



# Actuarial Valuation as at December 31, 2017 for Local Authorities Pension Plan

September 20, 2018

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## Executive Summary

An actuarial valuation has been prepared for the Local Authorities Pension Plan (the "Plan") as at December 31, 2017 for the primary purpose of establishing a funding range in accordance with legislative requirements for the Plan until the next actuarial valuation is performed. This section provides an overview of the important results and the key valuation assumptions which have had a bearing on these results. The next actuarial valuation for the purposes of developing funding requirements should be performed no later than as at December 31, 2020.

## Summary of Principal Results (000,000's)<sup>1</sup>

December 31, 2017	Going Concern – Maximum Margin	Going Concern – Optimal Margin	Solvency
Assets	\$ 41,047.3	\$ 41,047.3	\$ 42,672.4
Liabilities	\$ 57,938.1	\$ 39,270.8	\$ 55,713.0
<b>Actuarial Excess/(Deficit)</b>	<b>\$ (16,890.8)</b>	<b>\$ 1,776.5</b>	<b>\$ (13,040.6)</b>
<b>Current Service Cost (% of Pay)</b>	<b>27.88%</b>	<b>16.98%</b>	
December 31, 2016	Going Concern		Solvency
Assets	\$ 36,580.2		\$ 37,674.4
Liabilities	\$ 38,839.5		\$ 53,182.8
<b>Actuarial Excess/(Deficit)</b>	<b>\$ (2,259.3)</b>		<b>\$ (15,508.4)</b>
<b>Current Service Cost (% of Pay)</b>	<b>17.55%</b>		

## Legislative Ratios

	December 31, 2017	December 31, 2016
Funded ratio – maximum margin	70.8%	N/A
Funded ratio – optimal margin	104.5%	94.2%
Solvency ratio	76.6%	70.8%

## Contribution Requirements

Considering the funded status of the Plan, the contributions recommended by the Local Authorities Pension Plan Board in this report, as a percentage of pensionable earnings, are as follows:

	Participants	Employer	Total
January 1, 2018 to December 31, 2018	10.58%	11.58%	22.16%
January 1, 2019 to December 31, 2020	9.58%	10.58%	20.16%

<sup>1</sup> Net of all adjustments such as estimated wind up expenses, where applicable.

## Key Assumptions

The principal assumptions to which the valuation results are most sensitive are outlined in the following table.

<b>December 31, 2017</b>	<b>Going Concern</b>	<b>Solvency</b>
Discount rate	5.40% per year (Optimal Margin) 2.90% per year (Maximum Margin)	Annuity purchases, net of indexing (for anyone already terminated or receiving a pension or retirement eligible): 1.15% per year Transfers, net of indexing (for anyone not yet terminated and not retirement eligible): 1.90% per year for 10 years, 2.30% per year thereafter
Inflation rate	2.00% per year	Unavailable
Cost of living Adjustments (COLA)	1.20% per year	Included in net annuity purchase rates
Pensionable earnings – Base	0.00% per year for 2 years and 3.00% thereafter	Not applicable
Pensionable earnings – Merit and Promotion	Age related table, derived from Plan experience	Not applicable
Increases in Year's Maximum Pensionable Earnings ("YMPE")	3.00% per year	Not applicable
Increases in ITA maximum pension limit	3.00% per year	Not applicable
Interest on member contributions	3.00% per year	Not applicable
Non-investment expenses	\$39.1 million	\$65.0 million wind up expenses
Mortality table	2014 Public Sector Canadian Pensioner Mortality Table with Plan specific adjustments, derived from Plan experience from 2003 to 2012, with generational improvements using Scale CPM-B	2014 Canadian Pensioners' Mortality Table with generational improvements using Scale CPM-B
Retirement rates	Variable by age and service, derived from Plan experience from 2003 to 2012	100% at the age which maximizes the value of member's entitlement
Termination rates	Variable by age and service, derived from Plan experience from 2003 to 2012	Not applicable
Termination option election		Not applicable
Deferred pension	25%	
Lump sum	75%	
Lump sum interest rate	1.90% per year for 10 years and 2.30% thereafter	
Lump sum mortality assumption	2014 Canadian Pensioner Mortality Table with generational improvements using Scale CPM-B	

<b>December 31, 2016</b>	<b>Going Concern</b>	<b>Solvency</b>
Discount rate	5.30% per year	Annuity purchases, net of indexing (for anyone already terminated or receiving a pension or retirement eligible): 1.20% per year Transfers, net of indexing (for anyone not yet terminated and not retirement eligible): 1.50% per year for 10 years, 2.20% per year thereafter
Inflation rate	2.00% per year	Unavailable
Cost of living Adjustments (COLA)	1.20% per year	Included in net annuity purchase rates
Pensionable earnings – Base	2.00% per year for 3 years and 3.00% thereafter	Not applicable
Pensionable earnings – Merit and Promotion	Age related table, derived from Plan experience	Not applicable
Increases in Year's Maximum Pensionable Earnings ("YMPE")	3.00% per year	Not applicable
Increases in ITA maximum pension limit	3.00% per year	Not applicable
Interest on member contributions	3.00% per year	Not applicable
Non-investment expenses	\$39.5 million	\$65 million wind up expenses
Mortality table	2014 Public Sector Canadian Pensioner Mortality Table with Plan specific adjustments, derived from Plan experience from 2003 to 2012, with generational improvements using Scale CPM-B	2014 Canadian Pensioners' Mortality Table with generational improvements using Scale CPM-B
Retirement rates	Variable by age and service, derived from Plan experience from 2003 to 2012	100% at the age which maximizes the value of member's entitlement
Termination rates	Variable by age and service, derived from Plan experience from 2003 to 2012	Not applicable
Termination option election		Not applicable
Deferred pension	25%	
Lump sum	75%	
Lump sum interest rate	1.50% per year for 10 years and 2.20% thereafter	
Lump sum mortality assumption	2014 Canadian Pensioner Mortality Table with generational improvements using Scale CPM-B	

## Section 1: Introduction

### Purpose and Terms of Engagement

We have been engaged by the Local Authorities Pension Board of Trustees, and hereafter referred to as the “Board”, to conduct an actuarial valuation of the Plan, as at December 31, 2017 for the general purpose of determining the minimum and maximum funding contributions required by pension standards, based on the actuarial assumptions and methods summarized herein. More specifically, the purposes of the valuation are to:

- Determine the financial position of the Plan on a going concern basis as at December 31, 2017;
- Determine the financial position of the Plan as at December 31, 2017 on a solvency basis;
- Determine the funding requirements of the Plan as at December 31, 2017; and
- Provide the necessary actuarial certification required under the *Public Sector Pension Plans Act (Act)* and the *Income Tax Act (ITA)*.

The results of this report may not be appropriate for accounting purposes or any other purposes not listed above. The next required valuation will be as at December 31, 2020.

### Summary of Changes Since the Last Valuation

The last such actuarial valuation in respect of the Plan was performed as at December 31, 2016. Since the time of the last valuation, we note that the following events have occurred:

- Solvency assumptions have been revised. The changes are summarized as follows:
  - Net annuity purchase discount rate decreased to 1.15% per year from 1.20% per year.
  - Net transfer value discount rate increased to 1.90% per year for 10 years and 2.30% per year thereafter from 1.50% per year for 10 years and 2.20% per year thereafter.
- Going concern actuarial assumptions have been revised. The changes are summarized as follows:
  - The optimal margin discount rate assumption was changed to 5.40% per year from 5.30% per year.
  - The maximum margin discount rate assumption was included.
  - The base increase in pensionable salary assumption was changed to 2.00% per year for two years and 3.00% per year thereafter from 0.00% per year for two years and 3.00% per year thereafter.

