Office of the Superintendent of Financial Institutions Canada
Office of the Chief Actuary

Bureau du surintendant des institutions financières Canada
Bureau de l'actuaire en chef

ACTUARIAL REPORT
on the
GOVERNMENT ANNUITIES

as at 31 March 2020

OSFI BSIF

Canada

Table of Contents

List of Tables

Page

I. Executive Summary

A. Purpose of Report

In accordance with section 15 of the *Government Annuities Improvement Act* ("the Improvement Act") an actuarial valuation was conducted as at 31 March 2020 for purposes of determining the actuarial liabilities and financial position of the Government Annuities Account ("the Account"). Section 15 of the Improvement Act also states that any surplus or deficit emerging as a result of the actuarial valuation shall be reported and, in the case of a surplus, credited to the Federal Government's Consolidated Revenue Fund (CRF) and charged to the Account or, in the case of a deficit, charged to the Federal Government's CRF and credited to the Account.

B. Data, Method and Assumptions

Data on current retirees, beneficiaries, deferred members, premiums and benefit payments were provided by Employment and Social Development Canada (ESDC) and Service Canada. The data are gathered through the electronic reports from the Government Annuities Secured Website. The Government Annuities Branch located in Bathurst administers the annuities as well as the corresponding website. The data are from a reliable source. We have performed summary tests on the data, and have found that they are accurate, reliable and sufficient for the purposes of the valuation. A description of contract types and a summary of the data are shown in Appendix 1 and Appendix 2 of this report. The actuarial liabilities are the present value of expected future benefits, determined in accordance with accepted actuarial practice and statutory valuation assumptions. Subsection 3(4) of the *Government Annuities Regulations* ("the Regulations") states that the actuarial liability is to be determined using an interest rate of 7% per annum and the mortality rates of the Annuity Table for 1983, as modified by Projection Scale G.

C. Results

The following table summarizes the results of the actuarial valuation as at 31 March 2020.

Table 1 Results Overview

	As at 31 March 2020
Assets	$ 86,635,013
Liabilities	$ 85,407,162
Surplus (Deficit)	$ 1,227,852

	Count	Average Annual Pension
Vested Members	21,949	$ 681
Deferred Members	101	$ 1,548
Total	22,050	$ 685

D. Conclusion

The surplus of $1,227,852 is credited to the Federal Government's CRF and charged to the Account. The next valuation will be performed as at 31 March 2021.

II. Introduction

The Canadian *Government Annuities Act* of 1908 was one of the earliest significant pieces of social legislation in Canada. Its purpose was to encourage Canadians to prepare financially for their retirement. Government Annuities were purchased either by individuals or by employers as pension plans for their employees.

By the 1960's, other social benefit plans, such as Old Age Security (OAS) and the Canada Pension Plan were introduced and began gaining importance in providing Canadians with basic retirement income. The government's recognition that retired Canadians could now be served by other social security programs as well as the private sector brought about the decision to disband the Annuities sales force. In 1975, an Act of Parliament formally ended the sale of Government Annuities. Employers, however, could register new employees under group contracts until 1979. The Government Annuities are not sponsored by the Government – meaning the Government has no fiduciary liability. Its responsibilities are limited to provide and secure benefits in accordance with each contract's provisions.

The Annuities Branch continues to administer contracts under payment and those due to become payable, on behalf of clients from across Canada and around the world. The Account is not subject to any federal or provincial pension legislation; it is only subject to the *Government Annuities Act*, the Improvement Act and the Regulations. The assets and liabilities are shown in the Public Accounts of Canada. The assets are notional and are not subject to any investment policy or performance goals and objectives.

The Office of the Chief Actuary (OCA), Office of the Superintendent of Financial Institutions Canada (OSFI), has the mandate of performing the annual actuarial valuation of the Account as of 31 March 2020. The purpose of the valuation is to establish the Account’s liabilities, notional assets, and financial position, based on the statutory valuation assumptions.

III. Data

A. Data Required

Since the actuarial valuation determines both the assets and the liabilities, full details on the members as well as on the cash flows that occurred within the year are needed.

B. Member Data

Basic data on pensioners, beneficiaries and deferred members are provided by ESDC and Service Canada. The data are retrieved from the Government Annuities Secure Website maintained by the Annuities Branch in Bathurst. The site enables the production of reports which show the member data required to establish the liabilities: certificate number, maturity date, member, spouse and beneficiaries' gender and dates of birth, annual pension amounts, and form of pension.

The required data reports are VY4741 for vested members (pensioners) and GY5642 for deferred members (members with deferred rights).

Notes on VY4741 Vested Data

Additional pension amounts data are required from Service Canada concerning the continuing pensions for joint and survivor contracts with percentages other than 50% or 100%, as well as for reducing annuities. VY4741 data does not show the accurate continuing pension amounts for annuities of type 29, 37, and 70-79.

