Actuarial Report
(28th)

supplementing the Actuarial Report on the

CANADA PENSION PLAN

As at 31 December 2015

Office of the Superintendent of Financial Institutions Canada
Bureau du surintendant des institutions financières Canada
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Canada

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26 October 2016

The Honourable William F. Morneau, P.C., M.P.
Minister of Finance
House of Commons
Ottawa, Canada
K1A 0A6

Dear Minister:

In accordance with subsections 115(2) and 115(3) of the *Canada Pension Plan*, which provides that an actuarial report shall be prepared whenever a Bill is introduced in the House of Commons to amend the *Canada Pension Plan*, I am pleased to submit the 28th Actuarial Report on the Canada Pension Plan.

Yours sincerely,

Jean-Claude Ménard

Jean-Claude Ménard, F.S.A., F.C.I.A.
Chief Actuary

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Executive Summary

This is the 28th Actuarial Report on the Canada Pension Plan since the inception of the Canada Pension Plan (CPP or the Plan) in 1966. It has been prepared in compliance with subsections 115(2) and (3) of the *Canada Pension Plan*, which provide that:

> "(2) In addition to any report required under subsection (1) and in accordance with a request of the Minister of Finance, whenever any Bill is introduced in the House of Commons to amend this Act in a manner that would in the opinion of the Chief Actuary materially affect any of the estimates contained in the most recent report made under that subsection, the Chief Actuary shall prepare a report as set out in subsection (3).
>
> (3) A report that is prepared under subsection (2) in respect of a Bill shall set out the extent to which the Bill would, if enacted by Parliament, materially affect any of the estimates contained in the most recent report made under subsection (1), using the same actuarial assumptions and basis that were used in that report and using, in addition, other actuarial assumptions and another basis if the Chief Actuary is of the opinion that these other actuarial assumptions and the other basis more accurately reflect a change in demographic or economic circumstances since the most recent report made under subsection (1) was prepared."

The most recent report made pursuant to Section 115(1) was the 27th Actuarial Report on the Canada Pension Plan as at 31 December 2015 (the "27th Report"), which was tabled in the House of Commons on 27 September 2016. Therefore, this 28th Actuarial Report supplementing the Actuarial Report on the Canada Pension Plan as at 31 December 2015 (the "28th Report") has been prepared on the basis of the 27th Report to show the effect of Bill C-26 on the long-term financial state of the Plan.

Part 1 of Bill C-26, an Act to amend the *Canada Pension Plan*, the *Canada Pension Plan Investment Board Act* and the *Income Tax Act*, amends the CPP legislation to, among other things:

- increase the amount of the retirement pension, as well as the survivor's and disability pensions and the post-retirement benefit, subject to the amount of additional contributions made and the number of years over which those contributions are made;
- increase the maximum level of pensionable earnings by 14% as of 2025;
- provide for the making of additional contributions, beginning in 2019;
- provide for the creation of the Additional Canada Pension Plan Account and the accounting of funds in relation to it; and
- include the additional contributions and increased benefits in the financial review provisions of the Act and authorize the Governor in Council to make regulations in relation to those provisions.

In accordance with clause 40 of Bill C-26, the additional Canada Pension Plan refers to the portion of benefits introduced by the Bill and all contributions in respect of those portions of benefits. The base Canada Pension Plan refers to the part of the Canada Pension Plan relating to benefits and contributions under the *Canada Pension Plan*, other than those included in the additional CPP. For the purpose of this Report, references to the CPP or Plan without any qualifier shall mean the whole plan, i.e. both the base and additional parts. Further, all references to the first additional contribution rate for the year 2023 and thereafter recognize that the first additional contribution rate is phased-in over the period 2019 to 2023.

Main Findings

The main findings of the actuarial projections of the financial state of the additional Canada Pension Plan presented in this Report are as follows.

- With the legislated first and second additional contribution rates of 2.0% for 2023 and thereafter and 8.0% for 2024 and thereafter, respectively, contributions for the additional CPP are projected to be higher than expenditures up to the year 2058 inclusive.

- With the legislated first and second additional contribution rates of 2.0% for 2023 and thereafter and 8.0% for 2024 and thereafter, assets of the additional CPP are expected to increase rapidly over the first several decades as contributions are projected to exceed expenditures. The additional CPP assets are projected to grow from $1.5 billion at the end of 2019 to $70 billion by 2025, $196 billion by 2030, and $1,330 billion by 2050.

- Due to the financing approach of the additional Plan, investment income will become the major source of revenues for the additional Plan. With the legislated first and second additional contribution rates of 2.0% for 2023 and thereafter and 8.0% for 2024 and thereafter, investment income is projected to represent about 70% of revenues of the additional CPP by 2075.

- The minimum first and second additional contribution rates are determined in accordance with the financing objective of the additional CPP, which requires that the projected additional contributions and investment income should be sufficient to fully pay the projected additional expenditures over the long term.

- The minimum first additional contribution rate applicable to contributory earnings up to the Year's Maximum Pensionable Earnings (YMPE) is 1.93% for the year 2023 and thereafter, with the rate phased in over the period 2019 to 2023. This rate is lower than the legislated first additional contribution rate of 2.0% for 2023 and thereafter.

- The minimum second additional contribution rate applicable to contributory earnings over the YMPE and up to Year's Additional Maximum Pensionable Earnings (YAMPE) is 7.72% for the year 2024 and thereafter. This rate is lower than the legislated second additional contribution rate of 8.0% for 2024 and thereafter.

- With the minimum first additional contribution rate of 1.93% applicable for 2023 and thereafter, and the minimum second additional contribution rate of 7.72% applicable for 2024 and thereafter, the additional Plan assets are expected to increase significantly but to a lower level than under the legislated first and second additional contribution rates.

- Under the minimum first additional contribution rate of 1.93% applicable for 2023 and thereafter, and the minimum second additional contribution rate of 7.72% applicable for 2024 and thereafter, the additional CPP assets, determined under an open group approach, represent 106% of its open group actuarial liability as at 1 January 2019.
- The ratio of additional CPP assets to the following year's additional expenditures is projected to be higher than 25 throughout the projection period.
- The additional CPP assets are assumed to be invested in a less volatile investment portfolio compared to the assets of the base CPP. Therefore, the average annual real rate of return on the additional Plan's assets over the 75-year period 2019 to 2093 is expected to be 3.55% compared to 3.98% for the base CPP assets over the same period.
- The projected number of contributors to the additional CPP is the same as under the 27th Report, since an individual cannot contribute to the additional Plan without also contributing to the base Plan. The number of contributors under the Plan (base and additional) is expected to grow from 14.3 million in 2019 to 15.0 million by 2025, and 17.8 million by 2050. Under the legislated first and second additional contribution rates of 2.0% and 8.0%, respectively, additional contributions are expected to increase from $1.6 billion in 2019 to $17 billion in 2025 and $44 billion in 2050.
- The number of beneficiaries of additional retirement benefits is expected to increase from 0.2 million in 2019 to 1.9 million in 2025, and 9.3 million in 2050.
- The significant reliance of the additional CPP on investment income as a source of revenues results in a high level of sensitivity of the contribution rates to financial market environments. If the assumed best-estimate real rate of return is decreased by 1.0% for each year over the projection period, the minimum first and second additional contribution rates would increase from 1.93% to 2.55% for the year 2023 and thereafter, and from 7.72% to 10.20% for 2024 and thereafter, respectively. This represents a relative increase of 32%. Conversely, if the best-estimate real rate of return is increased by 1.0% for each year in the projection period, the minimum first and second additional contribution rates would decrease to 1.53% and 6.12%, respectively, representing a relative decrease of 21%.
- Assuming a permanent decrease of 14 basis points in the real rate of return (i.e. from best-estimate 75-year average 3.55% to 3.41%) would increase the minimum additional contribution rates to the level of the legislated rates of 2.0% and 8.0%. This represents a relative increase of about 3.6%. Under the base CPP, the same change in the expected real rate of return would increase the minimum contribution rate from 9.79% to 9.89%, a relative increase of only 1.0%. In other words, the same change in the expected rate of return causes a relative increase in the contribution rates about four times higher for the additional CPP than the base CPP.

This report confirms that if the *Canada Pension Plan* is amended as per Part 1 of Bill C-26, a legislated first additional contribution rate of 2.0% for the year 2023 and thereafter, and a legislated second additional contribution rate of 8.0% for the year 2024 and thereafter, result in projected contributions and investment income that are sufficient to fully pay the projected expenditures of the additional Plan over the long term.

I. Introduction

This report has been prepared in compliance with subsections 115(2) and (3) of the *Canada Pension Plan*, which provide that:

> “(2) In addition to any report required under subsection (1) and in accordance with a request of the Minister of Finance, whenever any Bill is introduced in the House of Commons to amend this Act in a manner that would in the opinion of the Chief Actuary materially affect any of the estimates contained in the most recent report made under that subsection, the Chief Actuary shall prepare a report as set out in subsection (3).
>
> (3) A report that is prepared under subsection (2) in respect of a Bill shall set out the extent to which the Bill would, if enacted by Parliament, materially affect any of the estimates contained in the most recent report made under subsection (1), using the same actuarial assumptions and basis that were used in that report and using, in addition, other actuarial assumptions and another basis if the Chief Actuary is of the opinion that these other actuarial assumptions and the other basis more accurately reflect a change in demographic or economic circumstances since the most recent report made under subsection (1) was prepared.”

The most recent report made pursuant to Section 115(1) was the 27th Actuarial Report on the Canada Pension Plan as at 31 December 2015 (the “27th Report”), which was tabled in the House of Commons on 27 September 2016. Therefore, this 28th Actuarial Report supplementing the Actuarial Report on the Canada Pension Plan as at 31 December 2015 (the “28th Report”) has been prepared on the basis of the 27th Report to show the effect of Bill C-26 on the long-term financial state of the Plan.

In particular, in accordance with clauses 52 (2) and (3) of Bill C-26, this report

- presents the projected additional Canada Pension Plan revenues and expenditures under the legislated additional contribution rates, and

- specifies the minimum first and second additional contribution rates that result in projected additional contributions and investment income that are sufficient to fully pay the projected expenditures of the additional CPP.

In accordance with subsection 114(4) of the *Canada Pension Plan*, the provisions of an amending Bill shall come into force:

> “…only on a day to be fixed by order of the Governor in Council, which order may not be made and shall not in any case have any force or effect unless the lieutenant governor in council of each of at least two thirds of the included provinces, having in the aggregate not less than two thirds of the population of all of the included provinces, has signified the consent of that province to the enactment.”

II. Description of Part 1 of Bill C-26

On 20 June 2016, the federal and provincial Ministers of Finance agreed in principle to a CPP enhancement with the following design features:

- A target replacement rate for additional retirement benefits of 8.33% of the adjusted career-average earnings below the Year's Maximum Pensionable Earnings (the "YMPE"), and 33.33% on adjusted career-average earnings between the YMPE and 114% of the YMPE.
- A gradual seven-year phase-in of the expansion to begin on January 1, 2019 consisting of a:
    - five-year contribution rate phase in below the YMPE, followed by a
    - two-year phase in of the upper earnings limit.

Part 1 of Bill C-26 amends the *Canada Pension Plan* in accordance with this agreement in principle. These amendments are described as follows.

Definitions

In accordance with clause 40 of Bill C-26, the additional Canada Pension Plan refers to the portion of benefits introduced by this Bill and all contributions in respect of those portions of benefits. The base Canada Pension Plan refers to the part of the Canada Pension Plan relating to benefits and contributions under the *Canada Pension Plan*, other than those included in the additional CPP.

First and Second Additional Contributory Periods

The first additional contributory period is the number of months from 1 January 2019 or attainment of age 18, if later, to the earliest of the month in which the contributor dies, the month before the one in which the retirement pension commences and the month before the one in which the contributor reaches 70 years of age.