### Board Information and Inputs

In order to prepare our valuation, we have relied upon the following information:

- A copy of the previous valuation report as at December 31, 2016;
- Membership data compiled as at December 31, 2017 by Alberta Pensions Services Corporation (“APS”);
- Asset data taken from the Plan’s audited financial statements; and

- A copy of the Plan regulations with any amendments up to and including December 31, 2017.

Furthermore, our actuarial assumptions and methods have been chosen to reflect our understanding of the Board's funding strategy with due respect to accepted actuarial practice and regulatory constraints.

## Subsequent Events

As of the date of this report, we have not been made aware of any subsequent events which would have an effect on the results of this valuation. However, the following points should be noted in this regard:

- Actual experience deviating from expected after December 31, 2017 will result in gains or losses which will be reflected in the next actuarial valuation report; and
- To the best of our knowledge, the results contained in this report are based on the regulatory and legal environment in effect at the date of this report and do not take into consideration any potential changes that may be currently under review. To the extent that actual changes in the regulatory and legal environment transpire, any financial impact on the Plan as a result of such changes will be reflected in future valuations.

## Section 2: Going Concern Valuation Results

### Going Concern Financial Position of the Plan

The going concern valuation provides an assessment of the Plan's financial position at the valuation date on the premise that the Plan continues on into the future indefinitely. This assumption is consistent with the Plan terms and the Board's mission.

The selection of the applicable actuarial assumptions and methods reflect the Plan's funding strategy, actuarial standards of practice, and pension standards.

In this report, the financial position of the Plan has been illustrated under the following two scenarios:

1. Optimal margin, and
2. Maximum margin.

Based on the Board's funding strategy, the Board and management use the funding discount rate not only to determine the funding contributions at each filed valuation, but also to manage unexpected changes in liabilities arising from market volatility. Because contribution increases are shared between employers and active plan members (reflecting the risk shared nature of the Plan), strategic build up and deployment of margin are critical risk management tools. Effectively, margin is increased when the plan's funded status improves and spent when the funded status declines. The effective deployment of margin enables the Board to manage contribution volatility and target stability of contributions for both participating employers and active plan members.

Within this funding valuation report, we have therefore included the key margin metrics which form the range within which the Board can determine funding contributions should market volatility occur. This range defines the acceptable level of contributions under both the *Income Tax Act* and the *Public Sector Pension Plans Act*.

## Going Concern Financial Position

The results of the current valuation on both a Maximum Margin and Optimal Margin basis, compared with those from the previous valuation, are summarized as follows:

(\$000,000's)	December 31, 2017 Maximum Margin	December 31, 2017 Optimal Margin	December 31, 2016 Optimal Margin
<b>Assets</b>			
Market value of assets	\$42,728.5	\$42,728.5	\$37,722.9
Asset smoothing adjustment	(1,690.1)	(1,690.1)	(1,159.2)
Present value of prior service payments	8.9	8.9	16.5
<b>Actuarial Value of Assets</b>	<b>\$41,047.3</b>	<b>\$41,047.3</b>	<b>\$36,580.2</b>
<b>Going Concern Liabilities</b>			
Active members	\$34,148.2	\$21,458.0	\$22,150.1
Pensioners and survivors	21,004.5	16,041.8	15,002.1
Deferred pensioners and hold-on deposits	2,745.4	1,771.0	1,687.3
<b>Total Liabilities</b>	<b>\$57,938.1</b>	<b>\$39,270.8</b>	<b>\$38,839.5</b>
<b>Actuarial Excess/(Unfunded Liability)</b>	<b>\$(16,890.8)</b>	<b>\$1,776.5</b>	<b>\$(2,259.3)</b>
<b>Going Concern Funded Ratio</b>	<b>70.8%</b>	<b>104.5%</b>	<b>94.2%</b>

On the basis of the plan provisions, membership data, going concern assumptions and methods and asset information described in the Appendices, the going concern normal cost of the Plan as at December 31, 2017 is shown in the following table. The normal cost as at December 31, 2016 is also shown for comparison purposes.

## Going Concern Normal Cost

(\$000,000's)	2018 Maximum Margin	2018 Optimal Margin	2017 Optimal Margin
<b>Normal Cost</b>			
Actuarial present value of benefits	\$ 3,048.7	\$ 1,819.1	\$ 1,880.2
Provision for expenses	39.1	39.1	39.5
<b>Total Normal Cost</b>	<b>\$ 3,087.7</b>	<b>\$ 1,858.2</b>	<b>\$ 1,919.7</b>
Estimated pensionable earnings (in year following valuation date)	\$ 11,077.2	\$ 10,945.0	\$ 10,937.5
<b>Total Normal Cost</b>			
<b>As a % of total pensionable earnings</b>	<b>27.88%</b>	<b>16.98%</b>	<b>17.55%</b>

## Change in Financial Position

The Plan's financial position as at December 31, 2017, an actuarial excess of \$1,776.5 million on the optimal margin basis, is reconciled with its previous position, an unfunded liability of \$2,259.3 million, as follows:

### Reconciliation of the Going Concern Financial Position For the Period from December 31, 2016 to December 31, 2017 (\$000,000's)

<b>Actuarial Excess/(Unfunded Liability) as at December 31, 2016</b>	<b>\$ (2,259.3)</b>
Expected interest on actuarial excess/(unfunded liability)	(119.7)
Change due to reconciliation of difference with prior actuary	322.9
Special payments in inter-valuation period with interest	715.1
<b>Expected Actuarial Excess/(Unfunded Liability) as at December 31, 2017</b>	<b>\$ (1,341.0)</b>
Change in financial position due to experience gains/(losses)	
Gain/(loss) from investment earnings greater/(lower) than expected	1,346.3
Gain/(loss) due to salary increases lower/(greater) than expected	184.9
Gain/(loss) due to COLA increases lower/(greater) than expected	67.8
Gain/(loss) due to YMPE greater/(lower) than expected	(46.9)
Gain/(loss) due to retirement experience	48.3
Gain/(loss) due to termination experience	45.3
Gain/(loss) due to mortality experience	(12.6)
Gain/(loss) due to interest on member contributions lower/(greater) than expected	13.9
Net gain/(loss) due to other experience and miscellaneous items	19.9
<b>Actuarial Excess/(Unfunded Liability) After Experience Gains/(Losses) as at December 31, 2017</b>	<b>\$ 325.9</b>
Change in liabilities due to change in discount rate	736.6
Change in liabilities due to change in pensionable earnings assumption	714.0
Change in liabilities due to plan amendments	0.0
<b>Actuarial Excess/(Unfunded Liability) as at December 31, 2017</b>	<b>\$ 1,776.5</b>

<b>Analysis of Experience During Intervaluation Period</b>	<b>Actual</b>	<b>Expected</b>
Average annual investment income on actuarial value, net of expenses	9.03%	5.30%
Average annual salary increase	2.29%	2.75%
Average annual COLA	0.78%	1.20%
Average annual <i>ITA</i> maximum increase	1.03%	3.00%
<b>Membership experience:</b>		
Terminations	7,822	7,855
Retirements	3,419	5,847
Deaths	154	224

## Discussion of Experience Gains and Losses

### Investment Earnings

The annualized rate of return earned by the pension fund based on the Actuarial Value of Assets (including smoothing) for the valuation period from December 31, 2016 to December 31, 2017 was 9.03% per year. The assumed rate of return for going concern valuation purposes was 5.30% per year in the 2016 valuation. An actual rate of return greater than the assumed rate resulted in a net actuarial gain of \$1,346.3 million.

### Salary and YMPE Experience

The annualized average salary rate paid to members of the Plan for the valuation period from December 31, 2016 to December 31, 2017 was 2.29% per year. The assumed salary rate for going concern valuation purposes was 2.75% per year, which consists of the base salary increase rate and the salary increase due to merit and promotion. An actual salary rate paid to members of the Plan lower than the assumed rate resulted in a net actuarial gain of \$184.9 million. Offsetting this gain was a lower increase in the YMPE than assumed, resulting in a loss \$46.9 million.