Moreover, manual additions must be done, as the VY4741 report excludes certain members due to internal validation controls at Bathurst. The data related to this limited number of members were extracted from the VY5141 report. There were 32 such members as at 31 March 2020.

Notes on GY5642 Deferred Data

Pursuant to the Improvement Act which granted annual accrual of contributions accounts at 7% from 1 April 1975, the following table shows the multipliers that must be applied to the annual original pension amounts.

Table 2 Multipliers for Deferred Pension Amounts

Premium Series	Original Interest Rate	Multiplier
4	4.0%	1.22
5	3.0%	1.32
6	3.5%	1.29
7	4.0%	1.22
8	5.0%	1.14

These multipliers reflect the increase between the original interest rate applicable on the contracts and 7%. As the deferred members data only show the pension amounts prior to the enhancements, these multipliers are used to update the annual pensions.

It can be seen that the methodology used to derive these multipliers granted higher increases to contracts with lower interest rates, and vice-versa. The objective sought at the time was to distribute the increases as equitably as possible.

A reconciliation of pension amounts and membership status with last year's membership has been performed. A detailed summary of membership data is shown in the Appendix 2 of this report.

C. Asset Data

Income consists of premiums received, funds reclaimed from the CRF for previously untraceable annuitants, notional earned interest and any transfer needed to cover the actuarial deficit. Payments and other charges represent matured annuities, commuted value of death benefits, premium refunds and withdrawals, and transfers to the CRF of actuarial surpluses and unclaimed annuities related to untraceable annuitants.

All reports used to determine the value of assets are provided by ESDC.

A list showing the names and short descriptions of the required reports is given in Appendix 3 of this report.

The data used are considered to be sufficient and reliable for the purposes of the actuarial valuation.

IV. Methods and Assumptions

A. Liability Valuation Method

The actuarial liabilities are associated with two groups of members: vested and deferred. The vested group consists of the participants for whom the pensions are in payment as at 31 March 2020. The deferred group consists of members for whom payment of pensions will start in the future. The liabilities are the actuarial present value of future pension payments, the result of discounting the future expected benefits with interest and post-retirement mortality.

B. Assumptions

The interest and post-retirement mortality assumptions are statutory, as stated in section 15 of the Improvement Act and subsection 3(4) of the Regulations. Namely, the liabilities must be based on a rate of interest of 7% per annum and on the mortality rates of the Annuity Table for 1983, as modified by Projection Scale G, published in Transactions of the Society of Actuaries, Vol. XXXV (1983), at pages 882 and 883.

Accordingly, the 1983 individual annuity mortality table (IAM83) is used for individual contracts and the 1983 group annuity mortality table (GAM83) is used for group contracts. Both tables are sex-distinct, and are projected for 15 years with Projection Scale G. Furthermore, for consistency with the methodology used to develop these mortality tables, the liabilities were calculated based on the annuitants' attained age (age last) at the valuation date.

Extracts from these mortality tables as well as associated life expectancies can be found in Appendix 4 of this report.

C. Asset Valuation Method

Since section 14 of the *Government Annuities Act* states that the monies received or paid under this act form part of the CRF, the assets are notional. Each year, any difference with the liabilities calculated is either credited (in the case of a surplus) or charged (in the case of a deficit) to the CRF, with a corresponding charge or credit to the Account. Following these adjustments, the assets value as at 1 April 2019 is equal to the 31 March 2019 liabilities. The assets value as at 31 March 2020 prior to any charge or credit to the CRF is obtained by adding interest at 7% on the 1 April 2019 value and adjusting for cash inflows and outflows also at 7% annual interest rate.

V. Results

A. Balance Sheet

The following table presents a summary of the balance sheet of the Account for the 2020 and 2019 fiscal years.

Table 3 Balance Sheet

Fiscal Year	**2019 – 2020**	**2018 – 2019**
Assets as at 1 April	**$ 96,301,548**	**$ 107,780,133**
INCOME		
Interest to 31 March	$ 6,141,971	$ 6,877,815
Premiums for Deferred Annuities	72	135
Unclaimed annuities recovered from CRF	32,306	509
TOTAL	**6,174,349**	**6,878,459**
PAYMENTS AND OTHER CHARGES		
Payments to Vested Members:		
Vested Regular Annuity Payments	$ 15,715,870[1]	$ 17,413,284[2]
Vested Commuted Values	33,096	56,395
Total Payments to Vested Members:	15,748,966	17,469,679
Monies Refunded	7,895	29,505
Values Transferred to CRF (Vested & Deferred)	84,023	59,227
TOTAL	**15,840,884**	**17,558,412**
INCOME LESS PAYMENTS AND OTHER CHARGES	**$ (9,666,535)**	**$ (10,679,953)**
Assets as at 31 March	**$ 86,635,013**	**$ 97,100,180**
Surplus charged to the Account and credited to the CRF	**$ (1,227,852)**	**$ (798,632)**
Net Assets as at 31 March	**$ 85,407,162**	**$ 96,301,548**
Actuarial Liabilities as at 31 March	**$ 85,407,162**	**$ 96,301,548**

[1] Includes annuity and retroactive payments totalling $40,088 for members that were recovered from the CRF in 2019-2020. Additionally, $10,136 of the $40,088 is an overpayment that was made to a participant that has not been recovered or transferred to the account receivable as at 31 March 2020.

