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Report on the Actuarial Valuation of the Canadian Union of Public Employees' Pension Plan as at January 1, 2020

Registration Number 0231910

September 18, 2020

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Section 1 – Executive Summary

We are pleased to present this report which was prepared at the request of the Joint Board of Trustees ("JBT") for the following purposes:

1. To report on the financial position of the Canadian Union of Public Employees Employees' Pension Plan ("Plan") as at January 1, 2020;
2. To establish the minimum and maximum contributions required for the period from January 1, 2020 until the results of the next valuation are available, for which the effective date must be no later than January 1, 2023; and
3. To provide the actuarial certifications required under the *Pension Benefits Act* (Ontario) and the federal *Income Tax Act*.

The intended users of this report are the JBT, the Canadian Union of Public Employees ("CUPE" or the "Employer"), the unions representing members of the Plan, the Financial Services Regulatory Authority of Ontario ("FSRA") and Canada Revenue Agency. This report is not intended or necessarily suitable for purposes other than those listed above. Any party reviewing this report for other purposes should have their own actuary or other qualified professional assist in their review to ensure that the party understands the assumptions, results and uncertainties inherent in our estimates.

Changes Since Previous Valuation

The last valuation of the Plan filed with government authorities was prepared as at January 1, 2018. Since the last valuation, the Plan text was amended as follows:

1. Indexation, effective January 1, 2018, of pensions and bridge benefits in course of payment as at January 1, 2018 and accrued deferred pensions as at January 1, 2018 by a percentage based on the date of commencement of the pension or deferred pension in accordance with the following table:

Date of Commencement of Pension or Deferred Pension	Percentage Increase
January 1, 2010 or earlier	9.07%
January 1, 2011	7.30%
January 1, 2012	5.98%
January 1, 2013	5.56%
January 1, 2014	5.00%
January 1, 2015	4.19%
January 1, 2016	3.12%
January 1, 2017	1.87%
January 1, 2018	0.00%

For any pension or deferred pension that commenced in a month other than January of a year, the percentage increase shall be determined by linear interpolation between the percentage increase for January 1 of that year and the percentage increase for January 1 of the following year, rounded to two decimal places;

2. Change in indexation provisions to provide for ad hoc indexation adjustments effective January 1 of each year, if surplus is then available, of pensions and bridge benefits in course of payment as at January 1 and accrued deferred pensions at January 1 pursuant to collective bargaining agreements;

3. Reduction of the period for full vesting of bridge benefits from 15 to 10 years of credited service for a member who was not accruing benefits under the Plan on May 16, 2007 and who retires on or after October 3, 2018;

4. Subject to applicable legislation, the Employer contribution will be increased by an additional 1% of members' salary when the going concern funded ratio is below 130% (subject to a minimum employer contribution of 13.2%, less any amount stipulated under applicable collective agreements); and

5. Updates for legislative changes and administrative practices.

An Actuarial Cost Certificate effective as of January 1, 2018 was filed on November 5, 2018, together with Amendment No. 78, which included the revised funding requirements as a result of the financial impact of the applicable Plan changes. The results as of January 1, 2018 provided for comparative purposes in this report reflect this Actuarial Cost Certificate.

This valuation reflects all amendments up to the time of preparing this report. See Section 3 for the impact of the changes on the valuation results and Appendix A for details of the changes to the Plan provisions.

The going concern actuarial assumptions were revised. In particular, the discount rate was decreased from 6.10% per year used in the previous valuation to 5.85% per year to reflect the current expectation of the long-term rate of return. See Appendix B for details of the assumptions used in this valuation and the rationale employed in setting these assumptions. See Section 3 for the impact of the change in assumptions on the valuation results.

The PfAD has increased from 10.0% to 13.1%. See Appendix H for the development of the PfAD.

The solvency economic assumptions were updated to reflect market conditions and statutory requirements as at the valuation date. These assumptions are summarized in Appendix C.

Reliance

We have relied on the asset information as disclosed in the audited financial statements. We have also relied on the JBT to provide all relevant data and to confirm the pertinent Plan provisions.

Summary of Results

	January 1, 2020	January 1, 2018
Going Concern Financial Position		
Going concern assets	$859,278,900	$776,439,900
Going concern liabilities	$702,721,200	$623,138,900
PfAD on actuarial liabilities	$92,056,500	$62,313,900
Going concern surplus/ (unfunded liability)	$64,501,200	$90,987,100
Going concern funded ratio (excluding PfAD)	122.3%	124.6%
PfAD	13.1%	10.0%
Hypothetical Wind-up Financial Position		
Market value of assets net of provision for expenses	$846,759,500	$794,268,000
Hypothetical wind-up liability	$994,202,800	$887,745,100
Hypothetical wind-up excess/ (deficiency)	($147,443,300)	($93,477,100)
Transfer ratio	85.2%[1]	89.5%
Solvency Financial Position		
Adjusted solvency assets net of provision for expenses	$846,759,500	$865,227,800
Solvency liabilities	$994,202,800	$887,745,100
New solvency excess/ (deficiency)	($147,443,300)	($22,517,300)
New reduced solvency excess/ (deficiency)	$1,687,100	$110,644,500
Solvency ratio	85.2%	89.5%
Minimum Contributions in First Year Following Valuation Date		
Current service cost	$20,924,800	$18,466,600
Members' required contributions	($9,760,600)	($8,863,200)
Employer portion of current service cost excluding PfAD	$11,164,200	$9,603,400
Provision for adverse deviations	$2,741,100	$1,846,700
Total Employer portion of current service cost with PfAD	$13,905,300	$11,450,100
As a percentage of estimated covered payroll	13.82%	12.53%
Employer % of estimated covered payroll limited to:	**13.82%[2]**	**11.29%**
Additional employer contributions required to fund unfunded liability or reduced solvency deficiency	$0	$0

[1] An updated transfer ratio was filed with FSRA in accordance with Regulations 19(4) and 19(5) and it was determined that the transfer ratio was 69.1% as of April 1, 2020.
[2] In addition to the minimum Employer contribution of 13.82%, the Employer will, in accordance with Plan provisions and provided it is an eligible contribution under the Income Tax Act, contribute an additional 1% of member's salary during a Plan year in which the going concern funded ratio is less than 130%.

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This report should be filed with the Financial Services Regulatory Authority of Ontario, to meet the filing requirements of the *Pension Benefits Act* (Ontario) and with Canada Revenue Agency, in order to ensure that contributions recommended in the report will qualify as eligible contributions for purposes of the *Income Tax Act*. The next actuarial valuation of the Plan should be performed no later than January 1, 2023.

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

Respectfully submitted,

Dany Desgagnés, FSA, FCIA

Esther Rochon, FSA, FCIA

Section 2 – Introduction

The Canadian Union of Public Employees Employees' Pension Plan (hereinafter referred to as the "Plan") was established effective January 1, 1971. The Plan has been amended from time to time, with the most recent amendment being effective on January 1, 2018.

Our report is based on the provisions of the Plan as at the valuation date and reflects all amendments which have become effective up to that date.

Subsequent Events

The Actuarial Standards Board (ASB) published amendments to the Standards of Practice (Section 3500: practice-specific standards for pension commuted values) on January 24, 2020 with an effective date no earlier than December 1, 2020. The effect, if any, of this new Standard of Practice has not been incorporated into this valuation.

Since January 1, 2020, and as of the date of this report, there has been a significant decline in bond yields and increased volatility and uncertainty in global economy markets in connection with COVID-19. The impact on the market value of assets, underlying assumptions and any other effects related to COVID-19 are not reflected in the valuation results and as such, the Plan financial position shown in this report may be materially different if those factors were incorporated in our valuation. These effects will be revealed in future valuations.

As of April 1, 2020, an updated transfer ratio was filed with the Financial Services Regulatory Authority of Ontario in accordance with Regulations 19(4) and 19(5) and it was determined that the transfer ratio was 69.1% as of April 1, 2020.