### COLA Experience

The COLA increase during 2017 was 0.78%, which was lower than the assumed rate of 1.20%. This lower than expected COLA increase resulted in a gain of \$67.8 million.

### Retirement, Termination and Mortality Experience

The aggregate experience for retirements, terminations and mortality was favourable and produced a net gain of \$81.0 million over the inter-valuation period.

## Discussion of Changes in Assumptions

Effective December 31, 2017, the following assumptions were changed:

### Economic Assumptions

- Based on short term salary settlement information provided, the base salary increase rate was changed to 0.00% in 2018 and 2019 and 3.00% per year thereafter from 2.00% in 2017, 2018 and 2019 and 3.00% per year thereafter.
- Based on changes in forward looking return expectations, the discount rate was changed to 5.40% per year from 5.30% per year.

In combination, these changes in assumptions decreased the going concern liabilities by \$1,450.6 million and the total normal cost by \$124.7 million.

### Demographic Assumptions

There were no change in demographic assumptions from December 31, 2016 to December 31, 2017.

## Reconciliation of the Current Service Cost

The annual going concern cost of benefits in respect of service accruing after the valuation date is known as the current service cost. The table below identifies the main components of the change in the current service rate from the prior valuation to this valuation.

### Reconciliation of the Current Service Cost (as a % of total pensionable earnings)

<b>Current Service Cost as at December 31, 2016</b>	<b>17.55%</b>
Change due to reconciliation of difference with prior actuary	0.12%
Demographic changes	0.10%
Actuarial assumption changes	(0.79)%
<b>Current Service Cost as at December 31, 2017</b>	<b>16.98%</b>

## Going Concern Valuation Sensitivity Results

In accordance with the Canadian Institute of Actuaries Standards of Practice specific to pension plans that became effective December 31, 2010, the table below presents the sensitivity of the going concern liabilities and the total normal cost, reflecting optimal margin, of using a discount rate 1% lower than that used for the going concern valuation. Note that we have also changed the interest rate used to determine commuted values upon termination of employment in the analysis below.

(\$000,000's)	Valuation Basis		Based on Rate of		Effect	
	December 31, 2017		1% Lower		\$	%
Going concern liabilities	\$	39,270.8	\$	46,339.1	\$	7,068.3 18.0%
Normal cost	\$	1,819.1	\$	2,329.0	\$	509.9 28.0%

Note that using a discount rate 1% higher than that assumed would result in a comparable reduction in the Plan's going concern liabilities and normal cost.

## Section 3: Solvency Valuation Results

### Solvency Financial Position of the Plan

The solvency valuation is a financial assessment of the Plan that is required by the *Act* and is performed in accordance with requirements prescribed by that legislation. It is intended to provide an assessment of the Plan's financial position at the valuation date on the premise that certain obligations as prescribed by the *Act* are settled on the valuation date for all members. The *Act* does not require funding based on the solvency valuation results.

On the basis of the plan provisions, membership data, solvency assumptions and methods and asset information described in the Appendices, as well as the requirements of the *Act*, the solvency financial position of the Plan as at December 31, 2017 is shown in the following table. The solvency financial position of the Plan as at December 31, 2016 is shown for comparison purposes.

### Solvency Financial Position

	December 31, 2017	December 31, 2016
<b>Assets</b>		
Market value of assets	\$ 42,728.8	\$ 37,722.9
Present value of prior service payments	8.9	16.5
Estimated wind up expenses	(65.0)	(65.0)
<b>Total Assets</b>	<b>\$ 42,672.4</b>	<b>\$ 37,674.4</b>
<b>Solvency Liabilities</b>		
Active members	\$ 30,764.0	\$ 30,080.9
Pensioners and survivors	22,300.5	20,573.2
Deferred pensioners and hold-on-deposits	2,648.5	2,528.7
<b>Total Liabilities</b>	<b>\$ 55,713.0</b>	<b>\$ 53,182.8</b>
<b>Solvency Excess/(Deficiency)</b>	<b>\$ (13,040.6)</b>	<b>\$ (15,508.4)</b>
Solvency ratio	76.6%	70.8%

## Solvency Valuation Sensitivity Results

In accordance with the Canadian Institute of Actuaries Standards of Practice specific to pension plans that became effective December 31, 2010, the table below presents the sensitivity of the solvency liabilities to using a discount rate of 1% lower than that used for the solvency valuation.

(\$000,000's)	Valuation Basis December 31, 2017	Based on Rate of 1% Lower	Effect	
			\$	%
Solvency liabilities	\$55,713.0	\$ 65,619.3	\$ 9,906.3	17.8%

Note that using a discount rate 1% higher than that assumed would result in a comparable reduction in the solvency liabilities.

## Incremental Cost on a Solvency Basis

The incremental cost on a solvency basis represents the present value at December 31, 2017 of the expected aggregate change in the solvency liabilities between December 31, 2017 and the next calculation date, that is December 31, 2020. Appendix E gives more details on the calculation methodology and on assumptions.

Based on this methodology and on these assumptions, the incremental cost on a solvency basis, for the period from December 31, 2017 to December 31, 2020, is \$9,256.7 million.

	2018	2019	2020
Incremental cost on a solvency basis	\$ 3,007.9	\$ 3,034.0	\$ 3,214.8

## Section 4: Contribution Requirements

### Contribution Requirements in Respect of the Normal Cost

The annual going concern cost of benefits in respect of service accruing after the valuation date is known as the normal cost. The following table outlines the range of normal cost determined according to the Board's funding strategy.

(\$000,000's)		2018 Maximum Margin		2018 Optimal Margin
<b>Normal Cost</b>				
Actuarial present value of benefits	\$	3,048.7	\$	1,819.1
Provision for expenses		39.1		39.1
<b>Total Normal Cost</b>	<b>\$</b>	<b>3,087.8</b>	<b>\$</b>	<b>1,858.2</b>
Estimated pensionable earnings (in year following valuation date)	\$	11,077.2	\$	10,945.0
<b>Total Normal Cost</b>				
<b>As a % of total pensionable earnings</b>		<b>27.88%</b>		<b>16.98%</b>

## Development of Special Payments

On the optimal margin basis, since the Plan is in a actuarial excess position all existing special payments schedules would be eliminated and no new special payments would be required. This represents the minimum special payments at one end of the funding strategy range.

The following table summarizes the amortization schedules of special payments reflecting the maximum margin discount rate. This represents the maximum special payments at the other end of the funding strategy range.

Valuation Date	Effective Date	End Date	Maximum Margin Annual Special Payment as % of Pensionable Earnings	Present Value as of December 31, 2017
On or prior to Dec. 31, 2010	Jan. 1, 2018	Dec. 31, 2018	3.59%	396.5
Dec. 31, 2010	Jan. 1, 2018	Dec. 31, 2025	0.27%	200.5
Dec. 31, 2011	Jan. 1, 2014	Dec. 31, 2026	0.44%	358.9
Dec. 31, 2013	Jan. 1, 2016	Dec. 31, 2028	0.31%	294.8
Dec. 31, 2016	Jan. 1, 2019	Dec. 31, 2031	0.21%	225.4
Dec. 31, 2017	Jan. 1, 2018	Dec. 31, 2032	11.14%	15,414.6
<b>Total</b>				<b>\$ 16,890.8</b>
Total Maximum – 2018			15.75%	
Total Maximum – 2019 to 2025			12.37%	
Total Maximum – 2026			12.10%	
Total Maximum – 2027 to 2028			11.66%	
Total Maximum – 2029 to 2031			11.35%	
Total Maximum – 2032			11.14%	

In accordance with the *Public Sector Pension Plans Act*, the Plan is not subject to the solvency funding requirements of the *Alberta Employment Pension Plans Act*.