The second additional contributory period is the number of months from 1 January 2024 or attainment of age 18, if later, to the earliest of the month in which the contributor dies, the month before the one in which the retirement pension commences and the month before the one in which the contributor reaches 70 years of age.

Year's Additional Maximum Pensionable Earnings (YAMPE)

A new upper earnings limit, Year's Additional Maximum Pension Earnings, is introduced. The YAMPE for a calendar year is the limit to which employment and self-employment earnings are subject to second additional contributions. The YAMPE is set at 107% of the YMPE in 2024, and at 114% of the YMPE in 2025 and thereafter. If the amount so calculated is not a multiple of $100, the next lower multiple of $100 is used.

Contribution Rates

The first additional and second additional contribution rates are introduced and defined in Schedule 2 of the legislation. The first additional contribution rate applies on earnings between the Year's Basic Exemption (YBE) and the YMPE. The first additional combined employer-employee contribution rate is equal to 2.0% for the year 2023 and thereafter. The first additional contribution rate during the phase-in period from 2019 to 2023 is shown in Table 1.

The second additional contribution rate applies on earnings between the YMPE and YAMPE. The second additional combined employer-employee contribution rate is equal to 8.0% for the year 2024 and thereafter.

Employees and employers pay equal shares of the first and second additional contribution rates, and the self-employed pay the full rates.

Table 1 Legislated Combined First and Second Additional Contribution Rates

Year	First Additional Rate (%)	Second Additional Rate (%)
2019	0.3	-
2020	0.6	-
2021	1.0	-
2022	1.5	-
2023	2.0	-
2024+	2.0	8.0

Additional Retirement Benefits

The calculation of the additional CPP retirement benefit is based on the first and second additional monthly pensionable earnings. The first additional monthly pensionable earnings are equal to the total of the highest 480 (or the number of months in the first additional contributory period, if lower) monthly adjusted pensionable earnings up to the YMPE for months in the first additional contributory period, divided by 480. Similarly, the second additional monthly pensionable earnings are equal to the total of the highest 480 (or the number of months in the second additional contributory period, if lower) monthly adjusted pensionable earnings between the YMPE and the YAMPE for months in the second additional contributory period, divided by 480. In other words, the above calculations provide for a monthly accrual of 1/480 of the total benefit which, in turn, is based on the best 480 months of relevant earnings.

The additional monthly retirement benefit is calculated as the sum of 8.33% of the first additional monthly pensionable earnings and 33.33% of the second additional monthly pensionable earnings.

The pensionable earnings used for the calculation of additional retirement benefits are adjusted to the date of retirement in the same way as for the base CPP. That is, the contributor’s pensionable earnings for any given month are indexed by the ratio of the average of the YMPE for the year of retirement and the four previous years, referred to as the Maximum Pensionable Earnings Average (MPEA), for the year of retirement to the YMPE for the year to which the given month belongs.

Further, to account for the lower first additional contribution rates in years 2019 to 2022, the pensionable earnings used to determine the first additional monthly pensionable earnings are multiplied by 0.15 in 2019, 0.30 in 2020, 0.50 in 2021 and 0.75 in 2022.

As for the base CPP, the additional CPP allows for take-up of retirement benefits between the ages of 60 and 70. The actuarial adjustment factors used for the additional CPP are the same as for the base CPP.

Additional Post-Retirement Benefits

In line with the base CPP, individuals under the age of 65 who receive either a CPP or QPP retirement pension and continue to work in Canada outside of Québec are required, along with their employers, to contribute to the additional Plan. Working beneficiaries aged 65 to 69 are not required to contribute, but are given the option to contribute to the base and additional Plans. Employers of those working beneficiaries opting to contribute after age 65 are also required to contribute.

The additional contributions paid by working beneficiaries provide for an additional post-retirement benefit that is earned at a rate of 1/40 of the maximum additional retirement pension per year of additional contributions and is adjusted for the earnings level and age of the contributor. Additional contributions paid by working beneficiaries do not affect eligibility for other CPP benefits.

An additional post-retirement benefit becomes payable the year following the year in which the additional contributions are made, and multiple post-retirement benefits may accumulate over time.

Additional Disability Benefits

The eligibility requirements for the additional disability benefit are those of the base CPP. That is, a contributor is deemed to be eligible to the additional CPP disability benefit if they are eligible to the base CPP disability benefit.

The additional disability benefit is strictly earnings-related, and is equal to 75% of the additional retirement pension that would be payable at the onset of disability if the first and second additional contributory period ended on that date and no actuarial adjustment applied. The automatic conversion of an additional disability benefit into an additional retirement pension at age 65 is based on the pensionable earnings at the time of disablement, price-indexed to age 65. In other words, the indexing from the time of disablement to age 65, which determines the initial rate of the additional retirement pension, is in line with increases in prices rather than wages, as is the case under the base CPP.

Additional Survivor Benefits

The eligibility requirements for the additional CPP survivor benefit are those of the base CPP. That is, a contributor is deemed to be eligible to the additional survivor benefit if they are eligible to the base CPP survivor benefit.

The additional survivor benefit is strictly earnings-related. The amount for survivors below age 65 is equal to 37.5% of the additional retirement benefit that would be payable at the time of death of the contributor if the first additional and second additional contributory period ended on that date and no actuarial adjustment applied. As for the base CPP, the additional survivor pension may be reduced because of age, the survivor’s disability status or the presence of dependent children. For survivors aged 65 and over, the additional survivor benefit is equal to 60% of either the additional retirement pension of the deceased contributor if they had been receiving a pension, or the additional retirement pension that would have been payable to the deceased contributor if the first and second contributory period had ended at the time of death, with no actuarial adjustment in either case.

Combined Benefits Rules

The combined benefits rules apply in the case where both additional disability and survivor benefits or both additional retirement and survivor benefits are payable. These rules result in lower overall amounts of additional survivor benefits payable.

The combined benefits rules of the additional CPP are the same as for the base CPP with one exception. Under the base CPP, there is a cap on combined benefits, which is the maximum value of the largest pension received (either disability or retirement). This cap is not applied to additional combined benefits.

Adjustment for Inflation

As for the base CPP, additional CPP benefits are increased in accordance with inflation each January 1st.

III. Best-estimate Assumptions Related to Amendments

The financial projections presented in this report are based on the best-estimate assumptions of the 27th Report modified to reflect the proposed amendments of Part 1 of Bill C-26. The following describes these modifications.

A. Investment Assumptions

The Canada Pension Plan Investment Board (CPPIB) invests base CPP funds according to its own investment policies which take into account the needs of contributors and beneficiaries, as well as financial market constraints. It is expected that a separate investment policy will be developed by the CPPIB with respect to the additional CPP assets. Since at the time of the preparation of the 28th Report there is no such separate investment policy in existence, the real rate of return assumption was developed to reflect the financing objective of the additional Plan. As the actual CPPIB investment strategy for the additional CPP assets becomes known, it will be reflected in subsequent actuarial reports by revising the real rate of return assumption.

As discussed in more detail in Section IV-C, the difference in financing approaches between the base and additional Plans results in a higher reliance of the additional CPP on investment income. Therefore, the additional CPP contribution rates are much more sensitive to investment experience, both negative and positive. In order to mitigate the risk of changes in the additional CPP contribution rates and benefits, it is assumed for the purpose of the 28th Report that the additional CPP assets will be invested in a portfolio that has a lower volatility than the assumed investment portfolio of the base CPP, and, thus, will generate lower returns. The assumed lower volatility portfolio of the additional Plan is constructed by adjusting the asset mix of the assumed investment portfolio developed for the 27th Report.

For both the 27th and 28th Reports, the investments have been grouped into three broad categories: equities, fixed income securities, and real assets. Equities consist of Canadian, foreign developed market, and emerging market equities. Fixed income securities consist of federal, provincial and corporate bonds, and short-term investments. Real assets include such categories as real estate and infrastructure.

The assumed asset mix of the additional Plan for the year 2019 and thereafter shown in Table 2 is equivalent to a portfolio invested 50% in equities and 50% in fixed income securities, assuming real assets behave half like equities and half like fixed income securities. In comparison, the ultimate asset mix for the base CPP developed for the purpose of the 27th Report is equivalent to a portfolio invested 67.5% in equities and 32.5% in fixed income securities. As a result, the additional CPP portfolio's volatility (one-year standard deviation) is 9.2%, which is lower than the volatility of 11.4% of the base CPP portfolio.

Table 2 Asset Mix of the Additional CPP Portfolio (2019 and thereafter)

Asset Class	Allocation
	(%)
Equity	37.5
Fixed Income Securities	37.5
Real Assets	25.0

The assumed long-term real rate of return on additional CPP assets takes into account the assumed asset mix of investments as well as the assumed real rates of return for all categories of additional CPP assets. For the purpose of this report, the assumed real rates of return before investment expenses for all assets categories, as well as the investment expenses, are the same as developed for the 27th Report.

The resulting nominal and real rates of return net of all expenses for the additional and base CPP for each projection year starting in 2019 are shown in Table 3. The assumed best-estimate real rates of return for the year 2025 and thereafter are 3.63% for the additional CPP and 4.03% for the base CPP. The projected average annual real rates of return over the 75 years from 2019 to 2093 are 3.55% for the additional CPP and 3.98% for the base CPP. The projected nominal rates of return are the sum of the real rates of return and the assumed level of inflation.

Table 3 Annual Rates of Return on Additional CPP and Base CPP Assets
(net of all expenses)

	Additional CPP		Base CPP	
Year	**Nominal**	**Real**	**Nominal**	**Real**
	(%)	(%)	(%)	(%)
2019	4.12	2.12	5.07	3.07
2020	4.45	2.45	5.38	3.38
2025+	5.63	3.63	6.03	4.03
Average over:				
2019-2023	4.51	2.51	5.40	3.40
2019-2028	5.03	3.03	5.69	3.69
2019-2093	5.55	3.55	5.98	3.98

B. Operating Expenses

Similar to the base CPP, the operating expenses of the additional CPP are expected to arise from different sources including the Department of Employment and Social Development Canada (ESDC), the Canada Revenue Agency (CRA), Public Services and Procurement Canada, the Office of the Superintendent of Financial Institutions Canada, the Department of Finance Canada, and the CPPIB. For the purpose of this report, operating expenses of the CPPIB are included in the investment expenses assumption.

ESDC and CRA are responsible for the majority of the CPP operating expenses. Thus, the short-term projections of the additional CPP operating expenses are based on preliminary estimates provided by these two organizations for fiscal years 2018 to 2022. Operating expenses incurred in calendar years 2017 and 2018 represent the start-up cost of the additional Plan. For the purpose of this report it is assumed that the operating expenses for these two years will be charged to the Additional CPP

Account in calendar year 2019, along with the expenses incurred in that year. The total amount of the operating expenses in calendar year 2019 is estimated to be $105 million.

Over the long term, it is assumed that the operating expenses of the additional CPP will be significantly lower than those of the base CPP due to the use of the existing CPP infrastructure. It is projected that the additional CPP operating expenses will represent 0.01% of total annual earnings for 2024 and thereafter. This compares to an assumption of 0.092% of total annual earnings in respect of the base CPP.

Table 4 shows the projected operating expenses of the additional CPP as a percentage of total earnings. As more information on the additional CPP operating expenses becomes available, these estimates will be revised in future actuarial reports.

Table 4 Operating Expenses – Additional CPP(1)
($ million)

Year	Operating Expenses	Total Earnings(2)	Operating Expenses as % of Total Earnings
			(%)
2019	105(3)	743,409	0.014
2020	50	770,959	0.007
2021	52	800,019	0.007
2022	54	830,397	0.007
2023	73	861,962	0.009
2024	89	894,842	0.010
2025	93	928,702	0.010
2030	111	1,110,373	0.010
2040	161	1,608,556	0.010
2050	231	2,308,810	0.010

(1) CPPIB operating expenses are not included in additional Plan operating expenses, but are accounted for separately in the investment expenses assumption.
(2) Total earnings used to project operating expenses include earnings from working beneficiaries.
(3) It is assumed that operating expenses incurred in calendar years preceding 2019 will be charged to the Additional CPP Account in the calendar year 2019, along with the expenses incurred in that year.

