	0.55	0.28	0.37	0.39	0.16	0.05	0.39	0.53	0.19	0.27	0.34
Canadian Small Cap								1.00	0.24	0.43	0.38	0.05	0.05	0.45	0.69	0.17	0.27	0.46
US Equities									1.00	0.78	0.74	0.10	-0.07	0.62	0.45	0.70	0.52	0.08
Foreign Eq. Small Cap										1.00	0.65	0.08	-0.04	0.56	0.51	0.54	0.45	0.18
EAFE Equities											1.00	0.23	-0.07	0.59	0.46	0.52	0.70	0.37
Real Estate												1.00	0.10	0.14	0.31	0.07	0.16	0.15
Infrastructure													1.00	-0.01	0.06	-0.05	-0.05	0.00
Private Equity														1.00	0.54	0.43	0.41	0.23
Absolute Return															1.00	0.31	0.32	0.39
US Low Vol																1.00	0.36	0.05
EAFE Low Vol																	1.00	0.26
EM Low Vol																		1.00

The correlations are assumed to remain constant over the entire projection period.

Forecasted Funding Policy Valuation Liabilities

As required under paragraph 15(2)(c) of Regulation 2012-75, the projection of the liability and future cash flows under the stochastic analysis uses the same demographic assumptions as used for the calculation of the funding policy valuation liability. As such, the funding policy valuation assumptions are used to project the demographics of the Plan on a deterministic basis 20 years into the future. Both the economic and demographic assumptions in Table 1.6 and Table 4.1 are used to project the number of members and their salaries, with each active member being replaced at death or retirement by a new entrant, resulting in the membership profile outlined herein. The following table contains the results of the deterministic projection, in particular the number of active members, along with their average pensionable service, average age, and average pensionable earnings for the year for each of the 20 years in the projection period.

Table C.5 – Projection Statistics for Active Members

Date	Number of Active Members	Average Age (years)	Average Pensionable Service (years)	Average Salary *
31-Dec-20	18,896	47.6	12.9	$ 72,952
31-Dec-21	18,896	46.8	12.5	74,537
31-Dec-22	18,896	46.8	12.6	76,434
31-Dec-23	18,896	47.0	12.7	78,410
31-Dec-24	18,896	47.2	12.9	80,425
31-Dec-25	18,896	47.4	13.0	82,497
31-Dec-26	18,896	47.6	13.2	84,595
31-Dec-27	18,896	47.8	13.4	86,698
31-Dec-28	18,896	48.0	13.5	88,794
31-Dec-29	18,896	48.2	13.7	90,939
31-Dec-30	18,896	48.3	13.8	93,132
31-Dec-31	18,896	48.4	14.0	95,388
31-Dec-32	18,896	48.5	14.1	97,673
31-Dec-33	18,896	48.7	14.3	100,031
31-Dec-34	18,896	48.9	14.5	102,458
31-Dec-35	18,896	49.0	14.7	104,931
31-Dec-36	18,896	49.2	14.9	107,460
31-Dec-37	18,896	49.4	15.1	110,062
31-Dec-38	18,896	49.6	15.3	112,722
31-Dec-39	18,896	49.8	15.5	115,356

** These are average salaries in each year reflecting the expected salary increase. The inflationary component of actual salary increases for a particular simulation are adjusted to be consistent with the inflationary increase within that simulation.*

The following table contains the results of the deterministic projection, in particular the number of inactive members, along with the total expected benefits in payment to inactive members over the projection period. Note that inactive members include all members who are not active members (including but not limited to deferred vested members and pensioners). The benefit payments outlined in the table below do not include any future cost-of-living adjustments which may be granted.

Table C.6 – Projection Statistics for Inactive Members

Date	Number of Inactive Members	Inactive Benefits in Payment ($M)
31-Dec-20	20,295	$ 402
31-Dec-21	21,396	422
31-Dec-22	21,945	433
31-Dec-23	22,395	442
31-Dec-24	22,799	451
31-Dec-25	23,153	459
31-Dec-26	23,485	466
31-Dec-27	23,788	473
31-Dec-28	24,098	482
31-Dec-29	24,393	490
31-Dec-30	24,672	497
31-Dec-31	24,973	504
31-Dec-32	25,196	509
31-Dec-33	25,376	515
31-Dec-34	25,513	520
31-Dec-35	25,616	525
31-Dec-36	25,669	528
31-Dec-37	25,701	531
31-Dec-38	25,686	535
31-Dec-39	25,704	540

The following table contains the results of the deterministic projection, in particular the total liability at the beginning of each year. The total liability is further split by actives and inactives. The liabilities outlined in the table below are all calculated using the funding policy valuation discount rate and do not include the value of any future cost-of-living adjustments which may be granted.