## Excess Surplus

The *Income Tax Act* requires that any excess surplus (as defined in the *Income Tax Act*) first be applied to reduce or eliminate the employer contribution requirements. Excess surplus is defined in Section 147.2(2)(d) of the *Income Tax Act*, as the portion of surplus (if any) that exceeds 25% of the going concern liabilities.

Since there is a deficit of \$16,890.8 million on a maximum margin basis, there is no excess surplus and therefore it does not impact the development of the Plan contribution requirements.

## Total Contributions

Under the *Income Tax Act*, the total contribution must be no more than (i) the total normal cost, plus (ii) where an unfunded actuarial liability exists, the amount of the unfunded actuarial liability, less (iii) any excess surplus.

The following table outlines the range of funding contributions that would be permitted under the *Income Tax Act* and *Public Sector Pension Plans Act* based on the valuation at December 31, 2017.

	Minimum Required	Maximum Permitted
Total normal cost	16.98%	27.88%
Special payments towards unfunded liabilities	0.00%	11.14-15.75%
Amortization of funding excess	0.00%	0.00%
Total contribution requirement	16.98%	39.02%-43.63%

The minimum contributions reflect the funding requirements based on the optimal margin funding assumptions. The maximum contributions pursuant to the *Income Tax Act* reflect the maximum margin funding assumptions.

The board must select a contribution rate for the period until the next actuarial valuation that falls between the minimum and maximum contribution permitted in accordance with the Board's funding strategy.

The Board has elected to maintain the contribution rate of 22.16% for the calendar year 2018 and has elected a contribution rate of 20.16% for the calendar years 2019 and 2020 subject to the December 31, 2018 valuation. These contribution rates meet the requirements of the *Public Sector Pension Plans Act* and are below the maximum permitted under the *Income Tax Act*. Consequently, unless another actuarial valuation is filed in the future with an earlier application date, the following contribution rates will be in effect for the calendar years 2018 through to 2020<sup>1</sup>.

<sup>1</sup> The applications of the total normal cost and the unfunded liability on pensionable earnings below and above the YMPE have been updated to reflect the results of the actuarial funding valuation as at December 31, 2017.

**Employee Contributions – As a % of Pensionable Salary**

	2018		2019		2020	
	Up to YMPE	Above YMPE	Up to YMPE	Above YMPE	Up to YMPE	Above YMPE
Total normal cost	7.02%	10.35%	7.02%	10.35%	7.02%	10.35%
Unfunded liability	2.37%	3.49%	1.37%	2.49%	1.37%	2.49%
Total contribution	9.39%	13.84%	8.39%	12.84%	8.39%	12.84%
Aggregate	10.58%		9.58%		9.58%	

**Employer Contributions – As a % of Pensionable Salary**

	2018		2019		2020	
	Up to YMPE	Above YMPE	Up to YMPE	Above YMPE	Up to YMPE	Above YMPE
Total normal cost	8.02%	11.35%	8.02%	11.35%	8.02%	11.35%
Unfunded liability	2.37%	3.49%	1.37%	2.49%	1.37%	2.49%
Total contribution	10.39%	14.84%	9.39%	13.84%	9.39%	13.84%
Aggregate	11.58%		10.58%		10.58%	

**Total Contributions – As a % of Pensionable Salary**

	2018		2019		2020	
	Up to YMPE	Above YMPE	Up to YMPE	Above YMPE	Up to YMPE	Above YMPE
Total normal cost	15.04%	21.70%	15.04%	21.70%	15.04%	21.70%
Unfunded liability	4.74%	6.98%	2.74%	4.98%	2.74%	4.98%
Total contribution	19.78%	28.68%	17.78%	26.68%	17.78%	26.68%
Aggregate	22.16%		20.16%		20.16%	

## Section 5: Actuarial Certificate

### Actuarial Opinion, Advice and Certification for the Local Authorities Pension Plan

#### Opinion

This actuarial certification forms an integral part of the actuarial valuation report for the Plan as at December 31, 2017. We confirm that we have prepared an actuarial valuation of the Plan as at December 31, 2017 for the purposes outlined in the Introduction section to this report and consequently:

#### **Our advice on funding is the following:**

- Contributions in the amounts within the range of minimum and maximum contribution amounts as outlined in Section 4 of this report should be made to the Plan, in accordance with legislative requirements.
- The next actuarial valuation for the purpose of developing funding requirements should be performed no later than as at December 31, 2020.

#### **We hereby certify that, in our opinion:**

- With respect to the purposes of determining the Plan's financial position on a going concern basis as at December 31, 2017:
  - The Plan has a going concern actuarial excess of \$1,776.5 million on the optimal margin basis as at December 31, 2017, based on going concern assets of \$41,047.3 million less going concern liabilities of \$39,270.8 million.
  - The Plan has a going concern unfunded liability of \$16,890.8 million on the maximum margin basis as at December 31, 2017, based on going concern assets of \$41,047.3 million less going concern liabilities of \$57,938.1 million.
  - There is no excess surplus as defined by Section 147.2(2) of the *Income Tax Act* in the Plan at December 31, 2017.
  - The going concern funded ratio is 1.045 on the optimal margin basis and 0.708 on the maximum margin basis as at December 31, 2017.
- With respect to the purpose of determining the Plan's financial position on a solvency basis:
  - The Plan has a solvency deficiency of \$13,040.6 million as at December 31, 2017, determined as solvency assets net of estimated windup expenses of \$42,672.4 million less solvency liabilities of \$55,713.0 million.
  - The solvency ratio is 0.766 as at December 31, 2017.
  - The Plan's liabilities would exceed the Plan's assets, net of estimated wind up expenses, by \$13,040.6 million if the Plan was terminated and wound up as at December 31, 2017.

- With respect to determining the funding requirements of the Plan:
  - The total normal cost for the 12 months following the valuation date is between 16.98% and 27.88% of pensionable earnings.
  - The estimated total contribution for the 3 years following the valuation date are as follows:

<b>Total Contributions – As a % of Pensionable Salary</b>						
	<b>2018</b>		<b>2019</b>		<b>2020</b>	
	<b>Up to YMPE</b>	<b>Above YMPE</b>	<b>Up to YMPE</b>	<b>Above YMPE</b>	<b>Up to YMPE</b>	<b>Above YMPE</b>
Total normal cost	15.04%	21.70%	15.04%	21.70%	15.04%	21.70%
Unfunded liability	4.74%	6.98%	2.74%	4.98%	2.74%	4.98%
Total contribution	19.78%	28.68%	17.78%	26.68%	17.78%	26.68%
Aggregate	22.16%		20.16%		20.16%	

- The contributions as outlined in this report are expected to be sufficient to satisfy the Plan's funding requirements.
- The contributions as outlined in this report qualify as eligible contributions under Section 147.2(2) of the *Income Tax Act*.
- For the purposes of the valuation:
  - The data on which this valuation is based are sufficient and reliable;
  - The assumptions used are appropriate; and
  - The actuarial cost methods and the asset valuation methods used are appropriate.
- This report and its associated work have been prepared, and our opinion given, in accordance with accepted actuarial practice in Canada and in compliance with the requirements outlined in subparagraphs 147.2(2)(a)(iii) and (iv) of the *Income Tax Act*.
- Notwithstanding the above certifications, emerging experience differing from the assumptions will result in gains or losses that will be revealed in subsequent valuations.