On June 3, 2020, the Employer made a one-time special contribution of $24,263,700 to the Plan to bring the solvency ratio to 85% as at January 1, 2020. In an email dated May 27, 2020 sent by Mark Eagles, Director, Advisory Services, Pensions at FSRA, we received confirmation that FSRA accepted this contribution to be recognized as an in-transit asset in a December 31, 2019 valuation if the contribution was made in full by the end of day on June 5, 2020. Since the payment was made on June 3, 2020, we have included this contribution as an in-transit contribution for this valuation.

We are not aware of any other events that occurred between the valuation date and the date this report was completed that would have a material impact on the results of this valuation.

Valuations Included in This Report

In this report, we describe the results of three different valuations of the Plan:

- The "going concern valuation", which is used to estimate the funded position of the Plan, assuming the Plan is continued indefinitely, and to estimate the contributions currently required to be made to the Plan's fund, both to fund the cost of any benefits being earned by members for current service and, in the event there is an unfunded liability, to liquidate the amount of the unfunded liability. The going concern valuation also reflects the requirement under the *Pension Benefits Act* (Ontario) for the funding of a provision for adverse deviations, both on the past service liabilities and the current service cost.

- The "hypothetical wind-up valuation", which is intended to reflect the status of the Plan as if it had been wound up on the valuation date and the Plan members had been provided with the benefits specified by the Plan and the *Pension Benefits Act* (Ontario). The purpose of this valuation is to show the degree of benefit security provided for all of the Plan members' accrued benefit by the current assets of the pension fund. The hypothetical wind-up valuation is not used to determine the required contributions to the Plan.

- The "solvency valuation", which is required by the Regulations under the *Pension Benefits Act* (Ontario). This valuation is similar to a hypothetical wind-up valuation, except that certain adjustments may be made to assets and liabilities. The solvency valuation does affect the required contributions to the Plan. If the solvency valuation reveals that there is a "reduced solvency deficiency" (as defined in the Regulations), then additional contributions must be made to the Plan.

The difference between the hypothetical wind-up and solvency valuations for purposes of this report relates to the value of assets that are included in the valuation. In the hypothetical wind-up valuation, the only assets taken into account are the invested assets of the Plan, which are taken at their market values net of a provision for wind-up expenses. In the solvency valuation, in addition to the Plan's invested assets, net of a provision for wind-up expenses, also taken into account is the present value of all special payments that are scheduled to be made for the next five years from the valuation date, if any.

Filing Requirements

The last filed actuarial report was effective January 1, 2018. Under the applicable legislation, the next statutory report that needs to be filed with government authorities is a report on the actuarial valuation of the Plan as at January 1, 2021. However, the JBT has chosen to file this report on the actuarial valuation of the Plan as at January 1, 2020 with the Financial Services Regulatory Authority of Ontario and the Canada Revenue Agency. The report covers the period from January 1, 2020 to January 1, 2023 and is to be used by the Employer to determine its funding requirements during that period or until the next actuarial valuation is performed, if sooner. The next actuarial valuation of the Plan should be performed with an effective date no later than January 1, 2023.

Section 3 – Going Concern Valuation

Valuation Balance Sheet

The following is the going concern valuation balance sheet as at January 1, 2020 based on:

- the Plan provisions (summarized in Appendix A);
- the going concern valuation assumptions (described in Appendix B);
- the membership data (summarized in Appendix D);
- the actuarial value of assets (determined in Appendix E); and
- the provision for adverse deviations ("PfAD") equal to 13.1% (determined in Appendix F).

with comparative figures from the valuation as at January 1, 2018.

	January 1, 2020	January 1, 2018
Going Concern Assets		
Market value	$821,959,800	$793,798,600
Smoothing adjustment	$11,719,400	($18,628,100)
Present value of future buyback contributions	$670,000	$771,400
Contributions receivable	$2,500,400	$1,607,000
Benefits and expenses accrued but unpaid	($1,834,400)	($1,109,000)
June 3, 2020 Employer contribution	$24,263,700	$0
Total going concern assets	$859,278,900	$776,439,900
Going Concern Liabilities		
Active members	$276,543,300	$251,086,300
Retired members and survivors	$422,049,700	$368,565,400
Terminated vested members and outstanding payments	$4,128,200	$3,487,200
Total actuarial liabilities	$702,721,200	$623,138,900
PfAD on actuarial liabilities	$92,056,500	$62,313,900
Total going concern liabilities including PfAD	$794,777,700	$685,452,800
Going Concern Surplus/ (Unfunded Liability) before PfAD	$156,557,700	$153,301,000
Going Concern Surplus/ (Unfunded Liability) with PfAD	$64,501,200	$90,987,100
Going Concern Funded Ratio	122.3%	124.6%

The prior year credit balance was nil as at January 1, 2020.

The going concern funded ratio is the ratio of the going concern assets excluding the present value of special payments less the prior year credit balance to the going concern liabilities excluding PfAD.

The Plan has a going concern surplus before PfAD of $156,557,700 as at January 1, 2020. As at the previous valuation date, the actuarial surplus before PfAD was $153,301,000 and there was therefore an increase of $3,256,700 during the two-year period since the preceding valuation date.

The table below quantifies the various factors which had an impact on the evolution of the actuarial surplus since the preceding valuation date.

Reconciliation of Going Concern Surplus	
Going Concern Surplus as at January 1, 2018 (including PfAD)	**$90,987,100**
Plus PfAD as at January 1, 2018	62,313,900
Going Concern Surplus as at January 1, 2018 (excluding PfAD)	**$153,301,000**
Interest on the actuarial surplus at prior valuation rate of 6.10% p.a.	19,273,200
Effects of January 1, 2019 and January 1, 2020 indexation	(16,080,500)
Gains from contributions in excess of the current service cost	26,933,000
Expected going concern surplus as at January 1, 2020, if plan experience had coincided with actuarial assumptions	**183,426,700**
Effects of smoothed investment return different than anticipated in the actuarial basis	(15,585,000)
Effects of salary, OAS and YMPE increases different from levels anticipated in the actuarial basis	(4,884,200)
Effects of early retirement experience different from assumption	5,159,800
Effects of pensioners mortality experience different from assumption	2,270,300
Effects of recognition of additional periods of credited service from Reciprocal Transfer Agreements and buybacks	1,872,000
Effects of employee contributions growing at rates different than anticipated in the actuarial basis	475,100
Effects of change in discount rate assumption	(16,842,800)
Miscellaneous other actuarial gains (losses)	665,800
Going Concern Surplus before PfAD as at January 1, 2020	**$156,557,700**
Minus PfAD as at January 1, 2020	(92,056,500)
Going Concern Surplus after PfAD as at January 1, 2020	**$64,501,200**

Current Service Cost

The current service cost for the year 2020 (with comparative results from the preceding valuation) has been determined according to the table below. Required employee contributions are negotiated and represent 9.7% of covered payroll.

A provision for adverse deviations equal to 13.1% must be applied to the total current service cost and is calculated at $2,741,100 in 2020 (please refer to Appendix F for additional details on the calculation of the PfAD).

	January 1, 2020	January 1, 2018
Total current service cost	$20,924,800	$18,466,600
Members' contributions	($9,760,600)	($8,863,200)
Employer portion of current service cost, excluding PfAD	$11,164,200	$9,603,400
Employer cost as a percentage of covered payroll	11.10%	10.51%
Provision for adverse deviations	$2,741,100	$1,846,700
Total Employer portion of current service cost with PfAD	$13,905,300	$11,450,100
As a percentage of covered payroll	13.82%	12.53%
According to the transitional measures, employer cost (as a percentage of covered payroll) is limited to:	**13.82%**	**11.29%**
Total Employer portion of current service cost with limited PfAD	**$13,905,300**	**$10,316,100**

The Employer current service cost expressed as a percentage of covered payroll is based on an estimated total payroll of $100,624,200 as at January 1, 2020. The actual dollar amount of current service cost for 2020 will depend on actual covered payroll and will vary from the estimate indicated above. Based on projected covered payroll, using the assumed salary increase assumption of 3% per annum, the Employer required contributions for current service and provision for adverse deviations are estimated at $14,322,500 for 2021 and $14,752,200 for 2022.