[2] Includes annuity and retroactive payments totalling $612 for members that were recovered from the CRF in 2018-2019.

B. Calculation of Interest

The following table outlines the calculation of the notional 7% annual interest credited to the Account for the 2020 and 2019 fiscal years.

Table 4 Calculation of Interest

Fiscal Year	**2019 – 2020**	**2018 – 2019**
VESTED MEMBERS		
Interest on :		
Prescribed Assets as at 1 April of prior year	$ 6,594,020	$ 7,361,944
Maturities	64,969	57,384
CRF Recoveries	1,302	0
Less interest on :		
Annuity Payments	(598,832)	(659,318)
Commuted Values	(639)	(2,104)
Transfers to CRF	0	0
TOTAL VESTED	**6,060,820**	**6,757,906**
DEFERRED MEMBERS		
Interest on :		
Prescribed Assets as at 1 April of prior year	147,089	182,665
Premiums	1	3
CRF Recoveries	18	15
Less interest on :		
Maturities	(64,969)	(57,384)
Refunds	(660)	(5,390)
Transfers to CRF	(328)	0
TOTAL DEFERRED	**81,151**	**119,909**
TOTAL INTEREST	**$ 6,141,971**	**$ 6,877,815**

C. Development of Actuarial Liabilities

The following table outlines the Account's actuarial liabilities by members' category as at 31 March of 2020 and 2019.

Table 5 Development of Actuarial Liabilities

Fiscal Year	Contract Type	**2019 – 2020**	**2018 – 2019**
VESTED MEMBERS			
Males, Ordinary Life	10 – 16	$ 41,336,309	$ 47,195,833
Females, Ordinary Life	10 – 16	21,911,561	23,955,194
Males, Guaranteed	21 – 29	9,948,624	10,940,463
Females, Guaranteed	21 – 29	5,126,150	5,418,757
Last Survivor	30 – 37	4,662,986	5,600,361
Reducing at OAS	70 – 79	729,029	847,531
Annuities Certain	50, 80	208,146	222,402
Temporary Annuities	60	4,160	7,413
Suspended Payments		13,309	12,324
VESTED TOTAL		**83,940,273**	**94,200,279**
DEFERRED MEMBERS			
Ordinary Life	10	41,602	94,781
Males, Guaranteed	21 - 24	887,815	1,293,201
Females, Guaranteed	21 - 24	484,366	665,350
Refunds in Process		1,814	0
Suspense Accounts	Account 721	51,293	47,937
DEFERRED TOTAL		**1,466,889**	**2,101,269**
TOTAL ACTUARIAL LIABILITIES		**$ 85,407,162**	**$ 96,301,548**

VI. Experience

A. Analysis of Experience

As there are no new contracts purchased under the *Government Annuities Act*, the main source of experience gains or losses is the mortality. It includes changes in expected future payments due to the death or survival of annuitants and the difference between actual and expected benefit payments during the year.

The table below presents a reconciliation of the surplus between 31 March 2019 and 31 March 2020.

Table 6 Gains (Losses)

Surplus as at 31 March 2019	**-**
Premiums paid with interest	$ 73
Vested members mortality	1,279,317
Deferred members - retirements, mortality, refunds	(19,827)
Transfers from CRF and other data changes	(31,711)
Surplus as at 31 March 2020	**$ 1,227,852**

B. Alternative Assumptions for Purposes of the Account's Financial Statements

Mortality

Following an external audit of the Account as at 31 March 2014, ESDC management asked the OCA to conduct a mortality experience study and to include the amount of the actuarial liabilities under experience-adjusted mortality rates in future Actuarial Reports on the Government Annuities.

Discount Rate

To promote greater comparability with other public service pension plans that are part of the Public Account of Canada, the liabilities shown in the Account's financial statements is measured using a different discount rate than the prescribed interest rate of 7%. The alternative rate is established based on a yield curve approach. This yield curve is determined by reference to market yields at the end of the reporting period on Government of Canada Bonds and treasury bills.

The OCA has determined that the liabilities as at 31 March 2020 under experience-adjusted mortality rates and the alternative discount rate is $114.8 million, which is $29.4 million higher than under the prescribed assumptions. More details are presented in Appendix 5.