Table C.7 – Projection of Funding Policy Actuarial Liabilities

Date	Total Liability ($M)	Active Liability ($M)	Inactive Liability ($M)
31-Dec-20	$ 7,376	$ 2,624	$ 4,752
31-Dec-21	7,453	2,487	4,966
31-Dec-22	7,527	2,484	5,043
31-Dec-23	7,598	2,501	5,097
31-Dec-24	7,669	2,528	5,141
31-Dec-25	7,740	2,568	5,172
31-Dec-26	7,813	2,614	5,198
31-Dec-27	7,887	2,667	5,220
31-Dec-28	7,961	2,706	5,255
31-Dec-29	8,035	2,753	5,282
31-Dec-30	8,111	2,810	5,301
31-Dec-31	8,189	2,873	5,316
31-Dec-32	8,269	2,948	5,322
31-Dec-33	8,354	3,035	5,319
31-Dec-34	8,445	3,136	5,309
31-Dec-35	8,542	3,244	5,298
31-Dec-36	8,647	3,370	5,277
31-Dec-37	8,762	3,505	5,257
31-Dec-38	8,887	3,651	5,235
31-Dec-39	9,019	3,772	5,247

Stochastic Model Projection Methodology

The economic assumptions and forecasted funding policy valuation liabilities outlined above are combined together to form an asset-liability model and used in a Monte Carlo simulation technique to model 10,000 series of alternative economic scenarios over 20 years (this exceeds the minimum requirements under the PBA of 1,000 series of economic scenarios for 20 years). This model is used to measure whether the Plan achieves its risk management goals.

For each of these scenarios and for each year, the financial position of the Plan is measured. For each of these measurements, a decision consistent with the funding deficit recovery plan or the funding excess utilization plan, as applicable, is modeled. Notably, only step 1 and step 2 of the funding excess utilization plan and steps 1

through 4 of the funding deficit recovery plan are modeled. When modeling the funding deficit recovery plan actions over the 20-year period of each economic scenario, each of the five steps identified in the funding deficit recovery plan under Section IV of the Funding Policy is implemented in sequence until such time as the Plan's open group funded ratio reaches 100% or higher. A "benefit reduction trial" is recorded (for purposes of the primary risk management goal calculation) when step 4 of the funding deficit recovery plan found in Section IV of the Funding Policy is triggered (i.e. a reduction in past base benefits) at any point in the 20-year period of an economic scenario. The primary risk management measure is therefore the proportion of those 10,000 scenarios that do not lead to a base benefit reduction over a 20-year period. In order to pass the primary risk management goal, at least 9,750 of those 10,000 scenarios must not trigger a "benefit reduction trial" at any point over the 20-year period.

For every year in the 20-year projection, passive investment management and non-investment expenses are deducted from the expected return to account for the payment of expenses from the Plan. We assume the additional cost of any active management activities is expected to be offset by additional returns over the expected returns shown above, and it is therefore not included in the analysis. The amount of annual expenses deducted from the expected return are outlined the following table.

Table C.8 – Annual Expenses Deducted From Projected Stochastic Returns

Expenses type	Annual expense
Passive investment management	0.08% of assets
Non-investment	0.05% of assets

For the purpose of the stochastic analysis, the funding policy valuation discount rate remains fixed at 4.75% per annum throughout the projection period. The funding policy valuation discount rate is used to project the funding policy valuation liability and determine the present value of excess contributions throughout the projection period. The projection of the liability and future cash flows under the stochastic analysis uses the same demographic assumptions as used for the calculation of the funding policy valuation liability, as required under paragraph 15(2)(c) of Regulation 2012-75.

Stochastic Model Projection Outputs

The following tables were prepared using the outputs of the stochastic projection model. They represent key portfolio statistics of return on assets net of investment expenses, total funding policy valuation liabilities, total market value of assets, and open group funded ratio. The distribution of results is summarized by the use of percentiles, mean, standard deviation, and Conditional Tail Expectation ("CTE"). The CTE reflects the average result of the worst-case scenarios for the indicated percentile.

The summary statistics shown in Table C.9 below for the Fund return are shown for each year as well as over a 20-year period.

Table C.9 – Distribution of Projected Fund Return (Net of Investment Expenses)