Sensitivity Analysis

The following table shows the impact on the going concern liabilities as at January 1, 2020 and current service cost for 2020 of a one percentage point change in the discount rate assumption. All other assumptions were kept unchanged.

	Discount rate 1% lower	Discount rate 1% higher
Change in going concern liabilities (excluding PfAD)	$84,331,500 12.0%	($60,527,900) (8.6%)
Change in current service cost (excluding PfAD)	$4,062,100 19.4%	($2,349,300) (11.2%)

Section 4 – Hypothetical Wind-up Valuation

The purpose of the hypothetical wind-up valuation is to determine the financial position of the Plan if it were wound up on the valuation date. Accordingly, the following approach was used:

1. The Plan assets were valued at their market value.

2. The benefits valued were the pensions to which members would be entitled under applicable legislation and the Plan provisions, if the Plan were wound up on the valuation date. All Plan members become fully vested on Plan wind-up, regardless of age or service.

3. In respect of members employed in Ontario, for whom age and service add to 55 or more, the pension may start at any age at which the member would have qualified for a pension if the Plan had not been wound up and if the member had continued in employment until retirement. Thus, the pension for such a member would be subject to a reduction of 3% for each year by which the retirement age precedes the earlier of (i) the date on which the member would have attained 80 points if employment had continued until retirement and (ii) the date the member attains age 60. In the hypothetical wind-up valuation, we assumed that the pension would start at the age which produced the highest present value of the pension for such members.

4. The actuarial assumptions are determined in accordance with the Canadian Institute of Actuaries' (CIA's) Standard of Practice Section 3500 for determining Pension Commuted Values and the educational note *Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates between December 31, 2019 and December 30, 2020*. These assumptions are described in detail in Appendix C.

5. The values of the pensions are not discounted for death or disability before the pension start date.

Based on the Plan provisions in effect on January 1, 2020, the hypothetical wind-up valuation assumptions mentioned above and the membership data supplied by the Plan Administrator, the following is the hypothetical wind-up position as at January 1, 2020:

	January 1, 2020	January 1, 2018
Hypothetical Wind-up Assets		
Market value of Plan assets	$821,959,800	$793,798,600
Present value of future buyback contributions	$670,000	$771,400
Contributions receivable	$2,500,400	$1,607,000
Benefits and expenses accrued but unpaid	($1,834,400)	($1,109,000)
June 3, 2020 Employer contribution	$24,263,700	$0
Allowance for wind-up expenses	($800,000)	($800,000)
Total hypothetical wind-up assets	$846,759,500	$794,268,000
Wind-up Liabilities		
Active members	$421,039,100	$378,637,600
Retired members and survivors	$566,765,100	$503,643,100
Terminated vested members and outstanding payments	$6,398,600	$5,464,400
Total hypothetical wind-up liabilities	$994,202,800	$887,745,100
Hypothetical wind-up excess/ (deficiency)	($147,443,300)	($93,477,100)
Transfer Ratio	**85.2%**	**89.5%**

As shown above, if the Plan had been terminated on January 1, 2020, we estimated that the hypothetical wind-up liabilities would have exceeded the hypothetical wind-up assets by $147,443,300.

Incremental Cost

In accordance with the Canadian Institute of Actuaries' Standards of Practice, we have estimated the incremental cost of the hypothetical wind-up liabilities as at January 1, 2020. This is the expected aggregate change in hypothetical wind-up liabilities between January 1, 2020 and January 1, 2023 and it is based on the assumptions presented in Appendix C.

The incremental cost as at January 1, 2020 is $116,038,100. The incremental cost does not impact the funding requirements of the Plan under the *Pension Benefits Act* (Ontario) and is for information purposes only.

The Actuarial Standards Board (ASB) published amendments to the Standards of Practice (Section 3500: practice-specific standards for pension commuted values) on January 24, 2020 with an effective date no earlier than December 1, 2020. The effect, if any, of this new Standard of Practice has not been reflected in this calculation.

Hypothetical Wind-Up Valuation Sensitivity Analysis

If the wind-up discount rate changed by 1% from the assumptions described in Appendix C, and all other assumptions remained the same, the total wind-up liabilities would change as follows:

	Discount rate 1% lower	Discount rate 1% higher
Change in hypothetical wind-up liabilties	$147,195,300	($114,839,400)
	14.8%	(11.6%)

Section 5 – Solvency Valuation

The table below shows the solvency position of the Plan as at January 1, 2020. The calculations are based on the Plan provisions in effect on the valuation date, on the solvency valuation assumptions and methods described in Appendix C, and on the membership data supplied by the Plan Administrator.

The solvency valuation is similar to the wind-up valuation except for the adjustments to assets, as described in Section 2.

	January 1, 2020	January 1, 2018
Solvency Assets		
Market value of Plan assets	$821,959,800	$793,798,600
Present value of future buyback contributions	$670,000	$771,400
Contributions receivable	$2,500,400	$1,607,000
Benefits and expenses accrued but unpaid	($1,834,400)	($1,109,000)
June 3, 2020 Employer contribution	$24,263,700	$0
Present value of special payments in respect of previously established solvency deficiency (asset adjustment)	$0	$70,959,800
Allowance for wind-up expenses	($800,000)	($800,000)
Total solvency assets including the asset adjustment	$846,759,500	$865,227,800
Solvency Liabilities		
Active members	$421,039,100	$378,637,600
Retired members and survivors	$566,765,100	$503,643,100
Terminated vested members and outstanding payments	$6,398,600	$5,464,400
Total solvency liabilities	$994,202,800	$887,745,100
Solvency excess/ (deficiency)	($147,443,300)	($22,517,300)
Reduced solvency excess/ (deficiency)	$1,687,100	$110,644,500
Solvency ratio	**85.2%**	**89.5%**

The Plan has a solvency deficiency of $147,443,300 at January 1, 2020 and a reduced solvency excess of $1,687,100 at January 1, 2020.

The new reduced solvency excess/ (deficiency) arising during the year is equal to the solvency assets plus the solvency asset adjustment minus 85% of the solvency liabilities minus 85% of the solvency liability adjustment minus the prior year credit balance.

The solvency ratio is the ratio of the solvency assets (before accounting for the asset adjustment) of the plan to the total solvency liabilities.

Under the current funding rules, solvency special payments are only required for plans that have a reduced solvency deficiency. Since there is a reduced solvency excess, no solvency special payments are required.

Section 6 – Eligible Contributions

Minimum Contributions

The Plan has a going concern surplus as at January 1, 2020. In addition, as mentioned in Section 5, the Plan's solvency ratio is above 85% and there is therefore no solvency special payments required to be paid. As a result, the Employer is only required to make current service cost contributions plus the provision for adverse deviations.

The 2020 Employer current service cost has been calculated at 11.10% and the provision for adverse deviations at 2.72% of covered payroll.

If the number of actively employed members remains at the January 1, 2020 level, if the covered payroll of $100,624,200 for 2020 is to increase as per the actuarial assumptions and if no changes are made to cost sharing provisions through labour agreements, the minimum required monthly Employer contributions under the *Pension Benefits Act* (Ontario) for the three-year period following the valuation date would be estimated as follows:

	Annual Required Employer Contributions		
	2020 $	2021 $	2022 $
Current service cost contributions	11,164,200	11,499,100	11,844,100
Provision for adverse deviations	2,741,100	2,823,400	2,908,100
Total required contributions	**13,905,300**	**14,322,500**	**14,752,200**

Therefore, the Employer total required contributions for 2020 represent 13.82% of covered payroll, based on the estimated payroll of $100,624,200.