VII. Actuarial Opinion

In our opinion, considering that this report was prepared pursuant to the *Government Annuities Act* and *the Government Annuities Improvement Act*:

- the data on which this report is based are sufficient and reliable for the purposes of this report;
- the assumptions used comply with legislative requirements;
- the methods employed are appropriate for the purposes of this report; and
- as at 31 March 2020, there is a surplus of $1,227,852 which is credited to the Federal Government's Consolidated Revenue Fund and charged to the Government Annuities Account.

This report has been prepared, and our opinion given, in accordance with accepted actuarial practice in Canada. As of the date of the signing of this report, we have not learned of any events that would have a material impact on the results presented in this report as at 31 March 2020.

Annie St-Jacques
Fellow of the Canadian Institute of Actuaries
Office of the Chief Actuary, OSFI

Thierry Truong
Fellow of the Canadian Institute of Actuaries
Office of the Chief Actuary, OSFI

Alice Chiu
Associate of the Canadian Institute of Actuaries
Office of the Chief Actuary, OSFI

Ottawa, Canada
2 October 2020

Appendix 1 – Contract Types

The following describes the annuities provisions as specified by the contracts:

Ordinary Life: At maturity, this annuity is payable for as long as the annuitant lives, but at death the annuity ceases immediately and there are no death benefits.

Guaranteed: The annuity under this contract is payable for life but it is guaranteed for a minimum period of 5, 10, 15 or 20 years.

Contingent Survivor: This annuity is based on two lives. The annuity is payable to the principal annuitant for as long as he or she lives. At death, the annuity is payable to the survivor until his or her death.

Joint and Last Survivor: This contract differs from the Contingent Survivor contract in that the annuity instalments are payable to both parties. After the death of one partner, the annuity is made payable to the survivor as long as he or she lives.

Reducing Option: The Reducing Option is an arrangement whereby the level of the annuity purchased is paid at an increased amount from age 50 (or later) to age 65. At age 65, the annuity decreases by the amount of Old Age Security in effect at the date of maturity. The annuity is payable for life, with death benefits available for the duration of the guaranteed period, if there is one.

The following describes the contract types:

Single Life - No Guarantee (10 – 16)

10. Ordinary
11. Guarantee expired: on valuation change of 21 – 24
12. From last or contingent survivor: 30, 35, 36, 37
13. From last survivor guarantee expired: on first death of 31
14. From reducing ordinary: on reduction of 70
15. From reducing guaranteed: on reduction of 79, on valuation change of 29 or from 71-74 where reduction and end of guarantee coincide
16. From reducing survivor: 36, 37

Single Life with Guarantee (21 – 29)

21. Guaranteed 5 years
22. Guaranteed 10 years
23. Guaranteed 15 years
24. Guaranteed 20 years
29. From 71-74 after reduction still within guarantee

Joint Lives No Guarantee (30 – 37)

30. Ordinary Last Survivor (100%)
31. Last Survivor guarantee expired (100%)
35. Contingent Survivor (100%)
36. Contingent Survivor reducing by one half at death of Principal Annuitant (50%)
37. Contingent Survivor reducing by any other amount at death of Principal Annuitant

Annuities Certain (50 & 80)

50. Certain level amount (Includes from 80 after reduction)
80. Certain, reducing

Temporary Annuities (60)

60. Temporary

Reducing Annuities (70- 79)

70. Ordinary, reducing
71. Guaranteed 5 years, reducing
72. Guaranteed 10 years, reducing
73. Guaranteed 15 years, reducing
74. Guaranteed 20 years, reducing
79. From 71-74, guarantee expired before reduction

Appendix 2 – Membership Data

A. Vested members

Table 7 Membership Data - Contract Types 10-16: Vested Ordinary Life

AGE		MALES	FEMALES	TOTAL
50-59	Average Pension	550	737	674
	Number	5	10	15
	Average Age	58.2	58.0	58.1
60-69	Average Pension	870	852	860
	Number	91	114	205
	Average Age	66.2	66.5	66.4
70-79	Average Pension	751	660	712
	Number	1,224	916	2,140
	Average Age	76.4	75.7	76.1
80-89	Average Pension	642	552	616
	Number	7,259	2,909	10,168
	Average Age	85.0	85.1	85.1
90-100	Average Pension	706	547	645
	Number	4,190	2,624	6,814
	Average Age	92.9	93.6	93.2
100 +	Average Pension	689	523	588
	Number	73	115	188
	Average Age	102.2	102.6	102.4
Total Average Pension		675	570	639
Total Number		12,842	6,688	19,530
Total Average Age		86.7	87.1	86.9