Plan Year (January 1 / December 31)	2.5% CTE	5% CTE	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile	Mean	Standard Deviation
2020	-7.09%	-5.73%	-3.66%	1.35%	5.07%	8.66%	13.95%	5.07%	5.37%
2021	-7.52%	-5.96%	-3.58%	1.66%	5.29%	9.03%	14.36%	5.33%	5.49%
2022	-7.85%	-6.33%	-4.07%	1.54%	5.19%	9.08%	14.42%	5.25%	5.58%
2023	-7.51%	-5.92%	-3.53%	1.86%	5.45%	9.15%	14.59%	5.49%	5.49%
2024	-7.77%	-6.17%	-3.72%	1.64%	5.38%	9.08%	14.32%	5.34%	5.52%
2025	-7.37%	-5.84%	-3.58%	1.85%	5.47%	9.15%	14.62%	5.52%	5.52%
2026	-7.13%	-5.71%	-3.46%	1.77%	5.45%	9.27%	14.50%	5.51%	5.50%
2027	-6.98%	-5.50%	-3.27%	1.94%	5.66%	9.38%	14.74%	5.66%	5.48%
2028	-7.23%	-5.74%	-3.45%	1.96%	5.67%	9.42%	14.76%	5.68%	5.53%
2029	-7.18%	-5.70%	-3.50%	1.96%	5.61%	9.46%	14.83%	5.69%	5.55%
2030	-6.38%	-4.86%	-2.62%	2.61%	6.30%	10.00%	15.17%	6.30%	5.45%
2031	-6.67%	-5.15%	-2.81%	2.61%	6.31%	10.06%	15.23%	6.29%	5.51%
2032	-7.04%	-5.37%	-2.80%	2.58%	6.29%	9.99%	15.28%	6.26%	5.54%
2033	-6.65%	-5.06%	-2.64%	2.64%	6.39%	10.02%	15.46%	6.35%	5.50%
2034	-6.57%	-4.96%	-2.51%	2.75%	6.33%	10.04%	15.36%	6.36%	5.44%
2035	-6.64%	-5.20%	-3.03%	2.59%	6.32%	9.99%	15.23%	6.26%	5.52%
2036	-6.33%	-4.87%	-2.61%	2.51%	6.21%	9.94%	15.31%	6.25%	5.47%
2037	-6.61%	-5.05%	-2.66%	2.53%	6.23%	10.00%	15.26%	6.30%	5.50%
2038	-6.69%	-5.13%	-2.75%	2.69%	6.30%	10.06%	15.24%	6.31%	5.48%
2039	-6.82%	-5.24%	-2.89%	2.62%	6.37%	10.10%	15.38%	6.32%	5.53%
Annualized average over 20 years	2.73%	3.08%	3.63%	4.88%	5.74%	6.61%	7.87%	5.74%	1.29%

The stochastic model projects a distribution of the total funding policy valuation liabilities and assets for the portfolio over the projection period. The liabilities include the value of cost-of-living adjustments granted up to each respective valuation year, and exclude any reduction in past base benefits.

Table C.10 – Distribution of Projected Total Funding Policy Valuation Liability ($ millions)

Date	2.5% CTE*	5% CTE*	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile	Mean	Standard Deviation
31-Dec-20	7,376	7,381	7,397	7,474	7,530	7,585	7,667	7,531	79
31-Dec-21	7,474	7,495	7,532	7,660	7,761	7,859	7,985	7,760	137
31-Dec-22	7,585	7,618	7,672	7,853	7,986	8,115	8,289	7,984	186
31-Dec-23	7,708	7,752	7,820	8,041	8,206	8,367	8,585	8,204	231
31-Dec-24	7,836	7,889	7,973	8,223	8,416	8,610	8,883	8,420	275
31-Dec-25	7,968	8,027	8,125	8,413	8,629	8,849	9,173	8,635	316
31-Dec-26	8,104	8,170	8,272	8,599	8,834	9,089	9,456	8,848	356
31-Dec-27	8,227	8,299	8,420	8,782	9,048	9,333	9,736	9,062	399
31-Dec-28	8,347	8,430	8,565	8,969	9,266	9,575	10,030	9,277	441
31-Dec-29	8,466	8,561	8,712	9,155	9,479	9,813	10,314	9,492	482
31-Dec-30	8,574	8,681	8,857	9,342	9,696	10,061	10,590	9,705	523
31-Dec-31	8,682	8,801	8,989	9,539	9,914	10,299	10,857	9,923	565
31-Dec-32	8,783	8,916	9,132	9,733	10,137	10,551	11,149	10,144	608
31-Dec-33	8,894	9,041	9,284	9,941	10,368	10,800	11,436	10,370	648
31-Dec-34	9,012	9,170	9,436	10,152	10,603	11,061	11,738	10,603	691
31-Dec-35	9,121	9,303	9,598	10,370	10,852	11,329	12,043	10,847	734
31-Dec-36	9,246	9,447	9,781	10,605	11,109	11,607	12,369	11,098	776
31-Dec-37	9,387	9,606	9,958	10,830	11,367	11,906	12,685	11,358	818
31-Dec-38	9,533	9,770	10,166	11,083	11,633	12,207	13,002	11,628	857
31-Dec-39	9,685	9,949	10,379	11,337	11,913	12,501	13,343	11,907	899

**Note that the CTE is calculated on the lowest liability scenarios, since scenarios where the liability is reduced due to the funding deficit recovery plan represent scenarios that have had more negative investment returns.*

The stochastic model produces a distribution of the market value of assets over the projection period. The following table shows a summary of the projected distribution for each year.