Under the current funding rules, there is available actuarial surplus for a contribution holiday if the Plan's provision for adverse deviations (PfAD) is fully funded on a going concern basis, that is, the value of going concern Plan assets (excluding the amount of any letter of credit, if applicable), is equal to 100% + PfAD on the Plan's going concern liabilities. In addition, the plan's transfer ratio must be at least 105%. As at January 1, 2020, the available actuarial surplus is nil.

In addition to the minimum Employer contribution of 13.82% of members' salary, the Employer will, in accordance with Plan provisions and provided it is an eligible contribution under the Income Tax Act, contribute an additional 1% of members' salary during a Plan year in which the going concern funded ratio is less than 130%.

Maximum Contributions

At the Employer's option, the Employer may choose to fund at a higher level than the minimum requirement stated above. The maximum tax-deductible contributions the Employer could make is equal to the sum of:

1. A lump sum amount equal to the greater of the total going concern unfunded liability and the hypothetical wind-up deficiency, which was $147,443,300 as of January 1, 2020; plus

2. The current service cost contributions and PfAD as certified above for each year until the date of the next valuation.

Under the Ontario pension legislation, all contributions due to the Plan should be remitted monthly. Employee and Employer current service cost contributions are due within 30 days following the end of the relevant month.

Section 7 – Pension Benefit Guarantee Fund ("PBGF")

For the purposes of the Regulations under the *Pension Benefits Act* (Ontario), the PBGF assessment base and liabilities for the year following the valuation date are calculated as follows:

PBGF liabilities	$481,855,500	(a)
Total solvency liabilities	$994,202,800	(b)
Ontario asset ratio	48.47%	(c) = (a) ÷ (b)
Market value of assets (net of wind-up expenses)	$847,559,500	(d)
Ontario portion of assets	$410,812,100	(e) = (c) x (d)
PBGF assessment base	$71,043,400	(f) = (a) – (e)

Section 8 – Transfer Ratio

The "transfer ratio" for purposes of the Regulations under the *Pension Benefits Act* (Ontario) is the ratio of:

1. The solvency assets at market value, minus the lesser of the prior year credit balance or the sum of the minimum contributions required under the Regulation until the next valuation date, (i.e. $846,759,500) to

2. The solvency liabilities (i.e. $994,202,800).

As at January 1, 2020, the transfer ratio was determined to be 85.2%.

Subsequently an updated transfer ratio report as of April 1, 2020 was filed with the Financial Services Regulatory Authority of Ontario in accordance with Regulations 19(4) and 19(5) and it was determined that the transfer ratio was 69.1% as of April 1, 2020.

The Regulations under the *Pension Benefits Act* (Ontario) provide that, if the transfer ratio is greater than 100%, transfers of commuted values to terminating employees may be made in full, immediately. If the transfer ratio is less than 100%, the administrator can choose to do one of the following:

1. transfer a portion of the commuted value on the basis of the most recently determined transfer ratio and pay the portion held-back plus interest within 5 years of the initial transfer; or

2. transfer the full commuted value after an amount equal to the portion of the transfer deficiency based on the most recently determined transfer ratio has been remitted to the plan; or

3. transfer the full commuted value if the aggregate of transfer deficiencies for all transfers, based on the applicable most recently determined transfer ratio, made since the valuation date of the most recently filed actuarial valuation report does not exceed 5% of the market value of the assets of the Plan at that time.

However, if the transfer ratio is less than 100% and the administrator knows or ought to know that since the date of the last filed valuation, the transfer ratio has fallen by 5% or more of the most recently determined transfer ratio, then no commuted values can be paid out of the Plan until approval is obtained from the Chief Executive Officer of the Financial Services Regulatory Authority of Ontario. Once given, the administrator can choose to do one of the above, or an alternative method approved by the Chief Executive Officer of the Financial Services Regulatory Authority of Ontario.

Under the Regulations, an actuarial report on a pension plan indicates “solvency concerns” if the ratio of the solvency assets to the solvency liabilities is less than 85%. If a report indicates solvency concerns, the next actuarial valuation must be performed within one year of the current valuation date. Otherwise, the next valuation is not due until three years following the current valuation date.

Since the ratio of the solvency assets to the solvency liabilities is more than 85%, an annual valuation is not required. Thus, the effective date of the next valuation must be no later than January 1, 2023.

Section 9 – Actuarial Opinion

With respect to the Canadian Union Public Employees Employees' Pension Plan forming part of the actuarial report dated September 18, 2020 and based on a valuation of the Plan as at January 1, 2020:In our opinion, in respect of the going concern valuation, the hypothetical wind-up valuation and the solvency valuation,

(a) the membership data on which the valuations are based are sufficient and reliable for the purposes of the valuations;

(b) the assumptions are appropriate for the purposes of the valuations, and

(c) the methods employed in the valuations are appropriate for the purposes of the valuations.

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

Notwithstanding the foregoing opinion, emerging experience differing from the assumptions will result in gains or losses which will be revealed in future valuations.

This report has been prepared in a manner consistent with the recommendations for the preparation of actuarial valuation reports issued by the Canadian Institute of Actuaries.

This report has been prepared in accordance with applicable legislation.

Dany Desgagnés
Fellow, Canadian Institute of Actuaries

Esther Rochon
Fellow, Canadian Institute of Actuaries

September 18, 2020

Appendix A – Summary of Plan Provisions

This appendix describes the provisions of the Plan, as amended to January 1, 2020 that had a significant effect on the results of the valuations.

Effective Date

January 1, 1971.

Eligibility

All permanent full-time and part-time employees and term employees must join the Plan from their first day of employment; full-time and part-time temporary employees are eligible under rules compliant with applicable provincial legislation.

Retirement Date

Normal retirement is at age 65; a Member may however elect early retirement from the earlier of attainment of age 50 or completion of 25 years of credited service.

Contributions

Employees: 9.7% of earnings

Employer: Balance of cost.

Pension at Retirement

2% of average of the best 3 years earnings, times total credited service up to a maximum of 35 years, subject to a maximum pension equal to ITA defined benefit limit multiplied by years of credited service.

On early retirement after the earlier of age 60 and the age at which the sum of age and credited service totals at least 80, the full accrued pension is payable. On early retirement after age 50 or after 25 years of service, the accrued pension is reduced by ¼ of 1% for each month by which the early retirement date precedes the earlier of age 60 or the age at which the sum of age and credited service totals at least 80.

In addition, for members retiring on or after January 1, 1996, a bridge benefit is payable from early retirement date until attainment of age 65, subject to any maximum under the applicable legislation. The annual amount of such bridge benefit is calculated as follows:

- For members who were accruing benefits under the Plan on or before December 3, 1996, the sum of OAS and CPP benefits, reduced by 3% for each year by which the early retirement date precedes age 60 and pro-rated if credited service is less than 10 years.

- For members who were not accruing benefits under the Plan on December 3, 1996 but were accruing benefits on December 31, 1997, the sum of OAS and CPP benefits reduced by 3% for each year by which the early retirement date precedes age 60 and pro-rated if credited service accrued while an employee is less than 10 years.

- For members who were not accruing benefits on December 31, 1997 but were accruing benefits on December 31, 1999 and who retired after May 16, 2007 but before January 1, 2010, the sum of OAS and CPP benefits reduced by 3% for each year by which the early retirement date precedes age 60 and pro-rated if credited service accrued while an employee is less than 10 years.
- For members who were not accruing benefits under the Plan on December 31, 1999 but were accruing benefits on May 16, 2007, $8,000 reduced by 3% for each year by which the early retirement date precedes age 60 and pro-rated if credited service accrued while an employee is less than 10 years.
- For members who were not accruing benefits under the Plan on May 16, 2007 and who retired before October 3, 2018, $8,000 reduced by 3% for each year by which the early retirement date precedes age 60 and pro-rated if credited service accrued while an employee is less than 15 years.
- For members who were not accruing benefits under the Plan on May 16, 2007 and who retired on or after October 3, 2018, $8,000 reduced by 3% for each year by which the early retirement date precedes age 60 and pro-rated if credited service accrued while an employee is less than 10 years.