Table 5 presents a summary of the most important assumptions used in this Report and the 27th Report.

Table 5 Best-Estimate Demographic and Economic Assumptions

Canada	**27th and 28th Reports (as at 31 December 2015)**	
Total fertility rate	1.65 (2019+)	
Mortality	Canadian Human Mortality Database (CHMD 2011) with assumed future improvements	
Canadian life expectancy	Males	Females
at birth in 2016	86.7 years	89.7 years
at age 65 in 2016	21.3 years	23.7 years
Net migration rate	0.62% of population (2016+)	
Participation rate (age group 15-69)	77.5%	(2035)
Employment rate (age group 15-69)	72.6%	(2035)
Unemployment rate	6.2%	(2025+)
Rate of increase in prices	2.0%	(2017+)
Real wage increase	1.1%	(2025+)
Real rate of return (average 2019-2093)	Base CPP Assets	3.98%
	Additional CPP Assets	3.55%
Retirement rates for cohort at age 60	Males	34% (2016+)
	Females	38% (2016+)
CPP disability incidence rates (per 1,000 eligible)	Males	3.10 (2020+)
	Females	3.65 (2020+)

IV. Results

This section presents the financial projections in respect of the additional Plan. The financial estimates are based on those of the 27th Report with amendment-specific modifications to assumptions described in Section III. The amendments of Part 1 of Bill C-26 do not impact the financial projections with respect to the base CPP as presented in the 27th Report.

A. Contributions – Additional CPP

Projected additional contributions are the product of the additional contribution rates, the number of contributors, and the average additional contributory earnings. The additional contribution rates are set by law as shown in Table 1, with the first additional contribution rate equal to 2.0% for the year 2023 and thereafter, and the second additional contribution rate equal to 8.0% for 2024 and thereafter.

Table 6 presents the projected components of additional contributions, i.e. the projected number of contributors to the additional CPP, including retirement beneficiaries who receive additional benefits and are working (i.e. "working beneficiaries"), and their additional contributory earnings and contributions.

The number of contributors under the additional CPP is the same as for the base CPP. The number of contributors is expected to increase continuously throughout the projection period, but at a decreasing pace, from 14.3 million in 2019 to 15.0 million by 2025. The future increase in the number of contributors is limited due to the projected lower growth in the working-age population and labour force.

The first additional contributory earnings are derived by subtracting the YBE from pensionable earnings (up to the YMPE) and are the same as contributory earnings under the base CPP. The second additional contributory earnings for the year 2024 and thereafter are defined as an excess, if any, of pensionable earnings (up to the YAMPE) over the YMPE. As such, the growth of the second additional contributory earnings for the year 2025 and thereafter is linked to the growth in average employment earnings through the assumption regarding annual increases in wages.

Additional contributions are expected to be $1.6 billion in 2019 and then increase to $12.3 billion by 2023 following the phase-in increase of the first additional contribution rate. The total additional contributions are projected to reach $17.1 billion by 2025. Since the first and second additional contribution rates are constant at 2.0% and 8.0%, respectively, for the year 2025 and thereafter, additional CPP contributions increase at the same rate as additional contributory earnings for all years after 2024 and are projected to reach $20.7 billion by 2030.

The projected YMPE and YAMPE are also shown. The YMPE, as well as the YAMPE after 2025, are assumed to increase according to the real wage increase assumption. The YMPE is projected to increase from $69,700 in 2025 to $149,700 in 2050, and the YAMPE is assumed to increase from $79,400 to $170,600 over the same period.

Table 6 Contributions – Additional CPP

Year	First Additional Contribution Rate	Second Additional Contribution Rate	YMPE	YAMPE	Number of Contributors	First Additional Contributory Earnings	Second Additional Contributory Earnings	Additional Contributions
	(%)	(%)	($)		(thousands)	($ million)	($ million)	($ million)
2016	-	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-	-
2018	-	-	-	-	-	-	-	-
2019	0.3	-	58,500	-	14,266	524,960	-	1,575
2020	0.6	-	60,100	-	14,391	545,491	-	3,273
2021	1.0	-	61,900	-	14,509	567,494	-	5,675
2022	1.5	-	63,700	-	14,628	590,033	-	8,850
2023	2.0	-	65,700	-	14,747	614,202	-	12,284
2024	2.0	8.0	67,700	72,400	14,866	638,920	23,793	14,682
2025	2.0	8.0	69,700	79,400	14,980	664,010	48,026	17,122
2030	2.0	8.0	81,300	92,600	15,469	803,264	57,463	20,662
2035	2.0	8.0	94,700	107,900	16,129	978,913	69,649	25,150
2040	2.0	8.0	110,300	125,700	16,757	1,187,616	84,067	30,478
2050	2.0	8.0	149,700	170,600	17,814	1,722,602	120,374	44,082
2075	2.0	8.0	321,100	366,000	20,296	4,241,948	291,754	108,179

B. Expenditures – Additional CPP

The projected number of beneficiaries receiving additional CPP benefits by type of benefit is shown in Table 7. The total number of beneficiaries receiving additional retirement benefits increases over time as the number of contributors reaching age 60 (earliest retirement age) and over with at least one valid contribution to the additional CPP increases. Eventually by 2045, all new retirement beneficiaries under the base CPP will be entitled to additional retirement benefits. The total number of retirement beneficiaries receiving additional CPP retirement benefits is projected to increase from 201,000 in 2019 to 9.3 million in 2050.

The total number of disability and survivor beneficiaries receiving additional benefits increases over time as well. Since eligibility to these benefits is harmonized between the base and additional CPP, all new survivor and disability beneficiaries of the base CPP will be entitled to additional benefits as long as they have made at least one additional contribution. The total number of disability beneficiaries receiving additional benefits is projected to increase from 42,000 in 2019 to 522,000 in 2050. The total number of survivor beneficiaries receiving additional benefits is projected to increase from 81,000 in 2019 to 1.9 million in 2050.

Table 7 Beneficiaries – Additional CPP
(thousands)

Year	Retirement(1,2)	Disability(3)	Survivor(2,3)
2016	-	-	-
2017	-	-	-
2018	-	-	-
2019	201	42	81
2020	449	81	160
2021	713	117	239
2022	989	150	317
2025	1,892	233	546
2030	3,412	323	913
2035	4,983	391	1,254
2040	6,502	448	1,550
2050	9,261	522	1,950
2075	12,579	596	2,271

(1) The number given for retirement beneficiaries does not take into account that the retirement pension can be shared between spouses.
(2) A beneficiary who receives concurrently a retirement and a survivor's benefit is counted in each category.
(3) A beneficiary who receives concurrently a disability and survivor's benefit is counted in each category.

Table 8 shows the projected number of new retirement beneficiaries receiving additional benefits and their projected average additional monthly retirement benefit by sex and year in current dollars. New additional average retirement benefits are quite low in the early years due to the lower contribution rates during the phase-in period and the fewer years of additional contributions. These averages are projected to grow rapidly as the number of years of contributions to the additional CPP increases[1].

[1] Appendix B illustrates how the increase in the number of years of contributions to the additional CPP translates into the higher benefits.

Table 8 New Retirement Pensions – Additional CPP

	Number of New Beneficiaries Receiving Additional Benefits			Average Additional Monthly Retirement Pension		
Year	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**
				($)	($)	($)
2016	-	-	-	-	-	-
2017	-	-	-	-	-	-
2018	-	-	-	-	-	-
2019	105,124	96,080	201,204	0.45	0.39	0.42
2020	130,560	118,448	249,008	1.59	1.39	1.49
2021	139,212	127,265	266,478	3.39	2.93	3.17
2022	146,580	135,077	281,657	6.01	5.14	5.60
2025	165,316	154,735	320,051	20.94	17.20	19.13
2030	170,778	166,744	337,522	65.64	51.12	58.46
2035	183,827	191,250	375,077	131.15	103.72	117.16
2040	190,947	200,734	391,681	213.72	171.01	191.83
2050	229,865	240,268	470,134	451.43	364.33	406.91
2060	236,306	241,371	477,676	815.37	663.09	738.42
2070	232,339	242,626	474,965	1,130.41	931.92	1,029.02
2075	244,097	254,599	498,696	1,317.57	1,092.52	1,202.68

Table 9 shows the amount of projected additional expenditures by type. Projected additional benefit expenditures are low in 2019 and 2020 due to the low benefits being payable. As a result, total additional expenditures for these two years are in large part attributable to the operating expenses of the additional Plan. As higher benefits become payable to a greater number of beneficiaries, projected additional expenditures increase to reach $445 million in 2025 and $28.2 billion by 2050. Table 10 shows the same information as Table 9 but in millions of 2016 constant dollars.

Table 9 Expenditures – Additional CPP
($ million)

Year	Retirement(1)	Disability	Survivor	Operating Expenses(2)	Total
2016	-	-	-	-	-
2017	-	-	-	-	-
2018	-	-	-	-	-
2019	-	-	-	105(3)	105
2020	9	-	1	50	60
2021	28	2	1	52	83
2022	63	4	1	54	122
2023	120	9	2	73	204
2024	209	15	4	89	317
2025	321	25	6	93	445
2026	460	37	10	96	603
2027	635	54	15	100	804
2028	852	74	20	103	1,049
2029	1,111	99	29	107	1,346
2030	1,408	127	39	111	1,685
2031	1,753	158	50	115	2,076
2032	2,152	192	64	119	2,527
2033	2,614	231	80	124	3,049
2034	3,147	273	100	129	3,649
2035	3,750	320	121	134	4,325
2036	4,424	370	147	139	5,080
2037	5,172	425	176	144	5,917
2038	5,998	484	210	149	6,841
2039	6,908	549	249	155	7,861
2040	7,914	618	293	161	8,986
2041	9,026	692	343	167	10,228
2042	10,248	770	398	173	11,589
2043	11,590	853	462	180	13,085
2044	13,064	940	532	186	14,722
2045	14,683	1,031	612	193	16,519
2050	25,252	1,530	1,163	231	28,176
2055	40,795	2,058	2,034	274	45,161
2060	61,573	2,541	3,304	325	67,743
2065	85,764	3,063	5,059	387	94,273
2070	113,083	3,758	7,370	464	124,675
2075	144,917	4,603	10,297	557	160,374
2080	182,139	5,613	13,819	667	202,238
2085	226,064	6,738	17,846	797	251,445
2090	277,519	7,987	22,213	951	308,670

(1) Retirement expenditures include expenditures related to post-retirement benefits for working beneficiaries.
(2) Additional Plan operating expenses exclude CPPIB operating expenses, which are accounted for separately in the investment expenses assumption.
(3) It is assumed that operating expenses incurred in calendar years preceding 2019 will be charged to the Additional CPP Account in the calendar year 2019, along with the expenses incurred in that year.