Table C.11 – Distribution of Projected Market Value of Assets ($ millions)

Date	2.5% CTE	5% CTE	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile	Mean	Standard Deviation
31-Dec-20	7,612	7,725	7,898	8,311	8,618	8,917	9,357	8,619	445
31-Dec-21	7,433	7,590	7,829	8,445	8,888	9,335	10,004	8,896	658
31-Dec-22	7,263	7,493	7,828	8,571	9,149	9,731	10,608	9,165	851
31-Dec-23	7,224	7,462	7,834	8,742	9,415	10,127	11,202	9,453	1,026
31-Dec-24	7,199	7,442	7,831	8,887	9,674	10,482	11,745	9,715	1,187
31-Dec-25	7,173	7,449	7,878	9,034	9,941	10,856	12,335	9,997	1,359
31-Dec-26	7,117	7,432	7,911	9,209	10,221	11,259	12,900	10,281	1,523
31-Dec-27	7,141	7,473	7,994	9,390	10,493	11,645	13,477	10,583	1,685
31-Dec-28	7,114	7,485	8,076	9,585	10,771	12,051	14,172	10,891	1,860
31-Dec-29	7,174	7,560	8,175	9,765	11,045	12,453	14,839	11,204	2,041
31-Dec-30	7,238	7,657	8,322	10,022	11,396	12,942	15,585	11,588	2,229
31-Dec-31	7,311	7,750	8,481	10,258	11,754	13,448	16,373	11,985	2,436
31-Dec-32	7,403	7,877	8,615	10,511	12,109	13,923	17,155	12,389	2,637
31-Dec-33	7,538	7,998	8,746	10,789	12,511	14,482	17,900	12,814	2,841
31-Dec-34	7,624	8,098	8,854	11,101	12,892	15,056	18,853	13,261	3,071
31-Dec-35	7,746	8,259	9,079	11,362	13,287	15,646	19,828	13,710	3,315
31-Dec-36	7,903	8,416	9,231	11,634	13,676	16,186	20,727	14,176	3,567
31-Dec-37	8,062	8,588	9,426	11,949	14,100	16,790	21,717	14,667	3,829
31-Dec-38	8,200	8,752	9,656	12,242	14,589	17,453	22,705	15,181	4,103
31-Dec-39	8,405	8,964	9,859	12,556	15,064	18,119	23,805	15,717	4,408

The stochastic model produces a distribution of the open group funded ratio over the projection period. The following table shows a summary of the projected distribution for each year, before any corrective action required under the funding deficit recovery plan of the Funding Policy.

Table C.12 – Distribution of Projected Open Group Funded Ratio

Date	2.5% CTE	5% CTE	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile	Mean	Standard Deviation
31-Dec-19	132%	132%	132%	132%	132%	132%	132%	132%	0%
31-Dec-20	117%	119%	121%	127%	131%	135%	141%	131%	6%
31-Dec-21	111%	113%	117%	125%	131%	137%	146%	131%	9%
31-Dec-22	107%	110%	114%	123%	130%	138%	150%	131%	11%
31-Dec-23	105%	107%	111%	121%	130%	139%	154%	131%	13%
31-Dec-24	103%	105%	109%	120%	130%	140%	157%	131%	15%
31-Dec-25	102%	104%	108%	119%	129%	141%	160%	131%	16%
31-Dec-26	100%	103%	107%	118%	129%	142%	163%	131%	17%
31-Dec-27	99%	102%	107%	118%	129%	143%	166%	132%	18%
31-Dec-28	98%	101%	106%	118%	129%	144%	169%	132%	20%
31-Dec-29	97%	101%	106%	117%	129%	145%	173%	133%	21%
31-Dec-30	97%	101%	106%	118%	130%	146%	176%	134%	22%
31-Dec-31	97%	101%	106%	118%	130%	148%	181%	135%	23%
31-Dec-32	97%	101%	106%	118%	131%	150%	184%	137%	25%
31-Dec-33	97%	101%	107%	119%	132%	152%	188%	138%	26%
31-Dec-34	97%	101%	106%	120%	133%	154%	192%	139%	27%
31-Dec-35	97%	101%	107%	119%	133%	156%	197%	141%	29%
31-Dec-36	98%	101%	107%	120%	134%	158%	202%	142%	31%
31-Dec-37	98%	102%	107%	120%	135%	160%	206%	143%	32%
31-Dec-38	98%	102%	108%	120%	136%	161%	211%	145%	34%
31-Dec-39	99%	102%	108%	120%	137%	163%	216%	146%	35%

The following table provides the projected cumulative indexing (or cost-of-living adjustments) granted over the years as a percentage of total cumulative inflation, as produced by the stochastic simulation.

Table C.13 - Projected Cumulative Indexing Granted as a Percentage of Cumulative Inflation