ORIGINAL SIGNED BY \_\_\_\_\_  
 Brenda Pryske, FCIA, FSA  
 Partner

ORIGINAL SIGNED BY \_\_\_\_\_  
 Sajad Abdulla, FCIA, FSA  
 Associate Partner

Suite 1800, 600 – 3rd Avenue SW  
 Calgary, Alberta T2P 0G5  
 September 20, 2018

## Appendix A: Glossary of Terms

- The **actuarial excess/(unfunded liability)** is the difference between the actuarial value of assets and the going concern liabilities.
- The **actuarial value of assets** is the asset value used for going concern valuation purposes. Smoothing methods are sometimes used to smooth investment gains and losses over a certain period.
- The **estimated wind up expenses** is an estimate of the administrative and other expenses expected to be charged against the pension fund if the Plan were to terminate on the valuation date.
- The **going concern funded ratio** compares the actuarial value of assets to the going concern liabilities.
- The **going concern liabilities** are the actuarial present value of benefits earned in respect of service prior to the valuation date. The going concern liabilities are calculated using the going concern assumptions and methods summarized in Appendix D of this report.
- The **going concern position** is the difference between the actuarial value of assets and the going concern liabilities.
- The **maximum deductible contribution** refers to an eligible contribution pursuant to Section 147.2(2) of the *Income Tax Act*. Under Subsection 8502(b) of the Regulations to the *Income Tax Act*, each contribution made after 1991 in respect of a defined benefit provision of a registered pension plan must be such eligible contribution.

In a fiscal year, the following contributions are eligible under Section 147.2 of the *Income Tax Act*.

- The normal cost, eligible under Section 147.2(2) subject to certification by the actuary and approval by the Canada Revenue Agency; plus
- Special payments eligible under Section 147.2(2) up to the amount of the unfunded liability or the solvency deficiency, whichever is greater, subject to certification by the actuary and approval by the Canada Revenue Agency; less
- Required application of excess surplus.

The normal cost and special payments for this Plan will be deductible under Section 147.2(2) of the *Income Tax Act*, subject to the approval of the Canada Revenue Agency.

Note that contributions to a Plan are still permissible and deductible if there is an excess surplus, providing there is simultaneously a solvency deficiency in the Plan or the contributions are required as minimum contributions under provincial legislation, pursuant to Subsections 8516(2) and (3) of the Regulations to the *Income Tax Act*.

One restriction under the *Income Tax Act* is that if there is an excess surplus, and a solvency deficiency, the maximum deductible contribution is restricted to the full amount of the deficiency without allowance for interest or any other contributions such as normal cost and/or transfer deficiency payments.

- In order to be deductible in a given fiscal year, contributions must be made not later than 120 days after the end of the fiscal year.

- The **minimum required contribution** for each plan year is equal to:
  - The normal cost; plus
  - Special payments toward amortizing any unfunded liability over 15 years from the date on which the unfunded liability was established; less
  - Required application of excess surplus; less
  - Permitted application of actuarial excess.
- **Solvency assets** are the market value of pension fund assets adjusted to reflect contributions, benefit payments, transfers and fees/expenses in-transit at the valuation date.
- The **solvency liabilities** are the actuarial present value of benefits earned in respect of service prior to the valuation date determined as if the Plan were wound up on the valuation date. The solvency liabilities are determined using benefit entitlements on the assumption that the Plan has neither an actuarial excess nor a deficit. The solvency liabilities are calculated using the solvency valuation assumptions summarized in Appendix E of this report.
- The **solvency position** is the difference between the solvency assets (net of estimated wind up expenses) and the solvency liabilities.
- The **solvency ratio** compares the solvency assets less estimated wind up expenses to the solvency liabilities.
- The **solvency excess/(deficiency)** is the solvency position, increased by the solvency asset adjustment.
- The **special payments** are payments required to liquidate the unfunded liability:
  - The going concern special payments are payments required to liquidate the unfunded liability, with interest at the going concern valuation discount rate, by calculating the required percentage of pensionable earnings that must be contributed over a period of 15 years from the valuation date of the report in order to pay off existing deficits. The special payments commence one year following the valuation date.
- The **total normal cost** is the actuarial present value of benefits expected to be earned in respect of service for each year starting on the valuation date. The total normal cost is calculated using the going concern valuation assumptions and methods summarized in Appendix D of this report.

## Appendix B: Assets

### Asset Data

The Plan assets are held in trust by Alberta Investment Management Corporation on behalf of the Board and Alberta Treasury Board and Finance and are invested in accordance with the Board's written statement of investment policies and goals.

We have relied upon the Plan's financial statements prepared by the Auditor General of Alberta without further audit.

Tests of the sufficiency and reliability of the asset data were performed and the results were satisfactory. The tests included:

- A reconciliation of actual cash flow with expected cash flow from the previous actuarial report; and
- A reconciliation of any anticipated benefit payments in 2017 (for retirees, terminated or deceased employees) against the financial statements of the pension fund for confirmation of payments.

### Market Value of Assets

The following is a summary of the composition of the Plan's assets by asset type as reported by Alberta Treasury Board and Finance as at December 31, 2017. For comparison purposes, the composition at the previous valuation date of December 31, 2016 is also shown.

	December 31, 2017		December 31, 2016	
	\$ (000's)	%	\$ (000's)	%
Deposits and short-term securities	275,619	0.6%	470,535	1.2%
Bonds, mortgages and private debt	13,629,355	31.9%	10,580,889	28.1%
<b>Total Fixed Income</b>	<b>13,904,974</b>	<b>32.5%</b>	<b>11,051,424</b>	<b>29.3%</b>
Real estate	5,144,234	12.0%	4,710,660	12.5%
Real return bonds	551,659	1.3%	1,743,228	4.6%
Infrastructure	3,069,267	7.2%	2,320,542	6.2%
Timberland	504,126	1.2%	425,824	1.1%
<b>Total Inflation Sensitive and Alternatives</b>	<b>\$9,269,286</b>	<b>21.7%</b>	<b>9,200,254</b>	<b>24.4%</b>
Canadian equities	3,668,203	8.6%	4,193,071	11.1%
Global developed equities	9,897,644	23.2%	9,294,903	24.6%
Emerging market equities	2,457,151	5.8%	1,297,110	3.4%
Small cap equity	2,135,009	5.0%	1,270,489	3.4%
Private equities	1,087,897	2.5%	1,088,988	2.9%
<b>Total equities</b>	<b>19,245,904</b>	<b>45.1%</b>	<b>17,144,561</b>	<b>45.4%</b>
<b>Strategic, tactical and currency investments</b>	<b>298,926</b>	<b>0.7%</b>	<b>303,706</b>	<b>0.8%</b>
<b>Accrued interest, accounts receivable and payable</b>	<b>9,425</b>	<b>0.0%</b>	<b>22,998</b>	<b>0.1%</b>
<b>Total Invested Assets</b>	<b>\$42,728,515</b>	<b>100.0%</b>	<b>\$37,722,943</b>	<b>100.0%</b>

## Target Asset Mix

The target asset mix of the Plan is contained in the Plan's Statement of Investment Policies and Procedures and is as follows:

	Minimum	Target	Maximum
<b>Fixed Income</b>	<b>20.0%</b>	<b>30.5%</b>	<b>40.0%</b>
Short term and cash	0.0%	0.5%	10.0%
Long bonds	5.0%	15.0%	25.0%
Universe bonds	5.0%	15.0%	25.0%
Mortgages	0.0%	0.0%	10.0%
Private debt & loan	0.0%	0.0%	6.0%
<b>Inflation sensitive/alternatives</b>	<b>20.0%</b>	<b>30.0%</b>	<b>50.0%</b>
Real estate	10.0%	15.0%	25.0%
Real return bonds	0.0%	0.0%	10.0%
Infrastructure	5.0%	15.0%	25.0%
Timberland	0.0%	0.0%	3.0%
<b>Equities</b>	<b>25.0%</b>	<b>39.5%</b>	<b>50.0%</b>
Canadian equity	5.0%	8.0%	20.0%
Global developed equity	10.0%	15.0%	40.0%
Emerging market equity	0.0%	5.5%	10.0%
Small cap equity	0.0%	5.0%	10.0%
Private equity	3.0%	6.0%	9.0%
		<b>100.0%</b>	

## Reconciliation of Changes in Market Value of Assets

The table below reconciles changes in the market value of assets between December 31, 2016 and December 31, 2017.