Table 10 Expenditures - Additional CPP (millions of 2016 constant dollars)(1)

Year	Retirement(2)	Disability	Survivor	Operating Expenses(3)	Total
2016	-	-	-	-	-
2017	-	-	-	-	-
2018	-	-	-	-	-
2019	-	-	-	99(4)	99
2020	8	-	1	46	56
2021	25	2	1	47	76
2022	56	4	1	48	109
2023	105	8	2	64	178
2024	179	13	3	76	272
2025	270	21	5	78	374
2026	379	30	8	79	497
2027	513	44	12	81	650
2028	675	59	16	82	831
2029	863	77	23	83	1,046
2030	1,072	97	30	85	1,283
2031	1,309	118	37	86	1,550
2032	1,575	141	47	87	1,850
2033	1,876	166	57	89	2,188
2034	2,214	192	70	91	2,567
2035	2,587	221	83	92	2,983
2036	2,992	250	99	94	3,435
2037	3,429	282	117	95	3,923
2038	3,899	315	136	97	4,446
2039	4,402	350	159	99	5,009
2040	4,944	386	183	101	5,614
2041	5,528	424	210	102	6,264
2042	6,154	462	239	104	6,959
2043	6,823	502	272	106	7,703
2044	7,540	543	307	107	8,497
2045	8,308	583	346	109	9,347
2050	12,942	784	596	118	14,440
2055	18,936	955	944	127	20,963
2060	25,887	1,068	1,389	137	28,481
2065	32,658	1,166	1,926	147	35,899
2070	39,002	1,296	2,542	160	43,000
2075	45,270	1,438	3,217	174	50,098
2080	51,534	1,588	3,910	189	57,220
2085	57,932	1,727	4,573	204	64,436
2090	64,414	1,854	5,156	221	71,644

(1) For a given year, the value in 2016 constant dollars is equal to the corresponding value in current dollars divided by the cumulative index of the indexation rates for benefits provided as of 2016 in the projections.

(2) Retirement expenditures include expenditures related to post-retirement benefits for working beneficiaries.

(3) Additional Plan operating expenses exclude CPPIB operating expenses, which are accounted for separately in the investment expenses assumption.

(4) It is assumed that operating expenses incurred in calendar years preceding 2019 will be charged to the Additional CPP Account in the calendar year 2019, along with the expenses incurred in that year.

C. Financial Projections – Additional CPP

Tables 11 and 12 present the projected financial state of the additional CPP using the legislated first and second additional contribution rates of 2.0% and 8.0% in current dollars and in 2016 constant dollars, respectively.

Additional contributions are projected to be higher than additional expenditures up to the year 2058 inclusive. Over that period, the additional assets are projected to grow rapidly, from $1.5 billion at the end of 2019 to $70 billion by 2025, $196 billion by 2030, and $1,330 billion by 2050. As shown in Appendix A, by 2055, the additional assets are expected to surpass the base CPP assets as projected in the 27th Report.

Table 11 Financial Projections – Additional CPP

(2.0% first additional contribution rate, 8.0% second additional contribution rate)

Year	First Additional Contribution Rate	Second Additional Contribution Rate	Contributory Earnings	Contributions	Expenditures	Net Cash Flow	Investment Income	Assets at 31 Dec.	Return(1)	Asset/ Expenditure Ratio
	(%)	(%)	($ million)	($ million)	($ million)	($ million)	($ million)	($ million)	(%)	
2016	-	-	-	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-	-	-	-
2018	-	-	-	-	-	-	-	-	-	-
2019	0.3	-	524,960	1,575	105(2)	1,470	34	1,504	4.12	25.1
2020	0.6	-	545,491	3,273	60	3,213	146	4,863	4.45	58.6
2021	1.0	-	567,494	5,675	83	5,592	361	10,816	4.53	88.7
2022	1.5	-	590,033	8,850	122	8,728	738	20,283	4.71	99.4
2023	2.0	-	614,202	12,284	204	12,080	1,283	33,645	4.75	106.1
2024	2.0	8.0	662,713	14,682	317	14,365	2,176	50,187	5.23	112.8
2025	2.0	8.0	712,036	17,122	445	16,677	3,348	70,212	5.63	116.4
2026	2.0	8.0	739,246	17,769	603	17,166	4,492	91,870	5.63	114.3
2027	2.0	8.0	767,516	18,443	804	17,639	5,728	115,237	5.63	109.9
2028	2.0	8.0	797,132	19,145	1,049	18,096	7,059	140,392	5.63	104.3
2029	2.0	8.0	828,479	19,908	1,346	18,562	8,492	167,446	5.63	99.4
2030	2.0	8.0	860,727	20,662	1,685	18,977	10,030	196,454	5.63	94.6
2031	2.0	8.0	894,744	21,488	2,076	19,412	11,680	227,546	5.63	90.0
2032	2.0	8.0	930,439	22,322	2,527	19,795	13,445	260,786	5.63	85.5
2033	2.0	8.0	968,383	23,232	3,049	20,183	15,332	296,300	5.63	81.2
2034	2.0	8.0	1,007,408	24,172	3,649	20,523	17,346	334,169	5.63	77.3
2035	2.0	8.0	1,048,562	25,150	4,325	20,825	19,492	374,486	5.63	73.7
2036	2.0	8.0	1,088,928	26,113	5,080	21,033	21,773	417,293	5.63	70.5
2037	2.0	8.0	1,131,625	27,128	5,917	21,211	24,194	462,698	5.63	67.6
2038	2.0	8.0	1,176,748	28,224	6,841	21,383	26,762	510,842	5.63	65.0
2039	2.0	8.0	1,223,531	29,318	7,861	21,457	29,481	561,780	5.63	62.5
2040	2.0	8.0	1,271,683	30,478	8,986	21,492	32,357	615,629	5.63	60.2
2041	2.0	8.0	1,321,352	31,669	10,228	21,441	35,395	672,464	5.63	58.0
2042	2.0	8.0	1,372,835	32,899	11,589	21,310	38,599	732,374	5.63	56.0
2043	2.0	8.0	1,426,514	34,170	13,085	21,085	41,974	795,433	5.63	54.0
2044	2.0	8.0	1,480,985	35,465	14,722	20,743	45,524	861,700	5.63	52.2
2045	2.0	8.0	1,537,177	36,788	16,519	20,269	49,251	931,221	5.63	50.4
2050	2.0	8.0	1,842,976	44,082	28,176	15,906	70,659	1,329,652	5.63	42.7
2055	2.0	8.0	2,195,459	52,491	45,161	7,330	96,835	1,815,109	5.63	36.8
2060	2.0	8.0	2,612,088	62,420	67,743	-5,323	127,924	2,390,348	5.63	32.8
2065	2.0	8.0	3,129,007	74,736	94,273	-19,537	164,544	3,068,238	5.63	30.7
2070	2.0	8.0	3,767,678	89,917	124,675	-34,758	208,136	3,876,063	5.63	29.5
2075	2.0	8.0	4,533,702	108,179	160,374	-52,195	260,380	4,844,655	5.63	28.8
2080	2.0	8.0	5,441,299	129,776	202,238	-72,462	323,213	6,009,983	5.63	28.4
2085	2.0	8.0	6,508,854	155,214	251,445	-96,231	398,965	7,415,345	5.63	28.3
2090	2.0	8.0	7,773,709	185,303	308,670	-123,367	490,622	9,116,732	5.63	28.4

(1) Returns are net of all investment expenses.
(2) It is assumed that operating expenses incurred in calendar years preceding 2019 will be charged to the Additional CPP Account in the calendar year 2019, along with the expenses incurred in that year.

Table 12 Financial Projections – Additional CPP (millions of 2016 constant dollars)(1)
(2.0% first additional contribution rate, 8.0% second additional contribution rate)

Year	First Additional Contribution Rate	Second Additional Contribution Rate	Contributory Earnings	Contributions	Expenditures	Net Cash Flow	Investment Income	Assets at 31 Dec.
	(%)	(%)	($ million)	($ million)	($ million)	($ million)	($ million)	($ million)
2016	-	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-	-
2018	-	-	-	-	-	-	-	-
2019	0.3	-	497,077	1,491	99(2)	1,392	32	1,424
2020	0.6	-	506,389	3,038	56	2,983	136	4,515
2021	1.0	-	516,485	5,165	76	5,089	328	9,844
2022	1.5	-	526,469	7,897	109	7,788	659	18,098
2023	2.0	-	537,289	10,746	178	10,567	1,122	29,432
2024	2.0	8.0	568,358	12,591	272	12,320	1,867	43,041
2025	2.0	8.0	598,685	14,397	374	14,022	2,815	59,035
2026	2.0	8.0	609,375	14,647	497	14,150	3,703	75,730
2027	2.0	8.0	620,274	14,905	650	14,255	4,629	93,129
2028	2.0	8.0	631,576	15,169	831	14,337	5,593	111,234
2029	2.0	8.0	643,542	15,464	1,046	14,419	6,596	130,068
2030	2.0	8.0	655,482	15,735	1,283	14,452	7,639	149,608
2031	2.0	8.0	668,027	16,043	1,550	14,493	8,720	169,888
2032	2.0	8.0	681,056	16,339	1,850	14,489	9,842	190,888
2033	2.0	8.0	694,931	16,672	2,188	14,484	11,003	212,631
2034	2.0	8.0	708,761	17,006	2,567	14,439	12,204	235,105
2035	2.0	8.0	723,250	17,347	2,983	14,364	13,445	258,304
2036	2.0	8.0	736,365	17,659	3,435	14,223	14,724	282,186
2037	2.0	8.0	750,234	17,985	3,923	14,062	16,040	306,755
2038	2.0	8.0	764,852	18,344	4,446	13,898	17,394	332,032
2039	2.0	8.0	779,666	18,682	5,009	13,673	18,786	357,981
2040	2.0	8.0	794,461	19,040	5,614	13,427	20,214	384,603
2041	2.0	8.0	809,304	19,397	6,264	13,132	21,679	411,872
2042	2.0	8.0	824,350	19,755	6,959	12,796	23,178	439,770
2043	2.0	8.0	839,787	20,116	7,703	12,413	24,710	468,271
2044	2.0	8.0	854,759	20,469	8,497	11,972	26,274	497,335
2045	2.0	8.0	869,794	20,816	9,347	11,469	27,868	526,921
2050	2.0	8.0	944,521	22,592	14,440	8,152	36,212	681,444
2055	2.0	8.0	1,019,099	24,366	20,963	3,403	44,949	842,546
2060	2.0	8.0	1,098,191	26,243	28,481	-2,238	53,783	1,004,966
2065	2.0	8.0	1,191,505	28,459	35,899	-7,440	62,657	1,168,364
2070	2.0	8.0	1,299,458	31,012	43,000	-11,988	71,785	1,336,839
2075	2.0	8.0	1,416,252	33,793	50,098	-16,305	81,338	1,513,389
2080	2.0	8.0	1,539,534	36,718	57,220	-20,502	91,448	1,700,435
2085	2.0	8.0	1,667,978	39,776	64,436	-24,660	102,240	1,900,278
2090	2.0	8.0	1,804,319	43,010	71,644	-28,634	113,876	2,116,041

(1) For a given year, the value in 2016 constant dollars is equal to the corresponding value in current dollars divided by the cumulative index of the indexation rates for benefits provided as of 2016 in the projections.

(2) It is assumed that operating expenses incurred in calendar years preceding 2019 will be charged to the Additional CPP Account in the calendar year 2019, along with the expenses incurred in that year.

Table 13 shows the sources of the revenues required to cover the additional expenditures and Chart 1 compares sources of revenues of the base and additional Plan. With the growth in the additional assets, the importance of the investment income increases rapidly. By 2075, investment income is projected to represent about 70% of revenues of the additional CPP. The importance of investment income as a source of revenues is directly related to the financing approach of the additional CPP. In comparison, as shown in Chart 1, investment income of the base Plan is projected to represent 25% to 35% of total revenues during the projection period.

A strong reliance of the additional CPP on investment income as a source of revenues results in the additional contribution rates being much more sensitive to financial market environments than it is the case for the base CPP. Thus, in order to ensure the stability of the additional contribution rates, the additional Plan investment strategy should aim at achieving stable returns.