Death Benefits

Death prior to retirement – Maximum between the commuted value of the accrued pension and a refund of two times the member's required contributions with interest, subject to a minimum death benefit equal to that required under applicable provincial pension legislation.

Death after retirement – On death of a retired member who had a spouse at date of retirement, a 66 2/3% surviving spouse benefit is payable, subject to a guarantee of 60 monthly pension payments from the member's date of retirement. If the retiring member did not have a spouse at date of retirement, normal form of pension is a life pension with a guarantee of 120 monthly payments. Optional forms of payment are available at retirement, subject to actuarial adjustment.

The bridge pension post-retirement death benefits are the same as those applicable to the basic pension except that bridge payments always terminate at the time the member would have attained age 65.

Termination Benefits

All benefits accrued to date of termination are fully vested; terminating members may elect a deferred pension commencing at age 60 or a transfer of the commuted value of the accrued pension to another pension vehicle. All vested benefits, except those resulting from the purchase of service while not a temporary employee, must have been at least 50% funded by employer contributions.

Subject to any locked-in requirement under the applicable pension legislation, a terminating member may also elect a refund of his regular employee required contributions with interest.

Voluntary Contributions

Effective January 1, 1987 and January 1, 1989, a portion of the members' required contributions made by certain Plan members prior to those dates were deemed to be optional contributions.

Indexation of Benefits

Pensions in course of payment have been indexed in the past on an ad hoc basis. Under current plan provisions, indexation adjustments have become payable at the beginning of 2006, 2007 and 2008 to compensate for full CPI increase in the preceding year. In addition, indexation adjustments have become payable at the beginning of 2009 and 2010 to compensate for 50% of CPI increases in the preceding year. Indexation adjustments effective on or after January 1, 2011 are subject to certain conditions with respect to the financial status of the Plan. Pursuant to Amendment No. 78, indexation adjustments for the years 2010-2017 were paid on January 1, 2018. Finally, additional indexation of full CPI in 2018 was paid on January 1, 2019 and of 88% of CPI in 2019 was paid on January 1, 2020. For the purpose of the present valuation, no indexation adjustments beyond January 1, 2020 have been assumed.

Appendix B – Actuarial Assumptions and Methods – Going Concern Basis

Discount rate:	5.85% per annum, net of all expenses that are paid from the assets of the Plan. In the previous valuation, the discount rate was 6.10%.
Salary Increase:	3% per annum.
Increases in YMPE:	3% per annum from the 2020 level of $58,700.
Expense:	Discount rate includes an allowance of 0.65% for administration and investment expenses.
ITA Benefit Maximum:	$3,092.22 for year 2020, indexed by 3% per annum from 2021.
Mortality:	Private Sector Canadian Pensioners' Mortality Table, without size adjustment factor, projected from 2004 using Improvement Scale MI-2017.
Disability:	None
Retirement:	Following retirement rates are assumed, based on points (age + service):

Points	Rate	Points	Rate
64	0%	77	11.0%
65	1.0%	78	15.0%
66	1.5%	79	20.0%
67	2.0%	80	25.0%
68	2.5%	81	23.0%
69	3.0%	82	22.0%
70	4.0%	83 – 85	20.0%
71	5.0%	86	21.0%
72	6.0%	87	23.0%
73 – 75	7.0%	88 – 99	25.0%
76	8.0%	100	100%

Turnover: Termination rates are based on service. Sample rates are as follows:

Years of service	Termination Rate
0	0.036
5	0.019
10	0.007
15	0.003
20	-

Survivors' benefits: 85% of active members assumed to be married at retirement; female spouses assumed to be three years younger than male spouses.

Actuarial Cost Method

As with the previous valuation, we have used the projected unit credit actuarial cost method to determine the going concern liabilities of the Plan and the Employer's current service cost in respect of the Plan. Under this method, the actuarial liabilities consist of the present value of pensions in payment and vested deferred benefits for terminated members, plus that portion of the future benefits expected to be paid to present members which are related to their credited service up to the valuation date. Amounts of pension are determined based on each member's projected final average earnings. If the value of these actuarial liabilities plus the PfAD exceeds the actuarial value of the assets (determined as described below), the excess is defined as the unfunded actuarial liability and is funded by fixed special payments over a specified period or periods.

The total current service cost for the year following the valuation date is the present value of benefits accrued by Plan members with respect to their service in that year.

The characteristics of this actuarial cost method are that it matches year-by-year costs of benefits expected to be accrued by the Plan members each year to the contributions required for those years and since it results in a pattern of progressively increasing costs for an individual employee as that employee ages, it may also result in progressively increasing costs for the Plan as a whole if the average age profile of the Plan membership increases from year to year.

Asset Valuation Method

As with the previous valuation, we have used a smoothing method to determine the value of the assets recognized for valuation purposes. Under this smoothing method, the asset value is determined as the average of the current market value as at January 1, 2020 and the four prior years adjusted market values, where the adjusted market value of a prior year is determined by accumulating the prior year's market value to the valuation date, such accumulation being made at the valuation interest rate and taking into account the net cash-flow during the accumulation period. Appendix E presents the details of the determination of the smoothed value of assets as at January 1, 2020.

The objective of the asset valuation method is to moderate the volatility of contribution rates by deferring the recognition of investment gains and losses over the short-term.

Benefits Valued

The benefits valued were those in effect at the valuation date. A summary of the Plan provisions is provided in Appendix A. The valuation does not make any provision for future changes in Plan provisions and no provisions are included in liabilities for indexation adjustments after January 1, 2020.

Rationale

Economic Assumptions

With the exception of the discount rate, we have used the same economic assumptions as those used at the prior valuation as at January 1, 2018. For this valuation, the discount rate was decreased to 5.85% per year from 6.10% per year used in the previous valuation to reflect the current expectation of the long-term rate of return. The impact of this change is summarised in Section 3.

The selection of the economic assumptions (i.e. those related to interest rates and inflation) for this valuation was based on reasonable expectations for the relationships between key economic variables over the long term, as well as the expected impact of those economic variables on the investment performance of the pension fund given the fund's Statement of Investment Policies and Procedures ("SIP&P").

To determine the going concern discount rate, our model determined expected long-term capital market returns, standard deviations and correlations for each major asset class noted in Appendix E (universe bonds, Canadian equities, global equities, etc.). These long-term expectations are determined using a stochastic model which projects rates of inflation, bond yields and asset class returns for 5,000 paths over a 30-year horizon to create expected returns for each asset class. The simulated gross investment return was the return at the median of each asset class weighted by the Plan's target asset mix.

We have assumed that there will be no added-value returns from the active management strategy employed in excess of the associated additional investment management fees. The SIP&P effective January 1, 2020 is as follows:

Asset class	Target asset mix
Cash and Equivalents	2.0%
Fixed Income	32.0%
Canadian Equities	36.0%
Foreign Equities	15.0%
Real Estate Investments	15.0%
Total	**100%**

Based on the terms of engagement, no margin for adverse deviations has been included in the economic assumptions, as an explicit Provision for Adverse Deviations has instead been added to the going concern liabilities and current service cost in accordance with the Regulations under the *Pension Benefits Act* (Ontario).

Based on the methodology described above, the going concern discount rate assumption has been developed as follows:

	Discount rate
Simulated gross investment return	6.50%
Provision for administration and passive investment expenses	(0.40%)
Provision for active investment expenses	(0.25%)
Estimated net investment return rate before margin	5.85%
Margin for adverse deviations	-
Discount rate assumption	**5.85%**

The assumed level of administration and investment expenses is based on the average of the expenses paid from the fund over the last three calendar years.

Because the assumptions are intended to represent expected economic conditions over long periods of time, covering several decades, it is anticipated that the assumptions will be changed relatively infrequently, and that any change in the assumptions will be justified by new economic conditions that are likely to persist over the long term, rather than by short-term fluctuations in the financial markets, as well as the underlying objectives adopted by the JBT for the funding of the Plan's benefits.