Table 8 Membership Data - Contract Types 21-29: Vested Guaranteed

AGE		MALES	FEMALES	TOTAL
50-59	Average Pension	3,444	3,791	3,543
	Number	5	2	7
	Average Age	56.6	58.5	57.1
	Average guarantee	15.1	10.8	13.9
60-69	Average Pension	2,036	1,836	1,953
	Number	196	139	335
	Average Age	66.6	66.2	66.4
	Average guarantee	9.2	8.1	8.7
70-79	Average Pension	1,251	1,059	1,196
	Number	510	206	716
	Average Age	74.6	73.8	74.4
	Average guarantee	4.6	5.0	4.7
80-89	Average Pension	969	938	963
	Number	47	11	58
	Average Age	81.8	81.6	81.8
	Average guarantee	1.7	1.9	1.7
Total Average Pension		1,451	1,372	1,426
Total Number		758	358	1,116
Average Age		72.8	71.0	72.3
Average guarantee		5.7	6.1	5.8

Table 9 Membership Data - Contract Types 30-37: Vested Joint & Survivor

AGE		MALES	FEMALES	TOTAL
	Average Pension	1,813	-	1,813
	Number	2	-	2
60-69	Average Age	67.5	-	67.5
	Average Spouse Age	66.5	-	66.5
	Average Continuing Percentage	100%	-	100%
	Average Pension	390	265	385
	Number	78	3	81
70-79	Average Age	77.6	77.0	77.5
	Average Spouse Age	74.7	78.3	74.9
	Average Continuing Percentage	82%	100%	83%
	Average Pension	546	230	538
	Number	898	21	919
80-89	Average Age	84.5	83.1	84.5
	Average Spouse Age	81.6	82.4	81.6
	Average Continuing Percentage	73%	64%	72%
	Average Pension	754	2,099	760
	Number	214	1	215
90+	Average Age	92.1	96.0	92.1
	Average Spouse Age	87.9	96.0	87.9
	Average Continuing Percentage	75%	100%	75%
	Total Average Pension	575	309	569
	Total Number	1,192	25	1,217
	Average Age	85.4	82.9	85.4
	Average Spouse Age	82.2	82.4	82.2
	Average Continuing Percentage	74%	70%	74%

Table 10 Membership Data - Contract Types 50 & 80: Vested Certain

Average Pension	1,185
Number	53
Average Certain Period	3.84

Table 11 Membership Data - Contract Type 60: Vested Temporary

	MALES	FEMALES	TOTAL
Average Pension	583	781	682
Number	2	2	4
Average Age	63.0	64.0	63.5
Average Period	2.0	1.0	1.5

Table 12 Membership Data - Contract Types 70-79: Vested Reducing

	MALES	FEMALES	TOTAL
Average Pension	3,352	4,530	3,962
Number	14	15	29
Average Reduced Pension	1,702	1,620	1,660
Average Age	62.0	62.0	62.0

B. Deferred Members

Table 13 Membership Data - Contract Types 10-16: Deferred Ordinary Life

	TOTAL
Average Pension	3,202
Number	2
Average Age	65.0

Table 14 Membership Data - Contract Types 21-24: Deferred Guaranteed

	MALES	FEMALES	TOTAL
Average Pension	1,704	1,223	1,514
Number	60	39	99
Average Age	61.8	61.2	61.6
Average Guarantee	14.9	14.2	14.6

C. Membership Reconciliation

Table 15 Membership Reconciliation

VESTED							
Contract Types	**10-16**	**21-29**	**30-37**	**50&80**	**60**	**70-79**	**Total**
Count as at 31 March 2019	21,846	1,268	1,405	70	5	34	24,628
Maturities	3	26	0	0	0	2	31
Transfers from/to Other Contract Types	341	(169)	(174)	9	0	(7)	0
Deaths or Expired Annuities[1]	(2,666)	(9)	(14)	(24)	(1)	0	(2,714)
Net CRF Transfers[2]	5	0	0	(2)	0	0	3
Data changes	1	0	0	0	0	0	1
Count as at 31 March 2020	19,530	1,116	1,217	53	4	29	21,949

DEFERRED	
Count as at 31 March 2019	**141**
Maturities	(31)
Deaths and Refunds	(7)
Net CRF Transfers	(2)
Count as at 31 March 2020	**101**

[1] The 2,714 Deaths or Expired Annuities are composed of 1,854 group certificates and 860 individual contracts.
[2] The 3 net CRF transfers are individual contracts

Appendix 3 – Sources of Data

Reports Required

The following are the reports used in order to perform the Government Annuities Account valuation. The main reports are provided by ESDC and Service Canada.

Membership Data

VY4741P1: Basic Vested Data
VY5141: Vested Annuitants to be added manually (Records to be completed using report VY4742P1)
GY5642: Basic Deferred Data

Service Canada also provides us with accurate pension amounts for plans 16, 37, 70-79, and 29, and additional data for plans 50 and 80. This data consists of pension amounts, reduced pension amounts where applicable, date of reduction and date of final payment. Even though the total actuarial liability is taken directly from VY5141 for plans 50 and 80, it must be individually calculated for purposes of gains and losses analysis.