(\$000,000's)	2017	
<b>Market Value of Assets, Beginning of Plan Year</b>	<b>\$</b>	<b>37,722.9</b>
<b>Contributions During Plan Year</b>		
Member contributions	\$	1,258.3
Employer contributions		1,365.0
Reciprocal transfer and prior service payments		40.7
<b>Total</b>	<b>\$</b>	<b>2,664.0</b>
<b>Benefit Payments During Plan Year</b>		
Periodic payments	\$	1,181.3
Lump sum payments		321.6
Reciprocal transfer out		7.6
<b>Total</b>	<b>\$</b>	<b>1,510.5</b>
<b>Fees/Expenses</b>		
Administrative expenses	\$	39.1
Investment expenses		233.4
<b>Total</b>	<b>\$</b>	<b>272.4</b>
<b>Investment Income</b>	<b>\$</b>	<b>4,124.5</b>
<b>Market Value of Assets, End of Plan Year</b>	<b>\$</b>	<b>42,728.5</b>
Present value of prior service payments (PVPSP)		8.9
<b>Market Value of Assets, End of Plan Year including PVPSP</b>	<b>\$</b>	<b>42,736.4</b>

## Development of Actuarial Value of Assets

Under the asset smoothing method used in the prior valuation, all investment returns different than the expected best estimate are smoothed over a five year period. The smoothed value of assets as at December 31, 2017 is thus the average of:

- the market value of assets as at the December 31, 2017;
- the market value of assets as at December 31, 2016 rolled forward to December 31, 2017;
- the market value of assets as at December 31, 2015 rolled forward to December 31, 2017;
- the market value of assets as at December 31, 2014 rolled forward to December 31, 2017; and
- the market value of assets as at December 31, 2013 rolled forward to December 31, 2017.

The roll forwards for historical market values are based on the actual benefit payments and contributions to the Plan and an assumed rate of return of 6.7% in 2014, 6.3% in 2015, 6.0% in 2016 and 6.3% in 2017. These assumed rates of return are the assumed investment returns, net of expenses, with no margin for adverse deviation associated with the actuarial valuation reports for funding purposes for the periods for which the market value of assets is projected.

Note that in order to ensure that the smoothed value does not deviate unduly from the market value, an upper limit of 110% of the of the market value and a lower limit of 90% of the market value is placed on the smoothed value. The smoothed asset value is then adjusted to reflect outstanding prior service payments to yield the actuarial value of assets.

The smoothed value of assets as at December 31, 2017 is derived as follows (figures in \$ millions below):

	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Market Value at 12/31/2013	26,560.6				
Net Cash Flow in 2014	1,167.6				
Assumed interest (6.7%)	1,818.7				
Market Value at 12/31/2014	29,546.9	30,799.0			
Net Cash Flow in 2015	1,154.9	1,154.9			
Assumed interest (6.3%)	1,897.8	1,976.7			
Market Value at 12/31/2015	32,599.6	33,930.6	34,430.3		
Net Cash Flow in 2016	1,241.6	1,241.6	1,241.6		
Assumed interest (6.0%)	1,976.7	2,055.9	2,085.6		
Market Value at 12/31/2016	35,817.9	37,228.1	37,757.5	37,739.4	
Net Cash Flow in 2017	1,114.4	1,114.4	1,114.4	1,114.4	
Assumed interest (6.3%)	2,291.6	2,380.5	2,413.8	2,412.7	
Market Value at 12/31/2017	39,224.0	40,723.0	41,285.8	41,266.5	42,737.4

<b>Average of the five adjusted market values at 12/31/2017</b>	41,047.3
90% of market value at 12/31/2017	38,463.7
110% of market value at 12/31/2017	47,011.2
<b>Smoothed value of assets at 12/31/2017</b>	41,047.3
<b>Impact of asset smoothing</b>	(1,690.1)

## Appendix C: Membership Data

### Source of Data

This funding valuation was based on member data provided by APS as of December 31, 2017. Tests of the sufficiency and reliability of the member data were performed and the results were satisfactory. The tests included:

- A reconciliation of membership status against the membership status at the last valuation. This test was performed to ensure that all members were accounted for. A summary of this reconciliation follows on the next page;
- A reconciliation of birth, hire, and participation dates against the corresponding dates provided for the last valuation to ensure consistency of data;
- A reconciliation of credited service against the corresponding amount provided for the last valuation to ensure that no member accrued more than one year of credited service from December 31, 2016, notwithstanding increases due to service purchases during the inter-valuation period. This test also revealed any members who had any unexpected changes in service, such as having accrued less than one year of credited service or had no change in credited service;
- A reconciliation of pensionable earnings against the corresponding amounts provided for the last valuation to identify any unusual increases or decreases (more than 15% per year);
- A reconciliation of any stated benefit payments in 2017 (for retired, terminated or deceased employees) against the financial statements of the pension fund for confirmation of the payments; and
- A reconciliation of inactive member benefit amounts against the corresponding amounts provided for the last valuation to ensure consistency of data.

The following information was missing, and assumptions were made as follows with respect to such missing data:

- Annualization of pensionable salary: Data provided by APS included actual salary and service in 2017. For those members with small service (less than 0.2 years in 2017), annualized salary was set to last year's annualized salary increased by 2.00% plus merit and promotion. For those with small service and no prior salary information, annualized salary was set to \$78,285.
- Missing salary: for those members missing salary information in 2017, annualized salary was set to last year's annualized salary increased by 2.00% plus merit and promotion. For members with no prior salary information, annualized salary was set to \$78,285.
- Missing service: for those members missing all service information in the data, service was set to last year's plus the service ratio set out last year.
- Service ratios for part-timers: service ratios are provided by APS. For those members missing service ratio information, service ratios are set equal to 2017 in-year service, subject to a minimum of 0.4, for all members who were active as at January 1, 2017. Service ratios were set to a minimum of 90% for new entrants.
- 2018 pensionable salary: we have assumed that the 2018 pensionable salary to be used as a divisor for the normal cost percentage will equal the expected pay at the middle of 2018 (2017 pay increased by 0.00% plus merit and promotion plus  $\frac{1}{2}$  year interest at the appropriate discount rate).

- A copy of the administrator certification certifying the accuracy and completeness of the member data (and the plan provisions summarized in this report) is included in Appendix G of this report

## Payments Due

In this report, a contribution receivable is held for payments due on buybacks. These amounts represent contributions to be made by Plan participants after the valuation date to buy back certain periods of service. The valuation includes the effect of these buybacks in the assets as well as the liabilities for service being purchased. Per the valuation data received from APS, the amount of payments due for buyback service as at December 31, 2017 was \$8.9 million. As at December 31, 2016, this amount was \$16.5 million. For the purpose of the balance sheet presentation, these amounts appear as additions to the total assets.

## Membership Summary

The table below reconciles the number of members as of December 31, 2017 with the number of members as of December 31, 2016 and the changes due to experience in the period.