For salary increases, we have reflected negotiated salary increased pursuant to collective bargaining agreements and have assumed that salaries will increase at a rate of 3% per annum after that (i.e. the real economic growth in salary would be 1% above the assumed price inflation rate of 2% per annum). The long-term rate of 3% per annum for salary increases is in line with the findings of the most recent salary experience review performed over the period 2006-2015. The increases in the yearly maximum pensionable earnings ("YMPE") and the Income Tax Benefit limit after 2020 were assumed to be at the same rate of 3% per annum.

In our view, the economic assumptions used for the going concern valuation remain within an acceptable range that would be considered by actuaries to be appropriate for the current circumstances of the Plan.

Demographic Assumptions

Some demographic assumptions used for this valuation and prior valuations were based mainly on standard population tables instead of the Plan's experience, due to the limited statistical volume of data available. For mortality, we have used the Canadian Pensioners' Mortality ("CPM") Table for the private sector, without size adjustment factor, projected from base year 2004 with Improvement Scale MI-2017. This table is expected to be commonly used for valuations of pension plans where the amount of data relating to actual mortality experience of the specific Plan is of limited statistical significance and there is no reason to believe mortality experience for the Plan will differ significantly from that of other plans. With regards to the improvement scale, in December 2017, the CIA released the "Educational Note – Second Revision: Selection of Mortality Assumptions for Pension Plan Actuarial Valuations" containing mortality improvement scales based on experience studies conducted by the CIA and expert opinions. The report recommends a two-dimensional mortality enhancement scale, the MI-2017, developed in 2017 using general population data from 1967 to 2015. Considering the most recent data and study made available, and in absence of any additional credible information under the Plan, we have used the newly published Improvement Scale MI-2017 for the present valuation.

With respect to the retirement assumption, the early retirement table has been derived from a review of the actual experience observed under the Plan over recent years. Such study was performed in 2007 and updated in 2010; the rates of early retirement are function of the sum of age and credited service, as the review of the actual experience under the Plan indicated that this parameter was that having the most significant impact on the actual early retirement experience. The rates used for the present valuation are identical to those used in the prior valuation.

For termination of employment prior to retirement, the rates were developed based on standard termination tables; a review of actual experience observed under the Plan over recent years indicated that the standard rates used are in line with the termination patterns observed under the Plan.

Appendix C – Actuarial Assumptions and Methods – Hypothetical Wind-up and Solvency Bases

Interest (Hypothetical Wind-up and Solvency Basis):	2.96% per annum for annuity purchases (based on a duration of liabilities of 11.9). 2.50% per annum for 10 years and 2.60% per annum thereafter for lump sum transfers.
Increases in Pensionable Earnings:	None.
YMPE:	$58,700 for 2020; no future increase in YMPE.
ITA Benefit Maximum:	$3,092.22 per year of pensionable service.
Mortality:	2014 Combined Sector Canadian Pensioners' Mortality Table, without size adjustment factor, and Improvement Scale B. • Annuity purchases: Sex-distinct basis. • Lump sum transfers for Quebec members: Sex-distinct basis. • Lump sum transfers for all other members: Unisex basis with 40% male ratio.
Disability:	None.
Retirement:	Retirement is assumed at the age producing the highest present value of the vested pension.
Turnover:	None.
Marital Status:	85% of members are married, with male spouse 3 years older than female spouse.
Allowance for wind-up expenses:	$800,000.
Value of assets:	Assets are recognized at market value for wind-up and solvency valuations.
Assumption on settlement option at plan termination:	**Percentage electing transfers**

Percentage electing transfers	
Pensioners	0%
Active and terminated members	
• Quebec members	100%
• Other members	
✓ Eligible for retirement	50%
✓ Not eligible for retirement	75%

Actuarial Cost Method

As with the prior valuation, we valued the termination benefits payable under the Plan or the *Pension Benefits Act* (Ontario), if different. Under this valuation, the actuarial liabilities consist of the present value of pensions in payment and vested deferred benefits for terminated members, plus the accrued benefits that would have been paid to present members in the event of plan wind-up and which are related to their credited service up to the valuation date. Amounts of pension for active members are determined based on each member's final average earnings at the valuation date.

For the solvency and wind-up valuations, the economic assumptions were changed to reflect market conditions at January 1, 2020 and statutory requirements thereon. We made no provisions for adverse deviation in these valuations as these assumption bases are stipulated by regulation and reflect market conditions at the valuation date.

Asset Valuation Method

As with the previous valuation, we used the market value of assets for the hypothetical wind-up and solvency valuations, adjusting for amounts in transit and amounts payable.

Benefits Valued

The benefits valued were those in effect at the valuation date. A summary of the Plan provisions is provided in Appendix A. The valuation does not make any provision for future changes in Plan provisions and no provisions are included in liabilities for indexation adjustments after January 1, 2020.

Incremental Cost

The incremental cost is the present value, at the valuation date, of the expected aggregate change in the hypothetical wind-up liability between the valuation date and the next valuation date. It also reflects expected benefit payments between the valuation date and the calculation date.

The incremental cost under the hypothetical wind-up basis was determined as the sum of (a) and (b) minus (c) below:

a) the projected hypothetical wind-up liability at the next valuation date for those members at the current valuation date, allowing for service accrual and increase in earnings between the current valuation date and the next valuation date. No adjustment was made for new entrants and decrements between the two valuation dates. The resulting projected hypothetical wind-up liability was then discounted to the current valuation date;

b) the present value of the benefit payments expected to be paid between current valuation date and the next valuation date, discounted to the current valuation date;

c) the hypothetical wind-up liability as at the current valuation date.

Appendix D – Membership Data

The valuation was based on data compiled as of the valuation date, January 1, 2020, supplied to us by the Plan Administrator. This data is summarized in this this Appendix.

We subjected this data to a number of tests of reasonableness and consistency, including the following:

- a member's (and partner's as applicable) age is within a reasonable range;
- all dates remained unchanged from the data used in the previous actuarial valuation of the Plan:
- accrued pensions changed by a reasonable amount;
- the form of pension payment did not change (other than resulting from the death of a retired member); and
- we examined the additions to and deletions from each of the data files (i.e. files for active employees, pensioners and terminated members entitled to a deferred vested pension) since the previous valuation date to determine whether all Plan members were accounted for in this valuation, to check for duplicate records and to confirm pension amounts.

All of our tests had satisfactory results or the data was corrected. However, the tests may not have captured all deficiencies in the data. We have also relied on the Plan administrator's certification on the quality of the data.

RECONCILIATION OF MEMBERSHIP DATA

	Active Members	Terminated Vested Members	Retired Members
Number on January 1, 2018	**907**	**69**	**810**
New entrants	129	0	0
Reinstated as active from terminated vested	5	(5)	0
Benefit paid out	(11)	(11)	0
Termination vested	(25)	25	0
Death paid out	(1)	(1)	0
Retirements	(90)	(3)	93
Death of pensioners	0	0	(42)
Pensioners credit split	0	0	1
New beneficiaries	0	0	17
Number on January 1, 2020	**914**	**74**	**879**

Active Membership Distribution by Age and Years of Credited Service with Average Salary Rate at January 1, 2020

Males

Age at 1/1/2020	0-4	5-9	10-14	15-19	20-24	25-29	30 & over	Total
25-29	2							2
	94,408							94,408
30-34	12	5	2					19
	113,148	120,607	71,724					110,751
35-39	16	16	3	2				37
	115,108	123,002	109,348	119,936				118,316
40-44	16	11	15	5				47
	117,925	124,054	119,078	124,769				120,456
45-49	11	12	17	10	4			54
	113,197	125,107	123,500	119,722	124,551			121,136
50-54	9	9	6	16	3	1	2	46
	133,991	120,838	125,406	122,450	121,562	*	130,466	*
55-59	9	15	14	26	15	6	1	86
	127,384	127,895	132,212	121,917	151,074	125,553	*	*
60-64	3	3	1	9	9	3	4	32
	105,114	120,672	*	117,979	130,714	121,655	129,687	*
65-69		2	2	3		1	3	11
		121,262	106,365	108,186		*	124,567	*
Total	78	73	60	71	31	11	10	334
	117,795	123,938	*	120,794	138,884	123,783	*	122,900