Asset Data

VM3942: Vested benefit payments and maturities by period

GY5646, GM4741, and GM4742: Data related to refunds

Premiums paid are provided by the Annuity Accounting Division of ESDC.

Benefit payments are provided by the Annuity Accounting Division of ESDC.

The monthly VM3942 reports are extracted to reconcile the Annuity Accounting Division's benefit payments. Ultimately, the Annuity Accounting Division's figures are used for balance sheet purposes. The monthly GM4741 and GM4742 reports must be extracted for group and individual contracts.

Other Data

ESDC also provides balances for suspense accounts (GY5644 and GR3442), refunds in progress (GY5941) and suspended payments (VY5443).

Appendix 4 – Mortality Tables

Projection of Mortality

The mortality assumption is statutory, as stated in section 15 of the Improvement Act and subsection 3(4) of the Regulations. Mortality rates are to follow the Annuity Table for 1983, as modified by Projection Scale G published in Transactions of the Society of Actuaries, Vol. XXXV (1983), at pages 882 and 883. SOR/97-495, s. 2.

Accordingly, the IAM83 table is used for individual contracts and the GAM83 table is used for group contracts. Both tables are used on sex-distinct basis and are projected for 15 years with Projection Scale G. Furthermore, for consistency with the methodology used to develop these mortality tables, the liabilities were calculated based on the annuitants' attained age (age last) at the valuation date.

The following table shows the mortality rates as well as Projection scale G for selected attained ages.

Table 16 Mortality Rates

	GAM83 ORIGINAL		IAM83 ORIGINAL		PROJECTION SCALE G		GAM83 PROJECTED		IAM83 PROJECTED	
AGE	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
10	0.000293	0.000096	0.000382	0.000141	0.007500	0.012000	0.000262	0.000080	0.000341	0.000118
15	0.000325	0.000140	0.000435	0.000188	0.002200	0.007000	0.000314	0.000126	0.000421	0.000169
20	0.000377	0.000189	0.000505	0.000260	0.001400	0.005000	0.000369	0.000175	0.000494	0.000241
25	0.000464	0.000253	0.000622	0.000349	0.001000	0.006500	0.000457	0.000229	0.000613	0.000316
30	0.000607	0.000342	0.000759	0.000441	0.004900	0.010500	0.000564	0.000292	0.000705	0.000376
35	0.000860	0.000476	0.000917	0.000545	0.015000	0.018500	0.000686	0.000360	0.000731	0.000412
40	0.001238	0.000665	0.001341	0.000742	0.020000	0.022500	0.000914	0.000473	0.000990	0.000527
45	0.002183	0.001010	0.002399	0.001122	0.018500	0.021000	0.001650	0.000735	0.001813	0.000816
50	0.003909	0.001647	0.004057	0.001830	0.017500	0.020000	0.003000	0.001216	0.003113	0.001352
55	0.006131	0.002541	0.005994	0.002891	0.016000	0.018500	0.004813	0.001920	0.004706	0.002185
60	0.009158	0.004241	0.008338	0.004467	0.015000	0.017500	0.007300	0.003254	0.006647	0.003428
65	0.015592	0.007064	0.012851	0.007336	0.015000	0.017500	0.012429	0.005420	0.010244	0.005629
70	0.027530	0.012385	0.021371	0.011697	0.013500	0.017500	0.022452	0.009504	0.017429	0.008976
75	0.044597	0.023992	0.035046	0.020127	0.012500	0.016000	0.036929	0.018836	0.029020	0.015802
80	0.074070	0.042945	0.057026	0.036395	0.012500	0.015000	0.061334	0.034234	0.047220	0.029013
85	0.114836	0.069918	0.090987	0.065518	0.012500	0.015000	0.095090	0.055736	0.075342	0.052228
90	0.166307	0.111750	0.134887	0.113605	0.011000	0.013500	0.140882	0.091139	0.114265	0.092652
95	0.234086	0.182419	0.191214	0.174228	0.010000	0.012500	0.201328	0.151052	0.164455	0.144269
100	0.319185	0.295187	0.270906	0.239215	0.004000	0.005000	0.300561	0.273806	0.255099	0.221888
105	0.469531	0.487816	0.405278	0.353414	0.000000	0.000000	0.469531	0.487816	0.405278	0.353414
110	1.000000	1.000000	0.634814	0.584462	0.000000	0.000000	1.000000	1.000000	0.634814	0.584462

Life Expectancies

The following table shows life expectancies under the above-stated mortality assumption for selected attained ages.