	<b>Actives</b>	<b>Deferreds &amp; HODs</b>	<b>Pensioners &amp; Survivors</b>	<b>Total</b>
<b>Members, December 31, 2016</b>	<b>157,319</b>	<b>34,402</b>	<b>61,891</b>	<b>253,612</b>
Adjustments	(153)	(5)	12	(146)
New entrants	12,145	0	0	12,145
Return to active	1,060	(1,060)	0	0
<b>Terminations</b>				
Transfer/refunds	(1,868)	(2,648)	0	(4,516)
Deferred pensions	(5,954)	5,954	0	0
Death/guarantee expired	(154)	(93)	(1,474)	(1,721)
Retirement	(3,419)	(679)	4,098	0
Beneficiaries	0	0	600	600
Net change	1,657	1,469	3,236	6,362
<b>Members, December 31, 2017</b>	<b>158,976</b>	<b>35,871</b>	<b>65,127</b>	<b>259,974</b>

## Active Members

	December 31, 2017	December 31, 2016
Number	158,976	157,319
Average annualized pensionable earnings: following year	\$77,543 <sup>1</sup>	\$78,285
Average years of pensionable service	9.0 years	8.9 years
Average age	45.6 years	45.4 years
Average employee contributions	\$56,990	\$54,568

## Deferred Pensioners

	December 31, 2017	December 31, 2016
Number	23,270	22,206
Average annual deferred pension at normal retirement, with COLA to January 1 of following year	\$6,894	\$6,756
Average age	48.1 years	48.0 years

## Hold-on-Deposits

	December 31, 2017	December 31, 2016
Number	12,601	12,196
Average contributions with interest	\$3,749	\$3,656
Average age	46.8 years	46.4 years

## Pensioners and Survivors

	December 31, 2017	December 31, 2016
Number	65,127	61,891
Average annual pension	\$18,051	\$17,422
Average age	71.6 years	71.4 years

<sup>1</sup> The overall average salary limited to pensionable salary and excluding those members with 35 or more years of service (i.e. average contributory earnings) is \$76,304.

## Active Membership Distribution

The following table provides a detailed summary of the active membership at the valuation date by years of credited service and by age group. Average salary has not been limited to pensionable salary.

Age		< 5	5–10	10–15	15–20	20–25	25–30	30–35	>=35	Total
< 25	Count	2,611	19	0	0	0	0	0	0	2,630
	Average Earnings	\$61,937	\$68,937	\$N/A	\$N/A	\$N/A	\$N/A	\$N/A	\$N/A	\$61,988
25–30	Count	11,053	1,617	11	0	0	0	0	0	12,681
	Average Earnings	\$71,272	\$77,859	\$80,282	\$N/A	\$N/A	\$N/A	\$N/A	\$N/A	\$72,119
30–35	Count	11,783	6,781	805	6	0	0	0	0	19,375
	Average Earnings	\$74,190	\$85,754	\$91,509	\$84,774	\$N/A	\$N/A	\$N/A	\$N/A	\$78,960
35–40	Count	9,543	7,509	3,082	327	0	0	0	0	20,461
	Average Earnings	\$71,278	\$86,828	\$94,621	\$96,698	\$N/A	\$N/A	\$N/A	\$N/A	\$80,907
40–45	Count	8,189	6,736	4,015	1,489	106	1	0	0	20,536
	Average Earnings	\$67,604	\$82,157	\$93,702	\$99,497	\$*	\$*	\$N/A	\$N/A	\$79,940
45–50	Count	6,825	6,530	4,423	2,516	797	308	2	0	21,401
	Average Earnings	\$66,997	\$76,057	\$87,695	\$95,232	\$99,599	\$*	\$79,730	\$N/A	\$78,967
50–55	Count	5,227	5,918	4,507	3,121	1,743	1,753	527	60	22,856
	Average Earnings	\$66,789	\$72,358	\$79,594	\$86,749	\$94,868	\$96,751	\$91,721	\$85,002	\$78,544
55–60	Count	3,795	4,928	4,346	3,286	1,802	1,866	1,112	638	21,773
	Average Earnings	\$67,457	\$69,927	\$74,451	\$77,919	\$84,740	\$91,294	\$92,526	\$87,268	\$76,325
60–65	Count	1,789	2,802	2,679	2,374	1,396	1,196	750	693	13,676
	Average Earnings	\$66,822	\$69,959	\$71,446	\$75,782	\$77,744	\$83,550	\$85,683	\$85,717	\$74,494
>=65	Count	419	764	716	571	310	315	215	274	3,587
	Average Earnings	\$65,373	\$66,769	\$71,065	\$70,791	\$75,428	\$76,218	\$77,926	\$84,339	\$71,697
<b>Total Count</b>		<b>61,234</b>	<b>43,604</b>	<b>24,584</b>	<b>13,690</b>	<b>6,154</b>	<b>5,439</b>	<b>2,606</b>	<b>1,665</b>	<b>158,976</b>
<b>Average Earnings</b>		<b>\$69,680</b>	<b>\$78,676</b>	<b>\$83,585</b>	<b>\$85,245</b>	<b>\$87,669</b>	<b>\$90,650</b>	<b>\$89,179</b>	<b>\$86,058</b>	<b>\$77,543</b>

\* Not shown for confidentiality reasons to comply with privacy legislation.

## Retired/Deferred Vested Membership Distribution

The following table provides a detailed summary of the retired/deferred vested membership at the valuation date by age group.

Age		Pensioners and Survivors	Deferred Pensioners
< 50	Count	118	12,463
	Average annual pension	\$ 9,777	\$ 5,445
50–55	Count	183	3,721
	Average annual pension	\$ 11,244	\$ 8,737
55–60	Count	3,405	3,655
	Average annual pension	\$ 27,259	\$ 8,485
60–65	Count	10,762	2,650
	Average annual pension	\$ 25,045	\$ 8,723
65–70	Count	16,738	557
	Average annual pension	\$ 19,492	\$ 7,291
70–75	Count	13,950	178
	Average annual pension	\$ 16,537	\$ 8,623
75–80	Count	8,944	36
	Average annual pension	\$ 13,523	\$ 7,103
80–85	Count	5,777	7
	Average annual pension	\$ 12,174	\$ 6,363
85–90	Count	3,511	2
	Average annual pension	\$ 11,989	\$ *
90–95	Count	1,388	1
	Average annual pension	\$ 11,537	\$ *
≥95	Count	351	0
	Average annual pension	\$ 10,554	\$ n/a
<b>Total Count</b>		<b>65,127</b>	<b>23,270</b>
<b>Average annual pension</b>		<b>\$ 18,051</b>	<b>\$ 6,894</b>

\* Not shown for confidentiality reasons to comply with privacy legislation.

## Appendix D: Going Concern Assumptions and Methods

### Assumptions and Methods

A member's entitlements under a pension plan are generally funded during the period over which service is accrued by the member. The cost of each member's benefits is allocated in some fashion over the member's service. An actuarial valuation provides an assessment of the extent to which allocations relating to periods prior to a valuation date (often referred to as the actuarial liabilities) are covered by the plan's assets.

The going concern valuation provides an assessment of a pension plan on the premise that the plan continues on into the future indefinitely based on assumptions in respect of future events upon which a plan's benefits are contingent and methods that effectively determine the way in which a plan's costs will be allocated over the members' service. The true cost of a plan, however, will emerge only as experience develops, investment earnings are received, and benefit payments are made.

This appendix summarizes the going concern assumptions and methods that have been used for the going concern valuation of the Plan at the valuation date. The going concern assumptions and methods have been chosen to reflect our understanding of the Plan's funding objectives with due respect to accepted actuarial practice and regulatory constraints. For purposes of this valuation, the going concern methods and assumptions were reviewed and changes as indicated were made.

The actuarial assumptions and methods used in the current and previous valuations are summarized below and described on the following pages.