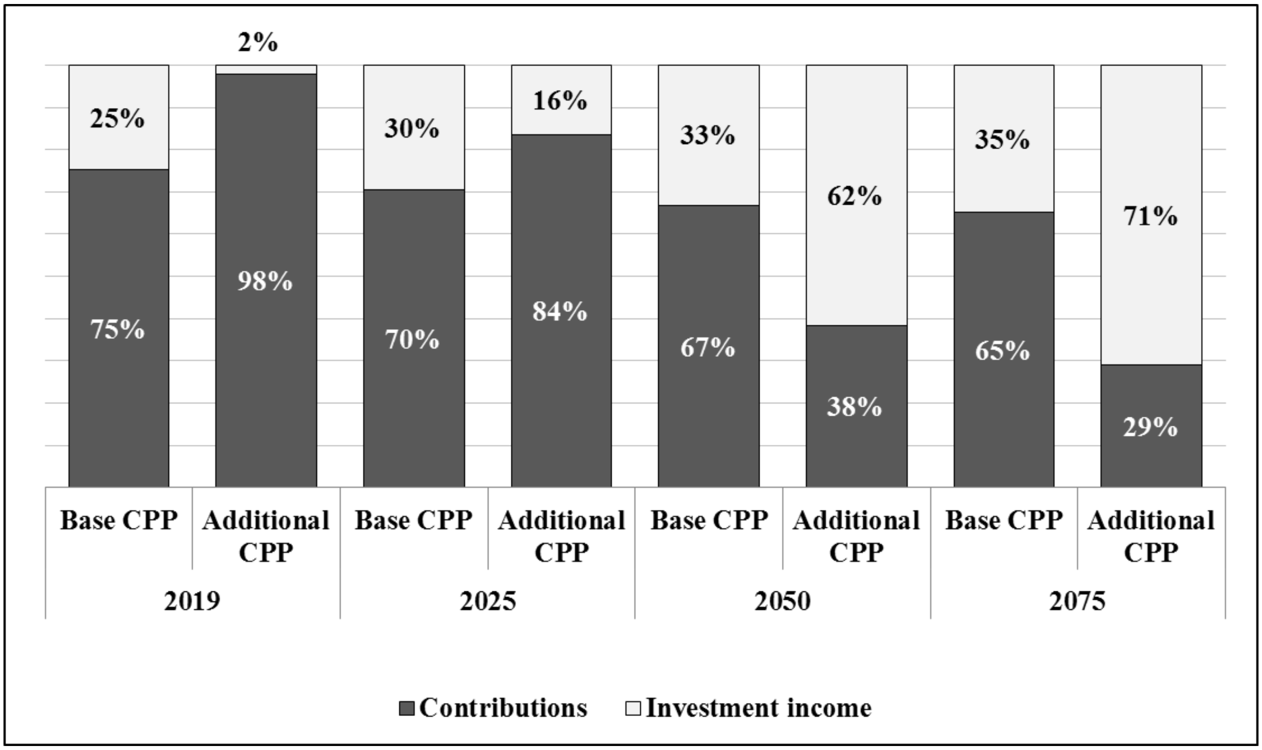
Table 13 shows the projected additional expenditures as a percentage of total additional revenues. This percentage is projected to increase from about 2% in 2025 to 10% in 2035. It continues to grow but at decreasing pace, and stabilizes at about 45% by the end of the projection period.

Table 13 Sources of Revenues – Additional CPP
($ billion)

Year	Contributions	Investment Income	Total Revenues	Investment Income as % of Revenues	Expenditures	Expenditures as % of Revenues
				(%)		(%)
2019	1.6	0.0	1.6	2.1	0.1	6.5
2020	3.3	0.1	3.4	4.3	0.1	1.8
2021	5.7	0.4	6.0	6.0	0.1	1.4
2022	8.9	0.7	9.6	7.7	0.1	1.3
2023	12.3	1.3	13.6	9.5	0.2	1.5
2024	14.7	2.2	16.9	12.9	0.3	1.9
2025	17.1	3.3	20.5	16.4	0.4	2.2
2026	17.8	4.5	22.3	20.2	0.6	2.7
2027	18.4	5.7	24.2	23.7	0.8	3.3
2028	19.1	7.1	26.2	26.9	1.0	4.0
2029	19.9	8.5	28.4	29.9	1.3	4.7
2030	20.7	10.0	30.7	32.7	1.7	5.5
2031	21.5	11.7	33.2	35.2	2.1	6.3
2032	22.3	13.4	35.8	37.6	2.5	7.1
2033	23.2	15.3	38.6	39.8	3.0	7.9
2034	24.2	17.3	41.5	41.8	3.6	8.8
2035	25.2	19.5	44.6	43.7	4.3	9.7
2036	26.1	21.8	47.9	45.5	5.1	10.6
2037	27.1	24.2	51.3	47.1	5.9	11.5
2038	28.2	26.8	55.0	48.7	6.8	12.4
2039	29.3	29.5	58.8	50.1	7.9	13.4
2040	30.5	32.4	62.8	51.5	9.0	14.3
2041	31.7	35.4	67.1	52.8	10.2	15.3
2042	32.9	38.6	71.5	54.0	11.6	16.2
2043	34.2	42.0	76.1	55.1	13.1	17.2
2044	35.5	45.5	81.0	56.2	14.7	18.2
2045	36.8	49.3	86.0	57.2	16.5	19.2
2050	44.1	70.7	114.7	61.6	28.2	24.6
2055	52.5	96.8	149.3	64.8	45.2	30.2
2060	62.4	127.9	190.3	67.2	67.7	35.6
2065	74.7	164.5	239.3	68.8	94.3	39.4
2070	89.9	208.1	298.1	69.8	124.7	41.8
2075	108.2	260.4	368.6	70.6	160.4	43.5
2080	129.8	323.2	453.0	71.4	202.2	44.6
2085	155.2	399.0	554.2	72.0	251.4	45.4
2090	185.3	490.6	675.9	72.6	308.7	45.7

Chart 1 Source of Revenues – Base and Additional CPP

(legislated contribution rates of 9.9% for the base CPP and 2.0% and 8.0% for the additional CPP)



D. Financial Projections of Additional CPP – Minimum First and Second Additional Contribution Rates

1. Methodology

In accordance with clause 50 (1) of Part 1 of Bill C-26 which adds a new paragraph 113.1(4)(d) to the *Canada Pension Plan*, the additional retirement, survivor, and disability benefits provided by the additional Plan are expected to be financed through additional contribution rates that are no lower than the rates

> *"… (i) that, beginning with the year 2024, are the lowest constant rates that can be maintained over the foreseeable future, and*
>
> *(ii) that result in projected contributions and investment income that are sufficient to fully pay the projected expenditures of the additional Canada Pension Plan over the foreseeable future…"*

The rates referred to in subparagraphs 113.1(4)(d)(i) and (ii) are to be determined by the Chief Actuary of the Office of the Superintendent of Financial Institutions in accordance with clause 52 (3) of Bill C-26, which amends paragraphs 115(1.1)(d) and (e) of the *Canada Pension Plan* and the associated regulations. At the time of the preparation of the 28th Report, no such regulations exist. Therefore, the approach described below was developed to determine the minimum additional contribution rates that satisfy the requirements of subparagraphs 113.1(4)(d)(i) and (ii).

The minimum first and second additional contributions rates were determined as the minimum constant contribution rates applicable, respectively, for years 2023 and 2024 and thereafter, that meet the following two conditions:

a. The additional CPP open group assets are at least 100% of its open group actuarial liability as at 1 January 2019, and
b. The ratio of the additional CPP assets to its following year's expenditures (A/E ratio) for each year over the first 75 years starting in 2025 (end of the phase-in period) exceeds a specified threshold.

The minimum first additional contribution rate for years 2019 to 2022 is obtained by multiplying the rate for year 2023 by 0.15 for 2019, 0.30 for 2020, 0.50 for 2021, and 0.75 for 2022.

The first condition (a) described above and the use of an open group approach address the requirement formulated in subparagraph 113.1(4)(d)(ii) and ensure that at the valuation date the projected additional contributions and investment income are sufficient to cover the projected additional expenditures over the long term.

The second condition (b) addresses the requirement of subparagraph 113.1(4)(d)(i) regarding the stability of the additional contribution rates over the long term. Further, the choice of the appropriate threshold (which is influenced to a certain degree by the assumed future demographic and economic environments) reinforces the requirement of subparagraph 113.1(4)(d)(i). For the purpose of the 28th Report, this threshold is determined to be equal to 25.

To determine the actuarial liability of the additional Plan on an open group basis, future additional expenditures with respect to current and future additional CPP participants are projected using the best-estimate assumptions of the 27th Report with some modifications as described in Section III of this report. The open group actuarial liability is then the present value of these projected additional expenditures discounted using the assumed nominal rate of return on additional CPP assets.

To determine the open group assets of the additional Plan, future additional contributions of current and future contributors are projected using the best-estimate assumptions of the 27th Report. In order to determine their present value, these total projected additional contributions are discounted using the assumed nominal rate of return on the additional CPP assets. This present value is added to the invested assets of the additional Plan to obtain the total open group assets.

This report uses a projection period of 150 years from the valuation date to determine the open group assets and actuarial liability of the additional CPP. Two main considerations are taken into account when a decision is made on the length of the projection period to determine the open group assets and actuarial liability of the additional CPP.

By using a finite projection period, some of the future expenditures of cohorts who will enter the labour force during that period are excluded from the open group actuarial liability. However, a part of the contributions for these cohorts are included in the open group assets. Thus, even taking into account the discounting of future cash flows of the additional Plan, using an insufficiently long projection period may overestimate the open group assets as a percentage of its actuarial liability. However, it should be noted that although increasing the length of the projection period enhances the assessment of the financial sustainability of the additional CPP, it also increases the uncertainty of the results. As discussed in detail in Section III.E of the OCA’s Actuarial Study No.13 “Assessing the Sustainability of the Canada Pension Plan through Actuarial Balance Sheets”, a projection period of 150 years achieves a balance between the accuracy and uncertainty of results.

2. Minimum First and Second Additional Contribution rates

The minimum first additional contribution rate for the year 2023 and thereafter is determined to be 1.93%. It is further determined to be 0.29% in 2019, 0.58% in 2020, 0.97% in 2021 and 1.45% in 2022 in accordance with the phase-in of the legislated first additional contribution rate. The minimum second additional contribution rate for the year 2024 and thereafter is determined to be 7.72%.

Table 14 demonstrates that these minimum additional contribution rates satisfy condition (a) formulated above. It shows that, as at 1 January 2019, the additional CPP assets under the open group approach are projected to be 106% of the open group actuarial liability. There are no invested assets as at 1 January 2019, and the total assets are equal to the present value of future additional contributions of current CPP participants and future participants of the additional Plan. The actuarial liability is equal to the present value of future additional benefits for current and future participants of the additional CPP. For information purposes, Table 14 also shows the additional CPP balance sheet under the open group approach as at 31 December 2028. By 2029, the invested assets are projected to represent 12% of total assets, and the assets are projected to be 105% of the actuarial liability.

Table 14 Additional CPP Balance Sheet as at 1 January 2019 and 31 December 2028
(open group approach)

	As at 1 January 2019	As at 31 December 2028
	($billion)	($billion)
Assets		
Current Assets	-	135
Future Contributions	674	964
Total Assets (a)	674	1,109
Actuarial Liability[1] (b)	633	1,055
Asset Excess (Shortfall) (a) – (b)	**40**	**54**
Assets as percentage of Liability (a)/(b)	**106.4%**	**105.1%**

(1) Liability includes operating expenses.

