



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 2022  
Office of the Chief Actuary



OSFI  
BSIF

Canada

## Table of Contents

		Page
1	Executive Summary .....	4
1.1	Purpose of Report .....	4
1.2	Data, Method and Assumptions .....	4
1.3	Results.....	4
1.4	Conclusion.....	5
2	Introduction.....	6
3	Data .....	7
3.1	Data Required .....	7
3.2	Member Data.....	7
3.3	Asset Data .....	8
4	Methods and Assumptions.....	9
4.1	Liability Valuation Method.....	9
4.2	Assumptions.....	9
4.3	Asset Valuation Method .....	9
5	Results .....	10
5.1	Balance Sheet .....	10
5.2	Calculation of Interest.....	11
5.3	Development of Actuarial Liabilities .....	12
6	Experience .....	13
6.1	Analysis of Experience .....	13
6.2	Alternative Assumptions for Purposes of the Account’s Financial Statements, Prepared in Accordance with Section 4600 of Part IV of the CPA Canada Handbook – Accounting.....	13
7	Actuarial Opinion.....	14
Appendix A —	Contract Types .....	15
Appendix B —	Membership Data .....	17
Appendix C —	Sources of Data .....	21
Appendix D —	Mortality Tables .....	22
Appendix E —	Alternative Mortality and Discount Rate Assumptions .....	24

## List of Tables

	Page
Table 1 Results Overview .....	4
Table 2 Multipliers for Deferred Pension Amounts .....	7
Table 3 Balance Sheet .....	10
Table 4 Calculation of Interest .....	11
Table 5 Development of Actuarial Liabilities.....	12
Table 6 Gains (Losses) .....	13
Table 7 Contract Types 10-16: Vested Ordinary Life.....	17
Table 8 Contract Types 21-29: Vested Guaranteed .....	18
Table 9 Contract Types 30-37: Vested Joint & Survivor .....	18
Table 10 Contract Types 50 & 80: Vested Certain .....	18
Table 11 Contract Type 60: Vested Temporary .....	18
Table 12 Contract Types 70 – 79: Vested Reducing.....	19
Table 13 Contract Types 10: Deferred Ordinary Life.....	19
Table 14 Contract Types 21-24: Deferred Guaranteed.....	19
Table 15 Membership Reconciliation.....	20
Table 16 Mortality Rates .....	22
Table 17 Life Expectancies .....	23
Table 18 Development of Actuarial Liabilities (with Experience-Adjusted Mortality and Alternative Discount Rate) .....	25
Table 19 Sample Mortality Rates (Experience-Adjusted Mortality) .....	26
Table 20 Reconciliation of Actuarial Liability (with Experience-Adjusted Mortality and Alternative Discount Rates) .....	27
Table 21 Calculation of Interest (with Experience-Adjusted Mortality and Alternative Interest Rates) ....	28

## 1 Executive Summary

### 1.1 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 2022 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.

### 1.2 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 Government Annuities Branch located in Bathurst administers the annuities. 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 A and Appendix B 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.

### 1.3 Results

The following table summarizes the results of the actuarial valuation as at 31 March 2022.

Table 1 Results Overview		As at 31 March 2022	
			(\$)
Assets			67,976,070
Liabilities			66,894,991
Surplus (Deficit)			1,081,079
		Count	Average Annual Pension (\$)
Vested Members	17,227		691
Deferred Members	51		1,786
Total	17,278		694

#### **1.4 Conclusion**

The surplus of \$1,081,079 is credited to the Federal Government's CRF and charged to the Account. The next valuation will be performed as at 31 March 2023.

## 2 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 2022. The purpose of the valuation is to establish the Account's liabilities, notional assets, and financial position, based on the statutory valuation assumptions.

### 3 Data

#### 3.1 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.

#### 3.2 Member Data

Basic data on pensioners, beneficiaries and deferred members are provided by ESDC and Service Canada. The reports provided 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 29 such members as at 31 March 2022.

##### *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 B of this report.

### **3.3 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 C of this report.

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



## **4 Methods and Assumptions**

### **4.1 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 2022. 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.

### **4.2 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 D of this report.

### **4.3 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 2021 is equal to the 31 March 2021 liabilities. The assets value as at 31 March 2022 prior to any charge or credit to the CRF is obtained by adding interest at 7% on the 1 April 2021 value and adjusting for cash inflows and outflows also at 7% annual interest rate.