Date	2.5% CTE	5% CTE	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile	Mean	Standard Deviation
31-Dec-20	95%	97%	100%	100%	100%	100%	100%	100%	1%
31-Dec-21	77%	83%	92%	100%	100%	100%	100%	99%	4%
31-Dec-22	63%	71%	82%	100%	100%	100%	100%	98%	7%
31-Dec-23	52%	60%	74%	100%	100%	100%	100%	96%	10%
31-Dec-24	44%	52%	66%	99%	100%	100%	100%	95%	12%
31-Dec-25	37%	45%	59%	96%	100%	100%	100%	94%	14%
31-Dec-26	33%	41%	54%	93%	100%	100%	100%	92%	16%
31-Dec-27	29%	37%	49%	90%	100%	100%	100%	91%	17%
31-Dec-28	26%	34%	47%	89%	100%	100%	100%	90%	18%
31-Dec-29	24%	32%	45%	87%	100%	100%	100%	90%	19%
31-Dec-30	22%	30%	43%	85%	100%	100%	100%	89%	20%
31-Dec-31	20%	28%	41%	84%	100%	100%	100%	89%	20%
31-Dec-32	18%	27%	40%	84%	100%	100%	100%	88%	21%
31-Dec-33	17%	26%	40%	83%	100%	100%	100%	88%	21%
31-Dec-34	16%	25%	39%	83%	100%	100%	100%	88%	21%
31-Dec-35	15%	24%	40%	84%	100%	100%	100%	88%	21%
31-Dec-36	14%	24%	40%	84%	100%	100%	100%	88%	21%
31-Dec-37	14%	24%	40%	85%	100%	100%	100%	88%	21%
31-Dec-38	14%	24%	40%	85%	100%	100%	100%	89%	21%
31-Dec-39	13%	24%	40%	85%	100%	100%	100%	89%	21%

The following table is the average correlation matrix for the asset classes outlined in Table C.4. The matrix represents the correlations between asset classes produced by the stochastic simulation.

Table C.14 – Average Correlation Among Asset Classes

Asset Classes	Inflation	Short Term Assets	Real Return Bonds	Government Bonds	Corporate Bonds	Canadian Equities	Canadian Low Vol	Canadian small Cap	US Equities	Foreign Eq. Small Cap	EAFE Equities	Real Estate	Infrastructure	Private Equity	Absolute Return	US Low Vol	EAFE Low Vol	Emerging Market Low Vol
Inflation	1.00	0.16	0.09	0.02	0.03	0.07	0.05	0.01	-0.34	-0.31	-0.20	0.28	0.15	-0.14	0.07	-0.23	-0.14	0.02
Short Term Assets		1.00	0.03	0.37	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Real Return Bonds			1.00	0.56	0.53	-0.09	-0.06	-0.12	-0.05	-0.18	-0.17	0.15	-0.25	-0.05	-0.17	-0.04	-0.12	-0.15
Government Bonds				1.00	0.86	-0.28	-0.20	-0.21	-0.18	-0.16	-0.35	-0.31	-0.16	-0.18	-0.34	-0.13	-0.25	-0.28
Corporate Bonds					1.00	0.01	0.01	0.06	0.01	0.08	-0.10	-0.18	-0.20	0.02	-0.05	0.00	-0.07	-0.12
Canadian Equities						1.00	0.70	0.79	0.40	0.54	0.56	0.23	0.08	0.55	0.76	0.28	0.39	0.49
Canadian Low Vol							1.00	0.55	0.28	0.38	0.39	0.16	0.06	0.39	0.54	0.20	0.27	0.34
Canadian small cap								1.00	0.24	0.44	0.38	0.06	0.05	0.45	0.69	0.17	0.26	0.45
US Equities									1.00	0.78	0.74	0.10	-0.07	0.62	0.45	0.70	0.52	0.08
Foreign Eq. Small Cap										1.00	0.65	0.08	-0.04	0.56	0.51	0.54	0.45	0.18
EAFE Equities											1.00	0.24	-0.07	0.59	0.46	0.52	0.70	0.37
Real Estate												1.00	0.11	0.14	0.31	0.07	0.17	0.15
Infrastructure													1.00	-0.01	0.06	-0.05	-0.05	0.01
Private Equity														1.00	0.54	0.43	0.41	0.23
Absolute Return															1.00	0.31	0.32	0.39
US Low Vol																1.00	0.36	0.05
EAFE Low Vol																	1.00	0.26
Emerging Market Low Vol																		1.00

The disclosures in this report have been prepared in compliance with the Canadian Institute of Actuaries Standard of Practice, subsection 3270 - Disclosure for Stochastic Models Used to Comply with Specific Regulatory Pension Plan Funding Requirements.

Limitations of Analysis for Risk Management Tests

This report contains analysis and results that rely on assumptions about future events. While we believe that the model inputs and assumptions are reasonable at the time this report has been prepared, other reasonable model inputs and assumptions could be used, resulting in potentially very different distributions of forecasted outcomes.

Future events and actual experience will vary from the simulated outcomes produced with this analysis. As these differences arise, contribution levels and benefits payable under the Plan will be adjusted in accordance with the priorities set out under the Funding Policy.

It is not possible or practical to reflect every variable in a model that is based in the real world. Therefore, we use summary information, estimates, and simplifications to facilitate the modeling of future events. We also exclude factors or data that we consider immaterial.

The results presented in this report are not intended nor should they be interpreted to represent a guarantee or warranty with respect to the future financial condition of the Plan. Furthermore, any determination of probabilities based on the model represent simulated outcomes and should not be interpreted as being actual probabilities.

Appendix D – Summary of Plan Provisions

The following is a brief summary of the main provisions of the NBPSPP effective January 1, 2020. For an authoritative statement of the precise provisions of the NBPSPP, reference must be made to the official NBPSPP documents.