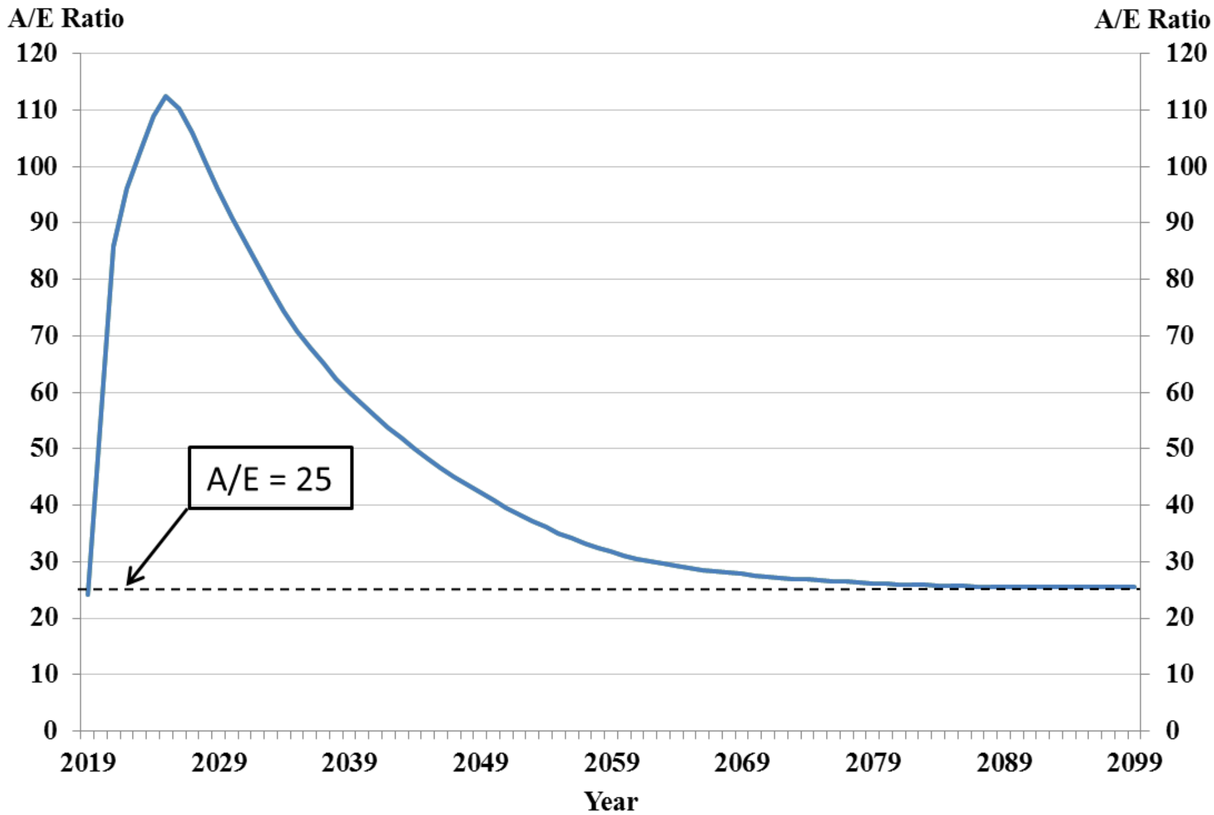
The financial projections presented in Table 15 are based on the minimum first additional contribution rate of 1.93% for the year 2023 and thereafter and the minimum second additional contribution rate of 7.72% for the year 2024 and thereafter. Chart 2 shows the evolution of the A/E ratio of the additional Plan under these minimum additional contribution rates. As shown, the A/E ratio is very high in the early years due to low expenditures. Eventually, the ratio stabilizes at a level close to 25. This confirms that the minimum additional first and second contribution rates of 1.93% and 7.72%, respectively, satisfy condition (b) above.

Table 15 Financial Projections - Minimum First Additional Contribution Rate of 1.93% and Second Additional Contribution Rate of 7.72%

Year	First Additional Contribution Rate	Second Additional Contribution Rate	Contributory Earnings	Contributions	Expenditures	Net Cash Flow	Investment Income	Assets at 31 Dec.	Asset/ Expenditure Ratio
	(%)	(%)	($ million)	($ million)	($ million)	($ million)	($ million)	($ million)	
2016	-	-	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-	-	-
2018	-	-	-	-	-	-	-	-	-
2019	0.29	-	524,960	1,522	105(1)	1,417	33	1,450	24.2
2020	0.58	-	545,491	3,164	60	3,104	141	4,695	56.6
2021	0.97	-	567,494	5,505	83	5,422	349	10,466	85.8
2022	1.45	-	590,033	8,555	122	8,433	714	19,613	96.1
2023	1.93	-	614,202	11,854	204	11,650	1,239	32,503	102.5
2024	1.93	7.72	662,713	14,168	317	13,851	2,102	48,456	108.9
2025	1.93	7.72	712,036	16,523	445	16,078	3,232	67,766	112.4
2026	1.93	7.72	739,246	17,147	603	16,544	4,335	88,645	110.3
2027	1.93	7.72	767,516	17,798	804	16,994	5,526	111,164	106.0
2028	1.93	7.72	797,132	18,475	1,049	17,426	6,809	135,399	100.6
2029	1.93	7.72	828,479	19,212	1,346	17,866	8,189	161,454	95.8
2030	1.93	7.72	860,727	19,939	1,685	18,254	9,670	189,378	91.2
2031	1.93	7.72	894,744	20,736	2,076	18,660	11,258	219,296	86.8
2032	1.93	7.72	930,439	21,541	2,527	19,014	12,956	251,266	82.4
2033	1.93	7.72	968,383	22,419	3,049	19,370	14,771	285,406	78.2
2034	1.93	7.72	1,007,408	23,326	3,649	19,677	16,706	321,789	74.4
2035	1.93	7.72	1,048,562	24,270	4,325	19,945	18,767	360,501	71.0
2036	1.93	7.72	1,088,928	25,199	5,080	20,119	20,957	401,578	67.9
2037	1.93	7.72	1,131,625	26,178	5,917	20,261	23,279	445,119	65.1
2038	1.93	7.72	1,176,748	27,236	6,841	20,395	25,741	491,254	62.5
2039	1.93	7.72	1,223,531	28,292	7,861	20,431	28,346	540,031	60.1
2040	1.93	7.72	1,271,683	29,411	8,986	20,425	31,099	591,555	57.8
2041	1.93	7.72	1,321,352	30,560	10,228	20,332	34,005	645,892	55.7
2042	1.93	7.72	1,372,835	31,748	11,589	20,159	37,067	703,118	53.7
2043	1.93	7.72	1,426,514	32,974	13,085	19,889	40,289	763,297	51.8
2044	1.93	7.72	1,480,985	34,224	14,722	19,502	43,676	826,474	50.0
2045	1.93	7.72	1,537,177	35,501	16,519	18,982	47,227	892,683	48.3
2050	1.93	7.72	1,842,976	42,539	28,176	14,363	67,553	1,270,702	40.8
2055	1.93	7.72	2,195,459	50,654	45,161	5,493	92,219	1,727,720	35.1
2060	1.93	7.72	2,612,088	60,235	67,743	-7,508	121,224	2,263,695	31.1
2065	1.93	7.72	3,129,007	72,120	94,273	-22,153	154,980	2,887,676	28.9
2070	1.93	7.72	3,767,678	86,770	124,675	-37,905	194,655	3,621,783	27.6
2075	1.93	7.72	4,533,702	104,393	160,374	-55,981	241,563	4,490,004	26.7
2080	1.93	7.72	5,441,299	125,234	202,238	-77,004	297,159	5,519,260	26.1
2085	1.93	7.72	6,508,854	149,782	251,445	-101,663	363,137	6,740,875	25.7
2090	1.93	7.72	7,773,709	178,817	308,670	-129,853	441,634	8,194,949	25.5

(1) It is assumed that operating expenses incurred in calendar years preceding 2019 will be charged to the Additional CPP Account in the calendar year 2019, along with the expenses incurred in that year.

Chart 2 Asset/Expenditure Ratio – Additional CPP
(1.93%/7.72% minimum first and second additional contribution rates)



V. Uncertainty of Results

This actuarial report is based on the projection of additional CPP revenues and expenditures over a long period of time. The information required by statute, which is presented in section IV of this report, has been derived using best-estimate assumptions regarding future demographic and economic trends. Both the length of the projection period and the number of assumptions required ensure that actual future experience will not develop precisely in accordance with the best-estimate assumptions.

The future income and outgo of the additional CPP depend on many demographic and economic factors. Thus, many assumptions in respect of the future demographic and economic outlook are required to project the financial state of the additional Plan. These assumptions impact the contribution rates, cash flows, amount of assets, as well as other indicators of the financial state. This section discusses the sensitivity of the minimum first and second additional contribution rates to the use of different assumptions than the best estimate.

The financing approach of the additional CPP strengthens the link between contributions paid by individuals during their working lives and the benefits they will receive. As a result, while some assumptions regarding such factors as fertility, migration, and labour force participation affect the cash flows and the amount of assets of the additional CPP, they, in general, do not have a major impact on the minimum first and second additional contribution rates. In comparison, these assumptions could have a significant impact on the minimum contribution rate of the base CPP.

This section presents the minimum first and second additional contribution rates under low- and high-cost scenarios with respect to three key assumptions which have significant impacts on these rates: mortality rates, real wage increases and the real rate of return. The alternative assumptions selected are intended to represent a wide range of potential long-term experience. For comparison purposes, the impacts on the base CPP minimum contribution rate are presented as well. Table 16 summarizes these alternative assumptions and Table 17 shows the resulting minimum first and second additional contribution rates. In this section, all references to the minimum first additional contribution rate mean the minimum first additional contribution rate for the year 2023 and thereafter, and all references to the minimum second additional contribution rate mean the minimum second additional contribution rate for the year 2024 and thereafter.

Mortality improvements (i.e. reductions in mortality rates) are expected to continue into the future. The increase in life expectancy at age 65 impacts the length of time that benefits are paid and, as a result, the contribution rates. The alternative assumptions used for this test are the same as those used in the 27th Report. The high-cost scenario assumes life expectancies at age 65 (with future mortality improvements) in 2050 that are 2.5 years and 2.3 higher than the best-estimate assumptions for males and females, respectively. As a result, the minimum first additional contribution rate increases from 1.93% to 2.06%, and the minimum second additional contribution rate increases from 7.72% to 8.24%. The corresponding change in the base CPP contribution rate is from 9.79% to 10.10%.

The low-cost scenario assumes life expectancies at age 65 (with future improvements) in 2050 that are 2.4 years lower than the best-estimate assumptions for both males and females. Under the low-cost scenario, the minimum first additional contribution rate decreases from 1.93% to 1.80%, the minimum second additional contribution rate decreases from 7.72% to 7.20%, and the base CPP minimum contribution rate decreases from 9.79% to 9.46%.

The real wage increase is the difference between the assumed annual nominal wage increase and inflation. Many factors influence the real wage increase including general productivity improvements and fluctuations in the size of the workforce. The high-cost scenario assumes a higher real wage increase of 1.8% compared to the best-estimate assumption of 1.1%. The resulting minimum first and second additional contribution rates increase respectively from 1.93% to 2.13% and from 7.72% to 8.52%. The low-cost scenario assumes a real wage increase of 0.4%, and the minimum first and second additional contribution rates decrease respectively from 1.93% to 1.79% and from 7.72% to 7.16%.

It should be noted that contrary to the additional CPP, for the base CPP the high-cost real wage sensitivity test presented in the 27th Report corresponds to a lower real wage increase of 0.4% producing the minimum contribution rate of 10.32%, and the low-cost scenario corresponds to a higher real wage increase of 1.8% producing the minimum contribution rate of 9.31%. The opposite impacts of changes in real wage increase assumption on the base and additional Plans are due to the fact that for the base CPP future contributions represent the main source of the revenues while investment income is the main source of revenues for the additional CPP.

In order to fund future benefits it is necessary to generate investment income on the additional CPP assets. The size of the future outgo of benefits depends on the benefits structure, future wages, population composition and other factors, but does not depend on the returns on the plan's assets. Therefore, lower future returns on assets should be counterbalanced by a higher inflow of contributions in order to fund the same benefit expenditures, and vice versa. The significant reliance of the additional CPP on investment income as a source of revenues, as shown in Table 13, results in the high sensitivity of the additional contribution rates to alternative assumptions of future rates of return.