## 5 Results

### 5.1 Balance Sheet

The following table presents a summary of the balance sheet of the Account for the 2022 and 2021 fiscal years.

Table 3 Balance Sheet (\$)		
Fiscal Year	2021 – 2022	2020 – 2021
<b>Assets as at 1 April</b>	<b>75,755,079</b>	<b>85,407,162</b>
<b>Income</b>		
Interest to 31 March	4,822,098	5,438,538
Premiums for Deferred Annuities	3,359	72
Unclaimed annuities recovered from CRF	<u>2,909</u>	<u>7,226</u>
<b>Total Income</b>	<b>4,828,366</b>	<b>5,445,836</b>
<b>Payments and Other Charges</b>		
Payments to Vested Members:		
Vested Regular Annuity Payments	12,531,186 <sup>1</sup>	14,057,002 <sup>2</sup>
Vested Commuted Values	<u>32,940</u>	<u>80,058</u>
Total Payments to Vested Members:	12,564,126	14,137,060
Monies Refunded	3,129	2,271
Values Transferred to CRF (Vested & Deferred)	<u>40,120</u>	<u>75,789</u>
<b>Total Payments and Other Charges</b>	<b>12,607,375</b>	<b>14,215,120</b>
<b>Income Less Payments and Other Charges</b>	<b>(7,779,009)</b>	<b>(8,769,284)</b>
<b>Assets as at 31 March</b>	<b>67,976,070</b>	<b>76,637,877</b>
<b>Surplus charged to the Account and credited to the CRF</b>	<b>(1,081,079)</b>	<b>(882,798)</b>
<b>Net Assets as at 31 March</b>	<b>66,894,991</b>	<b>75,755,079</b>
<b>Actuarial Liabilities as at 31 March</b>	<b>66,894,991</b>	<b>75,755,079</b>

<sup>1</sup> Includes annuity and retroactive payments totalling \$537 for members recovered from the CRF in 2021-2022.

<sup>2</sup> Includes annuity and retroactive payments totalling \$10,619 for members recovered from the CRF in 2020-2021.

## 5.2 Calculation of Interest

The following table outlines the calculation of the notional 7% annual interest credited to the Account for the 2022 and 2021 fiscal years.

<b>Table 4 Calculation of Interest (\$)</b>		
<b>Fiscal Year</b>	<b>2021 – 2022</b>	<b>2020 – 2021</b>
<b>Vested Members</b>		
Interest on:		
Prescribed Assets as at 1 April of prior year	5,221,914	5,875,819
Maturities	23,427	26,031
CRF Recoveries	168	408
Less interest on:		
Annuity Payments	(478,602)	(537,225)
Commutated Values	(1,862)	(2,938)
Transfers to CRF	0	0
<b>Total Vested Members</b>	<b>4,765,045</b>	<b>5,362,095</b>
<b>Deferred Members</b>		
Interest on:		
Prescribed Assets as at 1 April of prior year	80,942	102,682
Premiums	212	1
CRF Recoveries	0	4
Less interest on:		
Maturities	(23,427)	(26,031)
Refunds	(502)	(201)
Transfers to CRF	(172)	(12)
<b>Total Deferred Members</b>	<b>57,053</b>	<b>76,443</b>
<b>Total Interest</b>	<b>4,822,098</b>	<b>5,438,538</b>

### 5.3 Development of Actuarial Liabilities

The following table outlines the Account’s actuarial liabilities by members’ category as at 31 March of 2022 and 2021.

<b>Table 5 Development of Actuarial Liabilities</b>			
Fiscal Year	Contract Type	2021 – 2022 (\$)	2020 – 2021 (\$)
<b>Vested Member</b>			
Males, Ordinary Life	10 – 16	31,664,592	36,289,397
Females, Ordinary Life	10 – 16	18,434,224	20,173,534
Males, Guaranteed	21 – 29	7,880,889	8,875,497
Females, Guaranteed	21 – 29	4,198,250	4,662,576
Last Survivor	30 – 37	3,118,023	3,789,856
Reducing at OAS	70 – 79	467,932	605,067
Annuities Certain	50, 80	198,945	177,639
Temporary Annuities	60	7,025	4,889
Suspended Payments		25,367	20,310
<b>Vested Total</b>		<b>65,995,247</b>	<b>74,598,766</b>
<b>Deferred Members</b>			
Ordinary Life	10	47,950	44,514
Males, Guaranteed	21 – 24	479,534	642,737
Females, Guaranteed	21 – 24	313,535	412,659
Refunds in Process		-	1,520
Suspense Accounts	Account 721	58,725	54,884
<b>Deferred Total</b>		<b>899,744</b>	<b>1,156,313</b>
<b>Total Actuarial Liabilities</b>		<b>66,894,991</b>	<b>75,755,079</b>