Introduction

Various unions, the Province of New Brunswick and the Minister of Finance, in his capacity as plan governor and administrator of the Former PSSA entered into a Memorandum of Understanding pursuant to which they agreed to convert the Former PSSA to the Public Service Shared Risk Plan ("PSSRP") effective on January 1, 2014. As of that date, the Public Service Superannuation Act ("Former PSSA") was repealed by An Act Respecting Pensions Under the Public Service Superannuation Act (New Brunswick) which provided that the Former PSSA be converted to a shared risk plan in accordance with Part 2 of the PBA.

Effective January 1, 2014, the PSSRP was administered by an independent Board of Trustees. As of April 2016, the PSSRP has been renamed the New Brunswick Public Service Pension Plan.

Eligibility and Participation

Each Member of the Former PSSA joined the NBPSPP on January 1, 2014. Active members of the Pension Plan for Part-Time and Seasonal Employees of the Province of New Brunswick who were eligible to join the PSSRP ceased active membership in the said plan and were required to join the NBPSPP as of January 1, 2014.

Each employee who commences full-time or part-time employment on or after January 1, 2014 is required to join the NBPSPP upon employment. Most of the other categories of employees must join when they become eligible in accordance with the minimum requirements of the PBA.

Members of the Legislative Assembly on September 23, 2014 and after are required to join the NBPSPP.

Required Contributions

Each member is required to contribute 7.5% of earnings up to the YMPE, plus 10.7% of earnings in excess of the YMPE.

The participating employers are required to contribute 11.25% of earnings. In addition, the employers make temporary contributions of 0.75% of earnings for a 10-year period starting January 1, 2014.

The YMPE is the Year's Maximum Pensionable Earnings under the Canada Pension Plan, and is equal to $58,700 in 2020.

Contribution rates are subject to change in accordance with triggers found under the Funding Policy for the NBPSPP.

Normal Retirement

The normal retirement date is the first day of the month following the member's sixty-fifth birthday.

A member's annual normal retirement pension is equal to the sum of:

A. In respect of service before January 1, 2014, the product of:

   i. The number of years of the member's pensionable service before January 1, 2014, and

   ii. 1.3% of the annual average of the best five (5) consecutive years of earnings at January 1, 2014, up to the annual average YMPE for the 3 years prior to January 1, 2014, plus 2.0% of the excess of the annual average of the best five (5) consecutive years of earnings at January 1, 2014 over the annual average YMPE for the 3 years prior to January 1, 2014;

and

B. In respect of service from January 1, 2014, the sum of (i) and (ii) for each calendar year (or pro-rated for a portion thereof):

   i. 1.4% of the Member's annualized earnings for the calendar year, up to the YMPE for the calendar year; and

   ii. 2.0% of the portion of the Member's annualized earnings for the calendar year that are in excess of the YMPE for the calendar year.

Pensions accrued above are subject to cost-of-living adjustments, before and after retirement, every January 1st following January 1, 2014, subject to approval by the Board of Trustees, and in accordance with the trigger requirements found under the Funding Policy for the NBPSPP.

The following cost-of-living adjustments have been granted by the Board of Trustees based on the results of the actuarial valuation preceding the effective date of the adjustment and the terms of the Funding Policy.

Table D.1 – Cost of Living Adjustments

Effective Date	Cost of Living Adjustment
January 1, 2015	1.43%
January 1, 2016	1.49%
January 1, 2017	1.40%
January 1, 2018	1.47%
January 1, 2019	1.88%
January 1, 2020	2.12%

Normal and Optional Forms of Pension

The normal form of pension is a pension payable in equal monthly installments commencing on the member's pension commencement date and continuing thereafter during the lifetime of the member. For a member with a spouse or common-law partner at the time of the member's death, 50% of the member's pension (before application of reductions for early retirement) continues to such spouse or common-law partner in equal

monthly installments for the life of the spouse or common-law partner. Should the member have dependent children at the time of his/her death, such dependent children may be entitled to a pension if there is no spouse or common-law partner or after the death of such spouse or common-law partner. A minimum amount of pension equal to the member's own contribution with interest to retirement will be payable in total. Optional forms of pension are also available on an actuarially equivalent basis.

Early Retirement and Bridge Benefit

Early retirement is permitted on or after age 55 if the member has at least 5 years of employment or 2 years of plan membership.

On early retirement, an annual bridge benefit is payable in addition to the lifetime pension found under "Normal Retirement". The annual bridge benefit is payable to age 65 or to the death of the member, if earlier, and is equal to the sum of:

A. In respect of service before January 1, 2014, the product of:

   i. The number of years of the member's pensionable service before January 1, 2014, and

   ii. 0.7% of the annual average of the best five (5) consecutive years of earnings at January 1, 2014 up to the annual average YMPE for the 3 years prior to January 1, 2014;

and

B. In respect of service from January 1, 2014, for each calendar year (or pro-rated for a portion thereof), 0.6% of the Member's annualized earnings for the calendar year up to the YMPE for the calendar year.