The high-cost scenario with respect to the real rate of return assumes that the best-estimate real rate of return is reduced by 1.00% for each year in the projection period, resulting in a 75-year average real rate of return of 2.55%. The resulting minimum first and second additional contribution rates increase respectively from 1.93% to 2.55% and from 7.72% to 10.20%, a relative increase of 32%. For comparison, under this scenario, the minimum contribution rate of the base CPP increases from 9.79% to 10.53% representing a more modest relative increase of 8%.

The low-cost scenario with respect to the real rate of return assumes that the best-estimate real rate of return is increased by 1.00% for each year in the projection period, resulting in a 75-year average real rate of return of 4.55%. The resulting minimum first and second additional contribution rates decrease respectively from 1.93% to 1.53% and from 7.72% to 6.12%, a relative decrease of 21%. For comparison, under the low-cost scenario, the minimum contribution rate of the base CPP decreases from 9.79% to 9.05% (relative decrease of 8%), once again showing that the financial state of the base CPP is much less sensitive to the investment environment compared to the additional Plan.

Table 16 Sensitivity Test Assumptions

	Canada	Low-Cost		Best-Estimate		High-Cost	
1	Mortality (base and additional CPP):						
	Canadian life expectancy at age 65 in 2050 with future mortality improvements	Males	20.9	Males	23.3	Males	25.8
		Females	23.2	Females	25.6	Females	27.9
2	Real wage increase						
	Base CPP	1.8%		1.1%		0.4%	
	Additional CPP	0.4%		1.1%		1.8%	
3	75-year average real rate of return (2019-2093) (base and additional CPP)	4.55%		3.55%		2.55%	

Table 17 Sensitivity of Minimum First and Second Additional Contribution Rates
(percentages)

			Additional CPP			Base CPP	
	Assumption	Scenario	Minimum First Additional Contribution Rate(1)	Minimum Second Additional Contribution Rate(2)	Change Relative to the Best Estimate	Minimum Contribution Rate(3)	Change Relative to the Best Estimate
		Best Estimate	1.93	7.72		9.79	
1	Mortality Rates	Low Cost	1.80	7.20	-6.7%	9.46	-3.4
		High Cost	2.06	8.24	6.7%	10.10	3.2
2	Real Wage Increase	Low Cost	1.79	7.16	-7.3%	9.31	-4.9
		High Cost	2.13	8.52	10.4%	10.32	5.4
3	Real Rate of Return	Low Cost	1.53	6.12	-20.7%	9.05	-7.6
		High Cost	2.55	10.20	32.1%	10.53	7.6

(1) The minimum first additional contribution rate in this table refers to the rate applicable for 2023 and thereafter.
(2) The minimum second additional contribution rate in this table refers to the rate applicable for 2024 and thereafter.
(3) The minimum contribution rate in this table refers to the rate applicable for 2019 and thereafter.

The sensitivity of the minimum additional contribution rates to investment environments and financial market shocks could be further illustrated by developing scenarios that would result in the minimum additional contribution rates being equal to the legislated rates.

The first such scenario is a permanent decrease in the expected rate of return. It is estimated, that if the assumed real rate of return is 14 basis points lower than the best-estimate assumption (i.e. 75-year average of 3.41% versus the best estimate of 3.55%), the minimum additional contribution rates would increase to the level of the legislated rates of 2.0% and 8.0%. This represents a relative increase of about 3.6%. Under the base CPP, the same change in the expected real rate of return would increase the minimum contribution rate from 9.79% to 9.89% a relative increase of only 1.0%. In other words, the same change in the expected rate of return causes a relative increase in contribution rates about four times higher for the additional CPP than the base CPP.

The second scenario projects that market shocks will occur in either 2035 or 2050. If it is assumed that in 2035 the nominal rate of return on the additional CPP assets will be -9.0% (-11.0% real), the minimum additional contribution rates would increase to their legislated level. The assumption of a nominal rate of return on the additional CPP assets of -4.0% (-6.0% real) in 2050, a time where the assets of the additional CPP are much more important, would result in the same increase in the minimum additional contribution rates.

VI. Conclusion

The actuarial projections of the financial state of the Canada Pension Plan presented in this report reveal that if the CPP is amended as per Part 1 of Bill C-26, the constant minimum first and second additional contribution rates that result in projected contributions and investment income that are sufficient to fully pay the projected expenditures of the additional Canada Pension Plan would be, respectively, 1.93% for the year 2023 and thereafter and 7.72% for the year 2024 and thereafter.

This report confirms that if the *Canada Pension Plan* is amended as per Part 1 of Bill C-26, a legislated first additional contribution rate of 2.0% for the year 2023 and thereafter, and a legislated second additional contribution rate of 8.0% for the year 2024 and thereafter, result in projected contributions and investment income that are sufficient to fully pay the projected expenditures of the additional Plan over the long term. Under these rates, assets of the additional Plan would accumulate to $70 billion by 2025, and to $1,330 billion by 2050.

VII. Acknowledgements

The following people assisted in the preparation of this report:

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VIII. Actuarial Opinion

In our opinion, considering that this 28th CPP Actuarial Report was prepared pursuant to the *Canada Pension Plan*:

- the data on which this report is based are sufficient and reliable;
- the assumptions used are, individually and in aggregate, reasonable and appropriate; and
- the methods employed are appropriate for the purposes of this report.

Based on the results of this valuation, we hereby certify that the constant minimum first and second additional contribution rates that result in projected contributions and investment income being sufficient to fully pay projected expenditures of the additional Canada Pension Plan are respectively 1.93% for the year 2023 and thereafter, and 7.72% for the year 2024 and thereafter.

This report has been prepared, and our opinions given, in accordance with both accepted actuarial practice in Canada, in particular, the General Standards of Practice of the Canadian Institute of Actuaries, and internationally accepted actuarial practice as provided by the International Standards of Actuarial Practice for General Actuarial Practice (ISAP 1) and Financial Analysis of Social Security Programs (ISAP 2) of the International Actuarial Association.

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26 October 2016

Appendix A – Financial Projections of the base CPP

Table 18 shows the financial projections for the base CPP as presented in the 27th Report and for the additional CPP as presented in the 28th Report.

Table 18 Financial Projection of the Base and Additional CPP

	Base CPP – 27th Report						Additional CPP – 28th Report					
Year	**Contribution Rate**	**Contributions**	**Expenditures**	**Investment Income**	**Assets at 31Dec.**	**Asset/ Expenditure Ratio**	**Contribution Rates**	**Contributions**	**Expenditures**	**Investment Income**	**Assets at 31 Dec.**	**Asset/ Expenditure Ratio**
	(%)	($ million)	($ million)	($ million)	($ million)		(%)	($ million)	($ million)	($ million)	($ million)	
2016	9.9	46,515	42,877	5,835	294,831	6.5	-	-	-	-	-	-
2017	9.9	48,022	45,129	15,110	312,834	6.6	-	-	-	-	-	-
2018	9.9	49,923	47,673	15,638	330,723	6.6	-	-	-	-	-	-
2019	9.9	51,971	50,457	17,069	349,306	6.5	0.3/0.0	1,575	105(1)	34	1,504	25.1
2020	9.9	54,004	53,416	19,093	368,986	6.5	0.6/0.0	3,273	60	146	4,863	58.6
2021	9.9	56,182	56,493	20,412	389,087	6.5	1.0/0.0	5,675	83	361	10,816	88.7
2022	9.9	58,413	59,644	21,842	409,699	6.5	1.5/0.0	8,850	122	738	20,283	99.4
2023	9.9	60,806	62,927	23,097	430,675	6.5	2.0/0.0	12,284	204	1,283	33,645	106.1
2024	9.9	63,253	66,340	25,298	452,886	6.5	2.0/8.0	14,682	317	2,176	50,187	112.8
2025	9.9	65,737	69,851	27,605	476,377	6.5	2.0/8.0	17,122	445	3,348	70,212	116.4
2026	9.9	68,262	73,432	29,014	500,221	6.5	2.0/8.0	17,769	603	4,492	91,870	114.3
2027	9.9	70,881	77,055	30,439	524,485	6.5	2.0/8.0	18,443	804	5,728	115,237	109.9
2028	9.9	73,633	80,735	31,883	549,266	6.5	2.0/8.0	19,145	1,049	7,059	140,392	104.3
2029	9.9	76,510	84,501	33,363	574,639	6.5	2.0/8.0	19,908	1,346	8,492	167,446	99.4
2030	9.9	79,523	88,331	34,886	600,717	6.5	2.0/8.0	20,662	1,685	10,030	196,454	94.6
2031	9.9	82,651	92,210	36,447	627,605	6.5	2.0/8.0	21,488	2,076	11,680	227,546	90.0
2032	9.9	85,987	96,111	38,063	655,544	6.6	2.0/8.0	22,322	2,527	13,445	260,786	85.5
2033	9.9	89,494	100,054	39,746	684,730	6.6	2.0/8.0	23,232	3,049	15,332	296,300	81.2
2034	9.9	93,095	104,093	41,492	715,224	6.6	2.0/8.0	24,172	3,649	17,346	334,169	77.3
2035	9.9	96,912	108,249	43,322	747,209	6.6	2.0/8.0	25,150	4,325	19,492	374,486	73.7
2036	9.9	100,651	112,528	45,241	780,573	6.7	2.0/8.0	26,113	5,080	21,773	417,293	70.5
2037	9.9	104,614	116,923	47,246	815,510	6.7	2.0/8.0	27,128	5,917	24,194	462,698	67.6
2038	9.9	108,762	121,421	49,357	852,207	6.8	2.0/8.0	28,224	6,841	26,762	510,842	65.0
2039	9.9	113,131	126,064	51,588	890,862	6.8	2.0/8.0	29,318	7,861	29,481	561,780	62.5
2040	9.9	117,574	130,885	53,929	931,480	6.9	2.0/8.0	30,478	8,986	32,357	615,629	60.2
2041	9.9	122,165	135,911	56,391	974,124	6.9	2.0/8.0	31,669	10,228	35,395	672,464	58.0
2042	9.9	126,930	141,134	58,990	1,018,910	7.0	2.0/8.0	32,899	11,589	38,599	732,374	56.0
2043	9.9	131,919	146,576	61,723	1,065,976	7.0	2.0/8.0	34,170	13,085	41,974	795,433	54.0
2044	9.9	136,973	152,264	64,569	1,115,254	7.1	2.0/8.0	35,465	14,722	45,524	861,700	52.2
2045	9.9	142,207	158,220	67,547	1,166,788	7.1	2.0/8.0	36,788	16,519	49,251	931,221	50.4
2050	9.9	170,538	192,433	84,405	1,457,678	7.3	2.0/8.0	44,082	28,176	70,659	1,329,652	42.7
2055	9.9	203,190	235,278	104,335	1,799,883	7.4	2.0/8.0	52,491	45,161	96,835	1,815,109	36.8
2060	9.9	241,803	286,634	127,089	2,189,836	7.4	2.0/8.0	62,420	67,743	127,924	2,390,348	32.8
2065	9.9	289,714	345,401	153,538	2,644,967	7.4	2.0/8.0	74,736	94,273	164,544	3,068,238	30.7
2070	9.9	348,970	415,068	185,553	3,197,264	7.4	2.0/8.0	89,917	124,675	208,136	3,876,063	29.5
2075	9.9	419,953	499,669	224,534	3,869,318	7.5	2.0/8.0	108,179	160,374	260,380	4,844,655	28.8
2080	9.9	504,121	602,316	271,520	4,678,391	7.5	2.0/8.0	129,776	202,238	323,213	6,009,983	28.4
2085	9.9	603,066	727,360	327,105	5,633,298	7.5	2.0/8.0	155,214	251,445	398,965	7,415,345	28.3
2090	9.9	720,380	878,046	391,621	6,739,676	7.4	2.0/8.0	185,303	308,670	490,622	9,116,732	28.4

(1) It is assumed that operating expenses incurred in calendar years preceding 2019 will be charged to the Additional CPP Account in the calendar year 2019, along with the expenses incurred in that year

Appendix B – Illustrations of Additional Benefits

All illustrations in this Appendix are presented on the basis of the 2016 YMPE. This means that future amounts are discounted back to 2016 using the YMPE growth basis. Such adjusted amounts are referred to in this Appendix as being in 2016 YMPE-adjusted dollars.