Average age: 50.0

Average credited service: 12.0 years

Females

Age at 1/1/2020	0-4	5-9	10-14	15-19	20-24	25-29	30 & over	Total
25-29	19	2						21
	86,367	74,476						85,234
30-34	13	17	2					32
	102,433	91,083	79,682					94,981
35-39	19	26	9	5	1			60
	98,407	97,686	86,780	96,792	*			*
40-44	25	15	16	16	2			74
	109,506	99,514	114,292	95,398	100,623			105,225
45-49	27	31	26	20	7			111
	97,520	101,912	109,871	94,446	86,759			100,407
50-54	18	24	20	29	21	11	2	125
	103,339	101,219	100,380	96,844	96,041	105,491	104,853	99,939
55-59	14	12	17	32	21	5		101
	84,315	96,327	100,397	102,354	92,679	129,262		98,129
60-64	4	10	11	14	7	4	1	51
	83,372	100,708	99,937	108,758	106,965	124,511	*	*
65-69		1	2		1	1		5
		*	121,362		*	*		105,641
Total	139	138	103	116	60	21	3	580
	97,748	*	103,710	99,187	95,690	*	*	99,635

Average age: 48.7

Average credited service: 11.5 years

All Active Members

Age at 1/1/2020	0-4	5-9	10-14	15-19	20-24	25-29	30 & over	Total
25-29	21	2						23
	87,133	74,476						86,032
30-34	25	22	4					51
	107,576	97,793	75,703					100,856
35-39	35	42	12	7	1			97
	106,042	107,330	92,422	103,405	*			*
40-44	41	26	31	21	2			121
	112,792	109,896	116,608	102,391	100,623			111,141
45-49	38	43	43	30	11			165
	102,058	108,385	115,259	102,871	100,501			107,191
50-54	27	33	26	45	24	12	4	171
	113,556	106,570	106,156	105,948	99,231	*	117,660	*
55-59	23	27	31	58	36	11	1	187
	101,168	113,865	114,765	111,124	117,010	127,239	*	*
60-64	7	13	12	23	16	7	5	83
	92,690	105,315	*	112,366	120,323	123,287	*	111,632
65-69		3	4	3	1	2	3	16
		*	113,863	108,186	*	95,108	124,567	*
Total	217	211	163	187	91	32	13	914
	104,954	*	*	107,391	110,405	*	124,644	108,136

Average age: 49.2

Average credited service: 11.7 years

Terminated Vested Members

Males

Age Group	Number	Average Monthly Pension
		$
25-29	--	--
30-34	1	357
35-39	5	216
40-44	6	245
45-49	6	472
50-54	4	1,060
55-59	1	79
60-64	1	297
>65	1	46
Total	**25**	**416**

Average age: 46.3

Females

Age Group	Number	Average Monthly Pension
		$
25-29	1	145
30-34	4	176
35-39	9	371
40-44	5	258
45-49	9	961
50-54	8	504
55-59	8	309
60-64	4	114
>65	1	56
Total	**49**	**432**

Average age: 47.5

All Terminated Vested Members

Age Group	Number	Average Monthly Pension
		$
25-29	1	145
30-34	5	212
35-39	14	316
40-44	11	251
45-49	15	765
50-54	12	689
55-59	9	284
60-64	5	151
>65	2	51
Total	**74**	**426**

Average age: 47.1

Retired Members (including surviving spouses)

Males

Age Group	Number	Average Monthly Pension*
		$
<50	--	--
50-54	--	--
55-59	18	4,758
60-64	65	4,604
65-69	76	3,860
70-74	82	3,922
75-79	50	3,564
80-84	21	3,158
85-89	12	2,848
>90	5	2,119
Total	**329**	**3,918**

*Include bridging benefit

Average age: 70.8

Females

Age Group	Number	Average Monthly Pension*
		$
<50	--	--
50-54	10	3,905
55-59	61	4,168
60-64	125	4,489
65-69	148	2,986
70-74	111	2,819
75-79	50	2,303
80-84	26	2,036
85-89	9	2,266
>90	10	1,157
Total	**550**	**3,290**

*Include bridging benefit

Average age: 68.4

All Retirees

Age Group	Number	Average Monthly Pension*
		$
<50	--	--
50-54	10	3,905
55-59	79	4,303
60-64	190	4,528
65-69	224	3,283
70-74	193	3,288
75-79	100	2,934
80-84	47	2,537
85-89	21	2,598
>90	15	1,478
Total	**879**	**3,525**

*Include bridging benefit

Average age: 69.3

Appendix E – Plan Assets

Reconciliation of Assets

The asset data used in the valuation were compiled as at December 31, 2019. Assets of the Plan are invested through RBC Investor and Treasury Services and managed by independent investment management firms. We have relied on the audited financial statements for the fund prepared by KPMG LLP Chartered Accountants for the December 31, 2019 year end.

The following is a reconciliation of the pension fund assets from January 1, 2018 to December 31, 2019.

	Jan. 1, 2019 to Dec. 31, 2019	Jan. 1, 2018 to Dec. 31, 2018
Market value as at beginning of year	$753,202,000	$794,296,600
Employer contributions	$13,457,100	$10,975,700
Member contributions	9,870,100	$9,041,200
Transfer from other Plans	$3,030,700	$5,483,800
Investment income	$86,635,500	($26,875,300)
Benefit payments – pensions	($35,944,700)	($33,979,000)
Benefit payments – lump sum	($2,308,800)	($940,700)
Fees and expenses	($5,409,200)	($4,800,300)
Total assets available for benefits	**$822,532,700**	**$753,202,000**
Present value of future buyback contributions	$670,000	
Other in-transit items not included in assets	$93,100	
June 3, 2020 Employer contribution	$24,263,700	
Total Market value as at end of year	**$847,559,500**	
Net rate of return for each period	11.4%	(3.4%)

Summary of Asset Allocation as December 31, 2019

Classification	Assets at Market Value	% of Total Invested Assets	Target % Asset Allocation
Cash and Equivalents	$35,295,500	4.3%	2.0%
Fixed Income	$209,567,500	25.7%	32.0%
Canadian Equities*	$317,253,700	38.8%	36.0%
Foreign Equities	$127,209,900	15.6%	15.0%
Canadian Real Estate	$74,927,700	9.2%	9.0%
Global Real Estate	$52,114,700	6.4%	6.0%
Derivatives	$137,600	0.0%	0.0%
Total Invested Assets	$816,506,600	100.0%	100.0%
Other Assets/(Liabilities)	$6,026,100		
Total Assets Available for Benefits	$822,532,700		

* Include Canadian Small Cap Equities with a target asset allocation of 6.0%.

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Development of Smoothed Asset Value

Adjusted Market Value (AMV) Beginning From:

	1/1/2016	1/1/2017	1/1/2018	1/1/2019	1/1/2020
Assumed Interest Rate:	5.90%	5.90%	6.10%	6.10%	
AMV as at January 1, 2016:	682,120,803				
Net Contributions	(7,139,419)				
Investment Income	40,034,515				
AMV as at January 1, 2017:	715,015,899	751,964,534			
Net Contributions	(8,022,439)	(8,022,439)			
Investment Income	41,949,276	44,129,246			
AMV as at January 1, 2018:	748,942,736	788,071,341	793,798,641		
Net Contributions	(9,619,053)	(9,619,053)	(9,619,053)		
Investment Income	45,392,126	47,778,971	48,128,336		
AMV as at January 1, 2019:	784,715,809	826,231,259	832,307,924	753,036,857	
Net Contributions	(12,486,979)	(12,486,979)	(12,486,979)	(12,486,979)	
Investment Income	47,486,812	50,019,254	50,389,931	45,554,395	
AMV as at January 1, 2020:	819,715,642	863,763,534	870,210,876	786,104,273	820,299,329
Actuarial Value of Assets as at January 1, 2020 before payments in transit:					832,018,731
Resulting Actuarial Adjustment:					11,719,402

Appendix F – Provision for Adverse Deviations

In accordance with Section 11.2 of the Regulations, the Plan's Provision for Adverse Deviations (PfAD) to be applied to the going concern liabilities and current service cost, has been determined as outlined in this Appendix. For the purpose of determining the PfAD, this Plan is not classified as a closed plan as defined in the Regulations.