Table 17 Life Expectancies

	GROUP		INDIVIDUAL	
AGE	**MALES**	**FEMALES**	**MALES**	**FEMALES**
15	65.4	71.8	67.1	72.2
20	60.5	66.8	62.2	67.3
25	55.6	61.9	57.4	62.4
30	50.7	57.0	52.5	57.5
35	45.9	52.1	47.7	52.6
40	41.0	47.2	42.9	47.7
45	36.2	42.3	38.1	42.8
50	31.6	37.5	33.5	38.0
55	27.1	32.7	29.1	33.3
60	22.8	28.1	24.8	28.7
65	18.7	23.6	20.7	24.3
70	15.0	19.3	16.9	20.0
75	11.8	15.3	13.5	16.0
80	9.1	11.9	10.5	12.4
85	7.0	9.1	8.1	9.3
90	5.3	6.6	6.2	6.9
95	4.0	4.6	4.6	5.1
100	2.8	2.9	3.2	3.6
105	1.9	1.9	2.2	2.5
110	1.0	1.0	1.5	1.6

Appendix 5 – Alternative Mortality and Discount Rate Assumptions

Mortality Rates

The experience-adjusted mortality rates are based on the Canada Pension Plan retirement beneficiaries' mortality assumptions, as developed for the 30th Actuarial Report on the Canada Pension Plan as at 31 December 2018. These rates are further adjusted using a 3% load for males and a 4% load for females.

The experience-adjusted mortality rates are different from the rates used in the Actuarial Report on the Government Annuities as at 31 March 2019 report. The change in experience-adjusted mortality rates (from the 27th Actuarial Report on the Canada Pension Plan to the 30th Actuarial Report) resulted in an increase to liabilities as at 31 March 2020 of $61,801.

Discount Rates

The annual alternative discount rates used to calculate the liabilities are 0.93% as at 31 March 2020 and 1.72% as at 31 March 2019. They are determined using a yield curve approach. Under this approach, the discount rate corresponds to an equivalent flat discount rate based on a yield curve and the projected cash flows. The yield curve is based on market yields at the end of the reporting period on Government of Canada bonds and treasury bills. The Bank of Canada develops and publishes monthly a yield curve for Government of Canada zero-coupon bonds[1].

Table 18 shows the actuarial liabilities under the experience-adjusted mortality rates and the alternative discount rates while Table 19 provides sample experience-adjusted mortality rates at different ages and for different years.

[1] The methodology to develop this yield curve is set out on the Bank of Canada's website (http://www.bankofcanada.ca/2004/12/working-paper-2004-48/).

Table 18 Development of Actuarial Liabilities (with Experience-Adjusted Mortality[1] and Alternative Discount Rate[2])

Fiscal Year	Contract Type	2019 – 2020	2018 – 2019
VESTED MEMBERS			
Males, Ordinary Life	10 – 16	$ 50,924,126	$ 55,793,425
Females, Ordinary Life	10 – 16	27,593,817	28,838,480
Males, Guaranteed	21 – 29	16,302,027	16,650,613
Females, Guaranteed	21 – 29	8,767,338	8,574,246
Last Survivor	30 – 37	6,259,168	7,208,019
Reducing at OAS	70 – 79	1,286,407	1,362,293
Annuities Certain	50, 80	252,646	257,698
Temporary Annuities	60	3,297	6,823
Suspended Payments		13,309	12,324
VESTED TOTAL		**111,402,135**	**118,703,921**
DEFERRED MEMBERS			
Ordinary Life	10	96,267	179,053
Males, Guaranteed	21 - 24	2,071,164	2,637,515
Females, Guaranteed	21 - 24	1,138,568	1,374,095
Refunds in Process		1,814	0
Suspense Accounts	Account 721	51,293	47,937
DEFERRED TOTAL		**3,359,106**	**4,238,599**
TOTAL ACTUARIAL LIABILITIES		**$ 114,761,241**	**$ 122,942,521**

[1] Using mortality assumptions used for the CPP beneficiaries (with appropriate loading) consistent with the 30th CPP Actuarial Report for year 2019-2020 and the 27th CPP Actuarial Report for year 2018-2019.

[2] Using a yield curve approach determined by reference to market yields at the end of the reporting period on Government of Canada Bonds and Treasury Bills (the equivalent flat discount rate is 1.72% as at 31 March 2019 and 0.93% as at 31 March 2020).