Additional monthly benefits would accrue over a 40-year period starting on 1 January 2019 or when a contributor reaches age 18, if later. Table 19 presents illustrations of the maximum additional retirement benefit by the level of average career adjusted earnings. It is assumed that contributors have adjusted earnings in each year equal to the average career adjusted earnings as well as take their benefit at age 65 on January 1 of the year. As such, the first year shown in Table 19 is 2020.

As shown in Table 19, additional retirement benefits would be quite low in the early years due to the lower accrual rates during the phase-in period and the few years of contributions. For example, someone starting their retirement pension at age 65 in 2024 with five years of contributions under the additional Plan would receive an additional annual retirement benefit equivalent to $295 based on 2016 YMPE-adjusted dollar amounts and assuming that the retiree contributed on earnings at 114% of the YMPE. This represents an increase of 2.25% over the current benefit ($295 divided by $13,110). For someone starting their retirement pension at age 65 in 2065 who had contributed to the additional CPP for 40 years on earnings at 114% of the YMPE, the additional annual retirement benefit on a 2016 YMPE-adjusted dollar basis would equal $6,815, representing a 52% increase in the base CPP benefit.

Table 19 Maximum Annual Retirement Benefit under the Base and Additional Plans[1]
(in 2016 YMPE-adjusted dollars)

	Average Career Adjusted Earnings as % of YMPE and in 2016 YMPE-adjusted dollars[2] (YMPE = $54,900)					
	25% $13,725	**50% $27,450**	**75% $41,175**	**100% $54,900**	**107% $58,740**	**114% $62,585**
	Base Plan Maximum Annual Retirement Benefit					
	3,278	*6,555*	*9,833*	*13,110*	*13,110*	*13,110*
January 1, Year Reach 65	**Additional Maximum Annual Retirement Benefit**					
2020	4	8	12	16	16	16
2021	12	25	37	49	49	49
2022	26	52	78	104	104	104
2023	46	93	139	186	186	186
2024	74	147	221	295	295	295
2025	101	202	303	404	435	435
2026	128	257	385	513	574	605
2030	238	475	713	950	1,134	1,287
2040	511	1,021	1,532	2,042	2,532	2,990
2050	784	1,567	2,351	3,134	3,929	4,694
2060	1,052	2,105	3,157	4,210	5,311	6,382
2065+	1,092	2,184	3,276	4,368	5,592	6,815

(1) Maximum Pensionable Earnings Average (MPEA) of $52,440 in 2016.
(2) Future amounts are discounted back to 2016 using the YMPE growth basis.

The retirement benefit received may be considered in relation to average career adjusted earnings; that is, a total replacement rate may be estimated. This rate is determined as the ratio of the pension received to average career adjusted earnings. The replacement rates for the base Plan and the combination of the base and additional Plans are shown in Table 20. These rates are based on a contributor having adjusted earnings in each year equal to the average career adjusted earnings. Under the base CPP, the replacement rates shown for earnings up to the YMPE are less than 25% since the retirement benefit is determined using the Maximum Pensionable Earnings Average (MPEA of $52,440 in 2016) which is always less than the retirement year's YMPE ($54,900 in 2016). Thus, the replacement rate for average career adjusted earnings up to the YMPE is equal to 25% x MPEA (retirement year) / YMPE (pre-retirement year), or about 24% in 2016. For earnings above the YMPE, the replacement rate falls as average career adjusted earnings reach higher levels, but the pension remains capped at the maximum amount.

Table 20 shows that, by 2065, the combination of the base and additional retirement benefits will produce a replacement rate of 32% for earnings below YAMPE (equal to 107% of the YMPE in 2024 and to 114% of the YMPE for 2025 and thereafter). For earnings above the YAMPE the replacement rate falls.

Table 20 Replacement Rate for Annual Retirement Benefit at Age 65 (Base and Additional Plans)[(1)]

	Average Career Adjusted Earnings as % of YMPE and in 2016 YMPE-adjusted dollars[(2)] (YMPE = $54,900)								
	25% $13,725	**50% $27,450**	**75% $41,175**	**100% $54,900**	**107% $58,740**	**114% $62,585**	**125% $68,625**	**150% $82,350**	**200% $109,800**
	Base CPP Replacement rate								
	24%	*24%*	*24%*	*24%*	*22%*	*21%*	*19%*	*16%*	*12%*
January 1, Year Reach 65	**Base and Additional Plans Replacement Rate**								
2020	24%	24%	24%	24%	22%	21%	19%	16%	12%
2021	24%	24%	24%	24%	22%	21%	19%	16%	12%
2022	24%	24%	24%	24%	22%	21%	19%	16%	12%
2023	24%	24%	24%	24%	23%	21%	19%	16%	12%
2024	24%	24%	24%	24%	23%	21%	20%	16%	12%
2025	25%	25%	25%	25%	23%	22%	20%	16%	12%
2026	25%	25%	25%	25%	23%	22%	20%	17%	12%
2030	26%	26%	26%	26%	24%	23%	21%	17%	13%
2040	28%	28%	28%	28%	27%	26%	23%	20%	15%
2050	30%	30%	30%	30%	29%	28%	26%	22%	16%
2060	32%	32%	32%	32%	31%	31%	28%	24%	18%
2065+	32%	32%	32%	32%	32%	32%	29%	24%	18%

(1) Maximum Pension Earnings Average (MPEA) of $52,440 in 2016.
(2) Future amounts are discounted back to 2016 using the YMPE growth basis.

As discussed before, Table 19 illustrates retirement benefits for contributors having adjusted earnings in each year equal to the average career adjusted earnings as well as taking their benefit at age 65. In reality, only very few individuals have such a career earnings history. To illustrate the impact of variable career paths on the base and additional retirement benefits, Table 21 presents the average pensions of new retirement beneficiaries in 2075 both in 2016 YMPE-adjusted dollars and as a percentage of the maximum retirement benefit at age 65 for a given year. Since the figures in this table include all emerging retirement beneficiaries independent of age, these average amounts were adjusted to remove the impact of the downward and upward actuarial adjustments applied at retirement before and after age 65, respectively. Thus, these amounts illustrate only the variability of career earnings, but not the impact of individual decisions with respect to the timing of retirement.

It is projected that, in 2075, new CPP retirement beneficiaries will have an average base CPP benefit (with actuarial adjustment factors removed) equal to 63% of the maximum CPP retirement benefit at age 65 (66% for males and 61% for females). However, the average additional retirement benefit is projected to be 44% of the maximum CPP2 retirement benefit at age 65 (47% for males and 40% for females). This difference in relative size is due to the higher upper limit of covered earnings under the additional Plan compared to the base CPP (YAMPE versus YMPE). Since not everyone will consistently have earnings between YAMPE and YMPE throughout their careers, such earnings variability results in the dilution of the average benefit amounts.

Table 21 Average Annual New Benefits in 2075 - Base and Additional Plans, without Actuarial Adjustment Factors
(in 2016-YMPE adjusted dollars(1))

	Additional CPP			Base CPP		
	Males	**Females**	**Both Sexes**	**Males**	**Females**	**Both Sexes**
Maximum Benefit	$6,815	$6,815	$6,815	$13,110	$13,110	$13,110
Average Benefit	$3,233	$2,746	$2,984	$8,635	$8,007	$8,314
Average Benefit as Percentage of Maximum	47%	40%	44%	66%	61%	63%

(1) Future amounts are discounted back to 2016 using the YMPE growth basis.

Additional survivor and disability benefits would also be low in the early years, since they are proportional to additional retirement benefits. Maximum annual additional survivor benefits at age 65, equal to 60% of the accrued additional retirement benefit to the deceased contributor at the time of death, and maximum annual additional disability benefits, equal to 75% of the accrued additional retirement pension at the time of disablement, are shown in Tables 22 and 23, respectively.

Table 22 Maximum Annual Survivor Benefit at Age 65 under Base and Additional Plans[1,2,3]
(in 2016 YMPE-adjusted dollars)

	Average Career Adjusted Earnings as % of YMPE and in 2016 YMPE-adjusted dollars (YMPE = $54,900)					
	25% $13,725	**50% $27,450**	**75% $41,175**	**100% $54,900**	**107% $58,740**	**114% $62,585**
	Base Plan Maximum Annual Survivor Benefit at age 65					
	1,967	*3,933*	*5,900*	*7,866*	*7,866*	*7,866*
January 1, Year of death at age 65	**Additional CPP Maximum Annual Survivor Benefit at Age 65**					
2020	2	5	7	10	10	10
2021	7	15	22	29	29	29
2022	16	31	47	62	62	62
2023	28	56	84	111	111	111
2024	44	88	133	177	177	177
2025	61	121	182	242	261	261
2026	77	154	231	308	345	363
2030	143	285	428	570	680	772
2040	306	613	919	1,225	1,519	1,794
2050	470	940	1,410	1,881	2,358	2,816
2060	631	1,263	1,894	2,526	3,187	3,829
2065+	655	1,310	1,966	2,621	3,355	4,089

(1) Additional monthly survivor benefit at age 65 for the additional CPP is equal to 60% of the accrued additional retirement pension of the deceased contributor at their time of death with no actuarial adjustment, regardless of the age of the survivor, the survivor's disability status, and absence of dependent children. The same survivor pension formula applies under the base CPP for survivors aged 65 or older.
(2) Maximum Pensionable Earnings Average (MPEA) of $52,440 in 2016.
(3) Future amounts are discounted back to 2016 using the YMPE growth basis

Table 23 Maximum Annual Disability Benefit under Base and Additional Plans [1,2,3]
(in 2016 YMPE-adjusted dollars)

	Average Career Adjusted Earnings as % of YMPE and in 2016 YMPE-adjusted dollars (YMPE = $54,900)					
	25% $13,725	**50% $27,450**	**75% $41,175**	**100% $54,900**	**107% $58,740**	**114% $62,585**
	Base Plan Maximum Annual Disability Benefit					
Flat rate	*5,590*	*5,590*	*5,590*	*5,590*	*5,590*	*5,590*
Earnings-related	*2,525*	*4,983*	*7,442*	*9,900*	*9,900*	*9,900*
Total	*8,115*	*10,573*	*13,032*	*15,490*	*15,490*	*15,490*
January 1, Year Become Disabled	**Additional CPP Maximum Annual Disability Benefit**					
2020	3	6	9	12	12	12
2021	9	18	28	37	37	37
2022	19	39	58	78	78	78
2023	35	70	104	139	139	139
2024	55	111	166	221	221	221
2025	76	152	227	303	326	326
2026	96	192	289	385	431	454
2030	178	356	534	713	850	965
2040	383	766	1,149	1,532	1,899	2,243
2050	588	1,175	1,763	2,351	2,947	3,521
2060	789	1,579	2,368	3,157	3,983	4,786
2065+	819	1,638	2,457	3,276	4,194	5,111

(1) Additional monthly disability benefits are equal to 75% of the accrued additional retirement pension.
(2) Maximum Pensionable Earnings Average (MPEA) of $52,440 in 2016.
(3) Future amounts are discounted back to 2016 using the YMPE growth basis.