## 6 Experience

### 6.1 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 2021 and 31 March 2022.

Table 6	Gains (Losses) (\$)	
<b>Surplus as at 31 March 2021</b>		-
Premiums paid with interest		3,570
Vested members mortality		1,068,696
Deferred members – retirements, mortality, refunds		11,923
Transfers from CRF and other data changes		(3,110)
<b>Surplus as at 31 March 2022</b>		<b>1,081,079</b>

### 6.2 Alternative Assumptions for Purposes of the Account's Financial Statements, Prepared in Accordance with Section 4600 of Part IV of the CPA Canada Handbook – Accounting

#### 6.2.1 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.

#### 6.2.2 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 2022 under experience-adjusted mortality rates and the alternative discount rate is \$81.6 million, which is \$14.7 million higher than under the prescribed assumptions. More details are presented in Appendix E.

## 7 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 2022, there is a surplus of \$1,081,079 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 2022.



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Ottawa, Canada  
31 August 2022

## Appendix A — 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 B — Membership Data

### B.1 Vested members at 31 March 2022

Table 7 Contract Types 10-16: Vested Ordinary Life				
Age		Males	Females	Total
	Average Pension	630	959	893
50-59	Number	1	4	5
	Average Age	59.0	58.8	58.8
	Average Pension	965	918	939
60-69	Number	62	78	140
	Average Age	66.1	66.6	66.4
	Average Pension	855	746	803
70-79	Number	785	724	1,509
	Average Age	76.3	75.8	76.1
	Average Pension	648	551	618
80-89	Number	5,202	2,330	7,532
	Average Age	85.3	85.1	85.2
	Average Pension	700	557	646
90-100	Number	3,760	2,277	6,037
	Average Age	93.1	93.7	93.3
	Average Pension	701	491	579
100 +	Number	82	114	196
	Average Age	101.8	102.3	102.1
Total Average Pension		686	583	649
Total Number		9,892	5,527	15,419
Total Average Age		87.6	87.5	87.5

ACTUARIAL REPORT ON THE GOVERNMENT ANNUITIES  
AS AT 31 MARCH 2022

Table 8 Contract Types 21-29: Vested Guaranteed				
Age		Males	Females	Total
50-69	Average Pension	2,011	1,889	1,959
	Number	141	104	245
	Average Age	66.5	66.4	66.4
	Average guarantee	9.1	8.5	8.8
70-79	Average Pension	1,482	1,186	1,390
	Number	376	171	547
	Average Age	74.6	74.4	74.5
	Average guarantee	5.0	4.6	4.9
80-89	Average Pension	1,217	817	1,096
	Number	30	13	43
	Average Age	81.5	81.2	81.4
	Average guarantee	2.2	3.2	2.5
Total Average Pension		1,604	1,423	1,542
Total Number		547	288	835
Average Age		72.9	71.8	72.5
Average guarantee		5.9	6.0	5.9

Table 9 Contract Types 30-37: Vested Joint & Survivor				
	Males	Females	Total	
Total Average Pension	537	322	531	
Total Number	891	22	913	
Average Age	86.7	85.2	86.6	
Average Spouse Age	83.4	84.3	83.4	
Average Continuing Percentage	73%	70%	73%	

Table 10 Contract Types 50 & 80: Vested Certain		
		Total
Average Pension		1,283
Number		41
Average Certain Period		4.7

Table 11 Contract Type 60: Vested Temporary	
	Total
Average Pension	828
Number	3
Average Age	61.7
Average Period	3.3

**Table 12 Contract Types 70 – 79: Vested Reducing**

	Males	Females	Total
Average Pension	4,423	4,510	4,472
Number	7	9	16
Average Reduced Pension	2,268	2,037	2,138
Average Age	62.4	62.9	62.7

## B.2 Deferred Members at 31 March 2022

**Table 13 Contract Types 10: Deferred Ordinary Life**

	Total
Average Pension	3,224
Number	2
Average Age	67.0

**Table 14 Contract Types 21-24: Deferred Guaranteed**

	Males	Female	Total
Average Pension	1,915	1,453	1,727
Number	29	20	49
Average Age	62.4	61.2	61.9
Average Guarantee	15.7	15.5	15.6