Table 19 Sample Mortality Rates (Experience-Adjusted Mortality)

	MALES				FEMALES			
AGE	**2020-21**	**2030-31**	**2040-41**	**2050-51**	**2020-21**	**2030-31**	**2040-41**	**2050-51**
50	0.002815	0.002492	0.002295	0.002118	0.001941	0.001770	0.001632	0.001506
55	0.004266	0.003711	0.003416	0.003153	0.002877	0.002579	0.002377	0.002194
60	0.005466	0.004641	0.004274	0.003937	0.002862	0.002510	0.002311	0.002134
65	0.010972	0.009338	0.008589	0.007921	0.006704	0.005887	0.005424	0.005008
70	0.012674	0.014104	0.012975	0.011975	0.011570	0.010274	0.009476	0.008741
75	0.027096	0.023257	0.021404	0.019753	0.018835	0.016788	0.015476	0.014286
80	0.045562	0.039054	0.035940	0.033179	0.032650	0.028914	0.026642	0.024599
85	0.082427	0.070734	0.065096	0.060080	0.059344	0.051968	0.047849	0.044154
90	0.147369	0.129035	0.120879	0.113578	0.109053	0.096382	0.090297	0.084828
95	0.240491	0.221954	0.212855	0.203833	0.197817	0.182295	0.174643	0.167259
100	0.356993	0.341898	0.332599	0.323295	0.306700	0.292883	0.284438	0.276393
105	0.481930	0.472348	0.466106	0.460284	0.425853	0.416587	0.410482	0.405095
110	0.601201	0.601674	0.602047	0.602149	0.546828	0.547097	0.547996	0.547831
115	0.684756	0.684780	0.684855	0.684878	0.635888	0.636104	0.636349	0.636309
120	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000

The table below presents a reconciliation of the actuarial liability between 31 March 2019 and 31 March 2020.

Table 20 Reconciliation of Actuarial Liability (with Experience-Adjusted Mortality[1] and Alternative Discount Rates[2])

Fiscal Year	**2019 – 2020**	**2018 – 2019**
LIABILITY AS AT 1 APRIL	**$ 122,942,521**	**$ 134,645,884**
Accrued interest	$ 1,966,276	$ 2,626,096
Premiums	72	135
Reclaimed annuities	32,306	509
Annuity payments	(15,748,966)[3]	(17,469,679)[4]
Premium refunds and other	(7,895)	(29,505)
Unclaimed annuities	(84,023)	(59,227)
Change in mortality assumption	61,801	0
Change in discount rates[5]	5,944,491	2,992,752
Experience	(345,342)	235,556
LIABILITY AS AT 1 APRIL	**$ 114,761,241**	**$ 122,942,521**

[1] Using mortality assumptions used for the CPP beneficiaries (with appropriate loading) consistent with the 30th CPP Actuarial Report for year 2019-2020 and the 27th CPP Actuarial Report for year 2018-2019.

[2] Using a yield curve approach determined by reference to market yields at the end of the reporting period on Government of Canada Bonds and Treasury Bills (the equivalent flat discount rate is 1.72% as at 31 March 2019 and 0.93% as at 31 March 2020).

[3] Includes annuity retroactive payments totalling $40,088 (including an overpayment of $10,136) for members that were recovered from the CRF in 2019-2020, and vested commuted value payments of $33,096.

[4] Includes annuity retroactive payments totalling $612 for members that were recovered from the CRF in 2018-2019, and vested commuted value payments of $56,395.

[5] The discount rate used to calculate liabilities changed from 2.10% in 2017-2018 to 1.72% in 2018-2019 and 0.93% in 2019-2020 based on the yield curve approach.

The following table outlines the calculation of interest for the 2020 and 2019 fiscal years.

Table 21 Calculation of Interest (with Experience-Adjusted Mortality[1] and Alternative Interest Rates[2])

Fiscal Year	**2019 – 2020**	**2018 – 2019**
VESTED MEMBERS		
Interest on :		
Prescribed Assets as at 1 April of prior year	$ 2,041,707	$ 2,721,129
Maturities	15,708	16,983
CRF Recoveries	323	0
Less interest on :		
Annuity Payments	(148,096)	(197,680)
Commuted Values	(159)	(637)
Transfers to CRF	0	0
TOTAL VESTED	**1,909,483**	**2,539,795**
DEFERRED MEMBERS		
Interest on :		
Prescribed Assets as at 1 April of prior year	72,904	106,435
Premiums	0	1
CRF Recoveries	5	4
Less interest on :		
Maturities	(15,708)	(16,983)
Refunds	(326)	(3,156)
Transfers to CRF	(82)	0
TOTAL DEFERRED	**56,793**	**86,301**
TOTAL INTEREST	**$ 1,966,276**	**$ 2,626,096**

[1] Using mortality assumptions used for the CPP beneficiaries (with appropriate loading) consistent with the 30th CPP Actuarial Report for year 2019-2020 and the 27th CPP Actuarial Report for year 2018-2019.

[2] Using a yield curve approach determined by reference to market yields at the end of the reporting period on Government of Canada Bonds and Treasury Bills (the equivalent flat discount rate is 1.72% as at 31 March 2019 and 0.93% as at 31 March 2020).The calculation of interest for the fiscal year is based on the rates at the beginning of the period while the end of period liabilities are based on the rates at the end of the period (interest rates of 1.72% for fiscal year 2019-2020 and 2.10% for fiscal year 2018-2019).