The portions of the lifetime pension and bridge benefit accrued for service before January 1, 2014 are unreduced if the pension and bridge commence to be paid at age 60 or later. If such pension and bridge commence to be paid before age 60, they are each reduced by 1/4% per month (3% per year) that the pension and bridge commencement date precedes the first day of the month following age 60.

The portions of the lifetime pension and bridge benefit accrued for service on and after January 1, 2014 are reduced by 5/12% for each month (5% per year) that the pension and bridge commencement date precede the first day of the month following age 65.

Benefits on Termination of Employment

If a member terminates employment prior to completing five years of continuous employment and prior to completing two years of plan membership, the member is entitled to a refund of the total amount of his/her contributions to the NBPSPP and Former PSSA, if any, with interest.

If a member terminates employment before age 55 but after completing at least five years of continuous employment or two years of plan membership, the member may elect to:

i. receive a deferred lifetime pension payable from normal retirement date equal to the accrued pension to which the member is entitled as at his/her date of termination in accordance with the formula specified above for the normal retirement pension; or

ii. transfer the termination value of the deferred lifetime pension calculated in accordance with the PBA, to a registered retirement savings arrangement as allowed under the PBA.

Members electing a deferred lifetime pension will also be entitled to retire early in accordance with the "Early Retirement" section, and will also be eligible for a bridge benefit.

Death Benefits

If a member dies prior to completing five years of continuous employment and prior to completing two years of plan membership, the benefit payable is a refund of the member's own contributions to the NBPSPP and Former PSSA, if any, with interest.

If the member dies after completing at least five years of continuous employment or two years of plan membership, but before pension commencement, the death benefit is as follows:

i. If there is a spouse or common-law partner:

- The Termination Value, as defined under the PBA; or
- Pension of 50% of the accrued lifetime pension;

ii. If there is no spouse or common-law partner, but there are dependent children designated as beneficiaries:

- Pension of 50% of the accrued lifetime pension split equally among dependent children until they no longer qualify as dependent;

iii. If there is no spouse or common-law partner and no dependent children designated as beneficiaries:

- The Termination Value, as defined under the PBA, payable to the designated beneficiary(ies) or estate.

Any amount by which the Termination Value, as defined under the PBA, exceeds the aggregate of all pension payments made above, shall be paid to the designated beneficiary(ies) or estate.

In the event of death after pension commencement, the benefit payable is determined in accordance with the form of pension selected by the member at retirement.

Primary Purpose, Benefit Security and Cost-of-living Adjustments

The primary purpose of the NBPSPP is to provide pensions to eligible employees after retirement and until death in respect of their service as employees. A further purpose of this NBPSPP is to provide secure pension benefits to members without an absolute guarantee but with a risk-focused management approach delivering a high degree of certainty that full base benefits will be payable in the vast majority of potential future economic scenarios. As a shared risk plan, all future cost-of-living adjustments and other ancillary benefits under the NBPSPP shall be provided only to the extent that funds are available for such benefits, as determined by the Board of Trustees in accordance with applicable laws and the Funding Policy.

Appendix E – Summary of Funding Policy

The following is a brief summary of the main provisions of the Funding Policy for the NBPSPP effective January 1, 2020. For an authoritative statement of the precise provisions of the Funding Policy, reference must be made to the official document.

Purpose of the Plan and Funding Policy

The purpose of the NBPSPP is to provide secure pension benefits to members and former members without an absolute guarantee, but with a risk focused management approach delivering a high degree of certainty that base benefits can be met in the vast majority of potential future economic scenarios.

The primary focus is to provide a highly secure base lifetime pension at normal retirement age. However, the intention is that additional benefits may be provided depending on the financial performance of the NBPSPP.

The Funding Policy is the tool used by the Board of Trustees to manage the risks inherent in a shared risk plan. The Funding Policy provides guidance and rules regarding decisions that must, or may be made by the Board of Trustees around funding levels, contributions and benefits.

Risk Management

In accordance with legislation on shared risk plans, the primary risk management goal is to achieve a 97.5% probability that past base benefits at the end of each year will not be reduced over a 20-year period.

In addition, secondary risk management goals are to provide, on average, contingent indexing on base benefits for service rendered on or before the conversion date in excess of 75% of the indexation provided under the pre-conversion plan over a 20-year period, as well as to provide, on average over a 20-year period, other ancillary benefits that exceed 75% of the value of the ancillary benefits described in the Plan text at conversion.

Contributions

The initial employee contribution rate is equal to 7.5% of earnings up to the YMPE and 10.7% of earnings above the YMPE while the initial employer contribution rate is set at 11.25% of earnings. During the first 5 years after conversion, employers shall make temporary additional contributions at the rate of 0.5% of earnings as well as a further 0.75% of earnings for the first 10 years following conversion. These temporary contributions are to stop if the NBPSPP achieves an open group funded ratio of 140%.