### B.3 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 2021	17,411	968	1,030	43	2	22	19,476
Maturities	0	16	0	0	1	0	17
Transfers from/to Other Contract Types	243	(141)	(108)	12	0	(6)	0
Deaths or Expired Annuities <sup>1</sup>	(2,232)	(9)	(9)	(14)	0	0	(2,264)
Net CRF Transfers <sup>2</sup>	(3)	1	0	0	0	0	(2)
<b>Count as at 31 March 2022</b>	<b>15,419</b>	<b>835</b>	<b>913</b>	<b>41</b>	<b>3</b>	<b>16</b>	<b>17,227</b>

#### Deferred

Count as at 31 March 2021	73
Maturities	(17)
Deaths and Refunds	(1)
Net CRF Transfers	(4)
<b>Count as at 31 March 2022</b>	<b>51</b>

<sup>1</sup> The 2,264 Deaths or Expired Annuities are composed of 1,497 group certificates and 767 individual contracts.

<sup>2</sup> The 2 net CRF transfers are 3 group contracts transferred to the CRF and 1 individual contract transferred from the CRF.

## Appendix C — Sources of Data

### C.1 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.

### C.2 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 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.

### C.3 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 used 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 are used for group and individual contracts.

### C.4 Other Data

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

## Appendix D — Mortality Tables

### D.1 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.

Age	GAM83 Original		IAM83 Original		Projection Scale G		GAM83 Projected		IAM83 Projected	
	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

## D.2 Life Expectancies

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

**Table 17 Life Expectancies**

	Group		Individual	
	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 E — Alternative Mortality and Discount Rate Assumptions

### E.1 Mortality Rates

The experience-adjusted mortality rates are based on the Canada Pension Plan retirement beneficiaries' mortality assumptions, as developed for the 30<sup>th</sup> 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.

### E.2 Discount Rates

The annual alternative discount rates used to calculate the liabilities are 2.38% as at 31 March 2022 and 1.49% as at 31 March 2021. 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<sup>1</sup>.

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.

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<sup>1</sup> 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<sup>1</sup> and Alternative Discount Rate<sup>2</sup>)**

Fiscal Year	Contract Type	2021 – 2022 (\$)	2020 – 2021 (\$)
<b>Vested Member</b>			
Males, Ordinary Life	10 – 16	36,291,623	43,387,877
Females, Ordinary Life	10 – 16	21,455,414	24,651,466
Males, Guaranteed	21 – 29	11,311,551	13,793,404
Females, Guaranteed	21 – 29	6,116,974	7,444,396
Last Survivor	30 – 37	3,775,361	4,863,514
Reducing at OAS	70 – 79	712,262	1,011,018
Annuities Certain	50, 80	235,050	209,291
Temporary Annuities	60	6,965	4,702
Suspended Payments		25,367	20,310
<b>Vested Total</b>		<b>79,930,567</b>	<b>95,385,979</b>
<b>Deferred Members</b>			
Ordinary Life	10	82,481	90,010
Males, Guaranteed	21 - 24	908,886	1,380,743
Females, Guaranteed	21 - 24	576,500	885,488
Refunds in Process		-	1,520
Suspense Accounts	Account 721	58,725	54,884
<b>Deferred Total</b>		<b>1,626,592</b>	<b>2,412,645</b>
<b>Total Actuarial Liabilities</b>		<b>81,557,159</b>	<b>97,798,624</b>

<sup>1</sup> Using mortality assumptions used for the CPP beneficiaries (with appropriate loading) consistent with the 30<sup>th</sup> CPP Actuarial Report for both fiscal years 2020-2021 and 2021-2022.

<sup>2</sup> 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 1.49% as at 31 March 2021 and 2.38% as at 31 March 2022).

Table 19 Sample Mortality Rates (Experience-Adjusted Mortality)