PfAD = A + B + C

Where:

"A" = Fixed Component = 4% (for open plan) and 5% for (closed plan)

Therefore, A = 4%

"B" = First Variable Component = Asset Mix Component

This component is based on the plan's target asset allocation to non-fixed income assets.

Classification	Target Allocation
Cash	2.0%
Bonds	32.0%
Real Estate, Infrastructure, Mortgages	15.0%
Return seeking assets (e.g. equities, other alternative assets classes)	51.0%

Assets allocated to Non-Fixed Income Securities	=	Return seeking assets + 50% x Real Estate, Infrastructure and Mortgage Assets
	=	51.0% + 0.50 X 15.0%
	=	58.5%

Target allocation for Non-Fixed Income Assets	PfAD – Closed Plan	PfAD – Open Plan
0%	0%	0%
20%	2%	1%
40%	4%	2%
50%	5%	3%
60%	7%	4%
70%	11%	6%
80%	15%	8%
100%	23%	12%

Therefore, B = 3.85%

"C" is the greater of zero, and a value relative the plan's benchmark discount rate calculated in accordance with the Regulations

F = Value of the plan's going concern liabilities as of the valuation date, determined using a discount rate that is 1% less than the discount rate used in this report

G = Value of the plan's going concern liabilities as of the valuation date

Duration of the going concern liabilities = (F – G) / (G x 0.01) = 12.0

H = benchmark yield on long-term bonds issued by the Government of Canada for the valuation date, as determined by CANSIM V39056 = 1.76%

J = combined target asset allocation for fixed income assets = 41.5%

K = combined target asset allocation for non-fixed income assets = 100% – J = 58.5%

E = Benchmark Discount Rate (BDR)
= 0.5% + H + (1.5% x J) + (5% x K)
= 0.5% + 1.76% + (1.5% x 41.5%) + (5% x 58.5%)
= 5.81%

D = Best Estimate Discount Rate = 6.25%

C = Duration x Max (0, D – E) = 12.0 x (6.25% - 5.81%) = 5.28%

Therefore, the total PfAD for the Plan is = A + B + C = 4% + 3.85% + 5.28% = 13.13% rounded to 13.1%

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Appendix G – Plausible Adverse Scenarios

A plausible adverse scenario is considered to be one that will occur in the short term (immediately to one year) with a likelihood of occurring between 1 in 10 and 1 in 20 based on the opinion of the actuary. The purpose of the following scenarios is to illustrate the impact on the Plan's financial position of the following adverse but plausible assumptions relative to the best estimate assumptions selected for the Plan's going concern valuation. The purpose of disclosing these results is to demonstrate the sensitivity of the funded status and annual current service cost between January 1, 2020 and the next valuation date to certain key risk factors affecting the Plan. The results of the scenarios selected are shown in the table below, with a description of each scenario following.

	Going Concern Results at Jan.1, 2020 $	Plausible Adverse Scenario Results at January 1, 2020		
		Interest Rate Risk $	Deterioration of Asset Values	Longevity Risk
Total going concern assets	859,278,900	860,806,500	836,966,800	859,278,900
Total going concern liabilities	702,721,200	717,683,200	702,721,200	703,609,700
PfAD on actuarial liabilities	92,056,500	94,016,500	92,056,500	92,172,900
Total going concern liabilities plus PfAD	794,777,700	811,699,700	794,777,700	795,782,600
Going concern excess (unfunded liability)	64,501,200	49,106,800	42,189,100	63,496,300
Current service cost including PfAD	23,665,900	24,429,800	23,665,900	23,682,100
Change in going concern liabilities plus PfAD		16,922,000		1,004,900
Change in current service cost including PfAD		763,900		16,200
% Change in going concern liabilities plus PfAD		2.13%		0.13%
% Change in current service cost including PfAD		3.23%		0.07%
Discount rate	5.85%	5.65%	5.85%	5.85%
PfAD	13.1%	13.1%	13.1%	13.1%
Adjusted market value of assets	847,559,500	855,197,600	735,998,800	847,559,500

Interest Rate Risk

This scenario illustrates the sensitivity of the funded status of the Plan and current service cost to an immediate change in the market interest rates underlying fixed income investments.

In order to assess the impact of a decrease in interest rates of a magnitude consistent with a 1 in 10 likelihood of occurring, we have used the same stochastic model that is used to determine the going concern discount rate (see Appendix B). The stochastic model is based on 5,000 simulations of projected financial variables, including long-term yields on fixed income investments and asset class returns. Our long-term best estimates for these variables, and the going concern discount rate are based on the median values over these 5,000 simulations.

To determine the sensitivity to interest rate risk, and the resulting impact on Plan assets and liabilities, we have:

- considered the hypothetical going concern discount rate over the 500 trials where fixed income yields are lowest at the one-year horizon,
- determined the decrease in median long-term fixed income yields over the 500 trials where fixed income yields are the lowest at the one-year horizon.

As such, under the interest rate risk scenario, the going concern discount rate is decreased by 20 basis points as of January 1, 2020.

With respect to the impact on fixed income assets, the scenario results in a decrease in long-term yields on fixed income investments of 0.36%.

Based on the estimated duration of the Plan assets, liabilities and the current service cost, we have then determined the estimated change to the Plan's funded status under the interest rate risk scenario.

Deterioration of Asset Values

This scenario illustrates the sensitivity of the funded status of the Plan to short-term shock which causes a reduction in the market value of assets, with no change to the liabilities of the Plan. This scenario is assumed not to impact the current expectation of the long-term rate of return, and consequently, the going concern discount rate.

In order to assess the impact of a decrease in asset values of a magnitude consistent with a 1 in 10 likelihood of occurring, we have used the same stochastic model that is used to determine the going concern discount rate (see Appendix B). The stochastic model is based on 5,000 simulations of projected financial variables, including long-term yields on fixed income investments and asset class returns.

To determine the sensitivity to a deterioration in asset values, based on the Plan's target asset mix, we have:

- determined the decrease in median investment returns over the 500 trials where investment returns are the lowest at the one-year horizon.

As such, under the deterioration of asset values scenario, the market value of assets is decreased by 13.6% as of January 1, 2020. Since the asset valuation method for the going concern valuation is smoothed asset value, the going concern assets is decreased by 2.6% as of January 1, 2020.

Longevity Risk

This scenario illustrates the sensitivity of the funded status of the Plan to pension plan members living longer than expected. The impact of this scenario was determined using a one-year age setback to the mortality table used for the going concern valuation as of January 1, 2020, that is, a more conservative mortality assumption than currently employed.

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Certificate of Employer

With regards to the January 1, 2020 actuarial report for the Canadian Union of Public Employees Employees' Pension Plan, I hereby certify that, to the best of my knowledge and belief:

- A copy of the official Plan document and all amendments made to January 1, 2020, were provided to the actuary;
- The membership data provided to the actuary includes a complete and accurate description of every person who is entitled to benefits under the terms of the Plan for service up to January 1, 2020;
- The asset data provided or made available to the actuary is complete and accurate;
- The Plan has been determined to be an open plan as defined in Section 11.2(1) of Regulation 909 of the Pension Benefits Act (Ontario); and
- All events subsequent to January 1, 2020 that may have an impact on the valuation have been communicated to the actuary.

September 8, 2020
Date

[signature]
Signature

Administrative Officer
Title