The above-mentioned initial contribution rates may be adjusted by the Board of Trustees. A total contribution increase of up to 3% of earnings (1.5% each for employee and employer contributions) is to be triggered by the Board of Trustees if the open group funded ratio of the NBPSPP, as defined by the PBA, falls below 100% for two successive year ends until such time as the open group funded ratio reaches 110% without considering the effect of the contribution increase and the funding goal under regulation is met.

A reduction in contributions of up to 0.5% of earnings for employees and 3.5% of earnings for the employers can be triggered by the Board of Trustees (subject to employers never contributing less than employees) if the conditions set forth in the funding excess utilization plan are met, and the open group funded ratio is at least 140%.

If, at any time, there is an increase or a decrease in employees employed by the employer of more than 5% in a given year, the initial contribution rates shall be re-calculated.

Finally, effective as of the date 15 years after the conversion, the employee and employer contributions shall be set such that the total initial contributions remitted are shared equally between the employees and employers.

Funding Deficit Recovery Plan

The funding deficit recovery plan must be implemented by the Board of Trustees if the open group funded ratio falls below 100% for two successive plan year-ends and after implementing the 3% maximum total increase in contribution discussed above.

The funding deficit recovery plan consists of the following actions in the order of priority as listed below:

1. Change retirement rules for service on or after the conversion date for non-vested members to a full actuarial reduction for retirement before age 65;
2. Change retirement rules for service prior to the conversion date for non-vested members to a full actuarial reduction for retirement before age 60;
3. Reduce base benefit accrual rates for future service after the date of implementation of the funding deficit recovery plan by not more than 5%;
4. Reduce base benefits on a proportionate basis for all members regardless of membership status for both past and future service in equal proportions.

The above actions shall be taken one by one and when the funding goal under regulation is met, no further actions are required at that time.

The base benefit reduction in point 4, if required, shall be such that the funding goals under the Regulations for such purposes are achieved.

Changes set out under points 1 through 3 shall take effect no later than 12 months following the date of the funding policy valuation report that triggered the need for the changes. Base benefit reductions described in point 4 shall take effect no later than 18 months following the date of the funding policy valuation report that triggered the need for the action.

Funding Excess Utilization Plan

The funding excess utilization plan describes the actions the Board of Trustees must take or consider when the open group funding levels exceeds 105%.

The amount available for utilization is as follows:

- 1/6th of the excess funds that make up the difference between the open group funding level at the valuation date (to a maximum of 140%) and 105%; plus
- 100% of the excess above 140%, if any.

If base benefits and/or ancillary benefits have been reduced, all excess available for utilization must first be used to reinstate those reductions. Afterwards, the following actions are to be taken in the following order of priority:

1. Provide indexing of base benefits up to the full CPI since the last date where full CPI was achieved.

2. Apply total contribution reduction adjustment of up to 4% of earnings, provided the open group funded ratio is over 140%.

3. Establish a reserve to cover the next 10 years of potential contingent indexing.

4. If steps 1 through 3 have been taken, the Board of Trustees can propose other benefit changes provided such benefit changes meet the criteria outlined in the funding excess utilization plan.

Except for the timing of contribution reductions, the timing of the above actions shall be the first of the year that is 12 months after the date of the funding policy valuation report that triggered the actions.

Actuarial Assumptions

A funding policy actuarial valuation shall be conducted by the Plan's actuary at December 31st of each year. The discount rate is 4.75% per year and shall remain in effect for the first two actuarial valuation reports filed following the conversion report hence until the January 1, 2016 actuarial valuation. The Board of Trustees may consider a change in the discount rate for subsequent funding policy actuarial valuations.

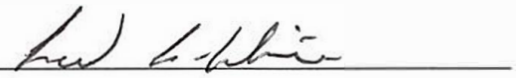
Other assumptions may be changed by the Board of Trustees as experience evolves.

Appendix F – Plan Administrator Confirmation Certificate

With respect to the Actuarial Valuation Report of the Public Service Pension Plan as at January 1, 2020, I hereby confirm that to the best of my knowledge:

- The data regarding Plan members and beneficiaries provided to Morneau Shepell as at January 1, 2020 constitutes a complete and accurate description of the information contained in the files;
- Copies of the official Plan text, Funding Policy and Statement of Investment Policies of the NBPSPP and all amendments to date were provided to Morneau Shepell; and
- There are no subsequent events or any extraordinary changes to the Plan membership as at January 1, 2020, which would materially affect the results.

The NBPSPP Board of Trustees

Signature: 

Name: Leonard Lee-White

Title: Chairperson

Date: July 30, 2020

Morneau Shepell is the only human resources consulting and technology company that takes an integrated approach to employee well-being to meet health, benefits and retirement needs. The Company is the largest administrator of retirement and benefits plans and the largest provider of integrated absence management solutions in Canada. LifeWorks by Morneau Shepell is the leading total well-being solution that combines employee assistance, wellness, recognition and incentive programs. As a leader in strategic HR consulting and innovative pension design, the Company also helps clients solve complex workforce problems and provides integrated productivity, health and retirement solutions.

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