Age	Males				Females			
	2022-23	2032-33	2042-43	2052-53	2022-23	2032-33	2042-43	2052-53
50	0.002733	0.002448	0.002259	0.002084	0.001903	0.001741	0.001606	0.001482
55	0.004120	0.003644	0.003362	0.003102	0.002805	0.002535	0.002339	0.002159
60	0.005239	0.004554	0.004202	0.003875	0.002771	0.002466	0.002275	0.002099
65	0.010523	0.009163	0.008453	0.007793	0.006492	0.005785	0.005336	0.004929
70	0.015808	0.013844	0.012768	0.011783	0.011247	0.010100	0.009326	0.008605
75	0.026062	0.022829	0.021065	0.019436	0.018340	0.016500	0.015233	0.014056
80	0.043787	0.038336	0.035371	0.032651	0.031705	0.028414	0.026221	0.024208
85	0.079261	0.069450	0.064058	0.059125	0.057429	0.051043	0.047087	0.043449
90	0.142415	0.127122	0.119383	0.112169	0.105702	0.094992	0.089176	0.083762
95	0.235769	0.219779	0.210756	0.202146	0.193727	0.180471	0.172958	0.165885
100	0.353022	0.339968	0.330955	0.321465	0.303306	0.291067	0.282934	0.274821
105	0.479426	0.471182	0.464777	0.458355	0.423505	0.415092	0.409191	0.403253
110	0.601240	0.601695	0.602109	0.602213	0.546975	0.547391	0.548027	0.547901
115	0.684758	0.684791	0.684870	0.684876	0.635913	0.636155	0.636308	0.636274
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 2021 and 31 March 2022.

**Table 20 Reconciliation of Actuarial Liability (with Experience-Adjusted Mortality<sup>1</sup> and Alternative Discount Rates<sup>2</sup>)**  
(\$)

Fiscal Year	2021 – 2022	2020 – 2021
<b>Liability as at 1 April</b>	<b>97,798,624</b>	<b>114,761,241</b>
		\$
Accrued interest	1,354,070	994,923
Premiums	3,359	72
Reclaimed annuities	2,909	7,226
Annuity payments	(12,564,126) <sup>3</sup>	(14,137,060) <sup>4</sup>
Premium refunds and other	(3,129)	(2,271)
Unclaimed annuities	(40,120)	(75,789)
Change in mortality assumption	-	-
Change in discount rates <sup>5</sup>	(4,733,007)	(3,746,679)
Experience	(261,421)	(3,039)
<b>Liability as at 1 April</b>	<b>81,557,159</b>	<b>97,798,624</b>

<sup>1</sup> Using mortality assumptions used for the CPP beneficiaries (with appropriate loading) consistent with the 30<sup>th</sup> CPP Actuarial Report for both fiscal years 2020-2021 and 2021-2022.

<sup>2</sup> 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 1.49% as at 31 March 2021 and 2.38% as at 31 March 2022).

<sup>3</sup> Includes annuity and retroactive payments totalling \$537 for members recovered from the CRF in 2021-2022, and vested commuted value payments of \$32,940.

<sup>4</sup> Includes annuity and retroactive payments totalling \$10,619 for members recovered from the CRF in 2020-2021, and vested commuted value payments of \$80,058.

<sup>5</sup> The discount rate used to calculate liabilities changed from 0.93% in 2019-2020 to 1.49% in 2020-2021 and 2.38% in 2021-2022 based on the yield curve approach.

The following table outlines the calculation of interest for the 2022 and 2021 fiscal years.

Table 21 Calculation of Interest (with Experience-Adjusted Mortality <sup>1</sup> and Alternative Interest Rates <sup>2</sup> ) (\$)		
Fiscal Year	2021 – 2022	2020 – 2021
<b>Vested Members</b>		
Interest on:		
Experience adjusted liabilities as at 1 April of prior year	1,421,251	1,036,040
Maturities	4,927	3,420
CRF Recoveries	36	55
Less interest on:		
Annuity Payments	(102,483)	(71,789)
Commuted Values	(398)	(395)
Transfers to CRF	0	0
<b>Total Vested Members</b>	<b>1,323,333</b>	<b>967,330</b>
<b>Deferred Members</b>		
Interest on:		
Experience adjusted liabilities as at 1 April of prior year	35,948	31,240
Premiums	45	0
CRF Recoveries	0	1
Less interest on:		
Maturities	(4,927)	(3,420)
Refunds	(292)	(226)
Transfers to CRF	(37)	(2)
<b>Total Deferred Members</b>	<b>30,737</b>	<b>27,593</b>
<b>Total Interest</b>	<b>1,354,070</b>	<b>994,923</b>

<sup>1</sup> Using mortality assumptions used for the CPP beneficiaries (with appropriate loading) consistent with the 30<sup>th</sup> CPP Actuarial Report for both fiscal years 2020-2021 and 2021-2022.

<sup>2</sup> 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 interest rate is 1.49% for fiscal year 2020-2021 and 2.38% for fiscal year 2021-2022). 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.