	December 31, 2017	December 31, 2016
<b>Economic Assumptions</b>		
Discount rate (Optimal Margin)	5.40% per year	5.30% per year
Discount rate (Maximum Margin)	2.90% per year	Not available
Inflation rate	2.00% per year	Same
Increases in pensionable earnings – Base	0.00% for two years and 3.00% per year thereafter	2.00% for three years and 3.00% per year thereafter
Increases in pensionable earnings – Merit and Promotion	Age related table, derived from Plan experience (Table A)	Same
Increases in maximum pension limit	In accordance with <i>Income Tax Act</i> , then 3.00% per year	Same
Interest on member contributions	3.00% per year	Same
Non-investment expenses	\$39.1 million	\$39.5 million
<b>Demographic Assumptions</b>		
Mortality rates	2014 Public Sector Canadian Pensioner Mortality Table with Plan specific adjustments, derived from Plan experience from 2003 to 2012	Same
Mortality improvements	Fully generational using improvement Scale B (CPM-B)	Same
Retirement rates	Variable by age and service, derived from Plan experience from 2003 to 2012 (Table B)	Same
Termination rates	Variable by age and service, derived from Plan experience from 2003 to 2012 (Table C)	Same
Disability rates	None	Same
Proportion married		
Non-retired proportion with pension partner	70%	Same
Non-retired pension partner age differential	Males three years older	Same
Termination option election		
Deferred pension	25%	Same
Lump sum	75%	Same
Lump sum interest rate	1.90% per year for the first 10 years and 2.30% per year thereafter	1.50% per year for the first 10 years and 2.20% per year thereafter

	December 31, 2017	December 31, 2016
Lump sum mortality	2014 Canadian Pensioner Mortality Table with generational improvement using Scale CPM-B	Same
<b>Methods</b>		
Actuarial cost method	Projected accrued benefit	Same
Asset valuation method	Market value smoothed over five years	Same

## Table A – Merit and Promotion Rates

Sample merit and promotion rates are shown in the following table:

Age	Members with less than 85 age-service points
20	3.00%
25	2.50%
30	1.60%
35	1.25%
40	0.90%
45	0.70%
50	0.40%
55	0.15%
60	0.00%

## Table B – Retirement Rates

Age-based retirement rates are shown as rates per 100 lives in the following table:

Age	Members with less than 85 age-service points	Members with 85 age-service points
55	6.0	22.2
56	5.1	14.7
57	5.2	14.9
58	5.6	14.9
59	7.6	17.5
60	10.4	20.9
61	9.5	17.1
62	9.3	17.8
63	10.1	16.6
64	21.0	30.2
65	50.0	50.0
66	50.0	50.0
67	50.0	50.0
68	50.0	50.0
69+	100.0	100.0

## Table C – Termination Rates

Age-based termination rates are shown as rates per 100 lives in the following table:

Age	Males			Females		
	0 – 1 Year of Service	1 – 2 Years of Service	Ultimate	0 – 1 Year of Service	1 – 2 Years of Service	Ultimate
20	27.3	15.0	8.9	31.5	24.2	10.0
21	21.0	13.7	8.9	20.3	22.5	10.0
22	18.9	13.8	8.9	18.4	17.5	10.0
23	15.9	12.6	8.9	18.5	13.3	10.0
24	17.2	11.4	8.9	16.1	13.0	10.0
25	15.8	9.5	8.9	15.8	12.9	10.0
26	14.1	11.8	7.5	15.4	12.5	9.6
27	14.5	11.7	7.3	16.2	12.5	9.2
28	13.8	10.0	6.9	16.0	13.5	9.7
29	12.8	11.1	6.7	16.0	11.9	8.9
30	12.4	10.2	6.5	14.9	12.8	9.5
31	11.2	10.0	5.6	16.4	11.7	8.7
32	12.9	9.3	5.6	14.6	12.7	8.9
33	13.2	9.0	5.5	14.6	12.2	8.0
34	11.4	7.4	5.5	14.0	11.9	7.8
35	14.8	8.5	4.9	13.3	10.2	7.7
36	13.0	10.7	5.5	14.5	10.5	6.7
37	10.4	8.2	4.3	13.9	11.2	6.6
38	12.2	8.8	4.9	12.7	9.0	6.2
39	10.7	9.0	4.6	12.6	9.0	5.7
40	11.8	8.2	4.0	12.5	9.5	4.8
41	10.5	6.8	3.7	11.5	8.0	4.9
42	13.0	9.2	3.7	11.3	8.9	4.7
43	13.6	10.2	3.4	11.2	9.0	4.7
44	11.3	7.5	3.0	11.4	7.3	4.3
45	11.3	6.4	3.5	10.0	7.4	4.0
46	11.8	8.9	3.1	10.6	8.0	3.9
47	10.1	7.5	2.9	10.0	7.8	4.0
48	9.7	8.0	2.9	11.1	7.7	3.8
49	11.4	6.2	2.6	11.3	7.4	3.8
50	13.0	6.1	2.8	11.7	7.6	4.1
51	9.2	7.2	2.8	11.1	8.4	4.0
52	13.0	9.5	2.9	10.5	8.3	3.8
53	8.9	7.2	3.0	11.9	7.4	3.6
54	13.1	6.8	6.3	10.5	8.2	5.2
55	0.0	0.0	0.0	0.0	0.0	0.0

## Justification of Actuarial Assumptions and Methods

### Economic Assumptions

#### Optimal Margin Discount Rate

The optimal margin discount rate is 5.40% per year.

The overall expected return (“best-estimate”) is 6.40% per year. As shown below, this includes the best estimate forward looking return expectations, added value from diversification and additional returns from active management net of investment management expenses.

This overall expected return was developed using best-estimate returns for each major asset class in which the pension fund is invested. The best-estimate discount rate is developed using the forward looking expected returns for each major asset class in which the pension fund is invested, inclusive of the equity risk premium. Historical practice for LAPP has been to select a mid-range or “normal” level of equity risk premium in establishing forward looking return expectations. A Monte Carlo simulation is performed over 30 years where the portfolio returns are projected assuming annual rebalancing. The average of the 30-year geometric return is used to develop an overall best-estimate rate of return for the entire pension fund. Gains from rebalancing and diversification are implicit to this return.

The rate of return has been established based on the Plan’s investment policy and its funding strategy (whether formal or informal) and objectives. There may be some barriers to achieving this return such as inflation higher than expected, asset returns lower than expected, and assets and liabilities that are mismatched. We have derived a going concern discount rate which reflects the Plan’s investment policy combined with a margin for adverse deviation so as to account for the variables mentioned above.

The following chart lays out the adjustments that have been made to the overall expected rate of return in order to arrive at our going concern discount rate assumption:

#### Development of Discount Rate

Weighted average best estimate asset return	5.73%
Rebalancing/diversification effect	0.72%
Investment management expenses	(0.55)%
Additional returns due to active management	0.50%
<b>Total portfolio return prior to margin</b>	<b>6.40%</b>
Optimal Margin for adverse deviations	(1.00)%
<b>Discount Rate, reflecting Optimal Margin</b>	<b>5.40%</b>

#### Maximum Margin Discount Rate

LAPP’s maximum margin / minimum risk portfolio<sup>1</sup> at December 31, 2017 is as follows:

- All Government Long-Term Bonds: 33%
- Universe Bonds 8%
- Real Return Bonds 59%

<sup>1</sup> Developed as part of the most recent asset-liability study

The maximum margin / minimum risk discount rate is developed based on market yields of fixed income investments, net of passive investment management expenses, at the valuation date. It illustrates the cost of the plan if no future equity risk premium is included in the discount rate. At December 31, 2017 the discount rate based on the minimum risk portfolio is 2.90%.

## Inflation Rate

The inflation rate is assumed to be 2.00% per year. The inflation rate assumption is connected to the benefits provided by LAPP by in the form of COLA increases. This reflects our best estimate of future inflation considering current economic and financial market conditions. For the previous valuation, we assumed the rate of inflation to be 2.00% per year.

## Increases in Pensionable Earnings

We have assumed future base rate salary increases will not increase for two years from the valuation date, and then increase at an assumed rate of inflation of 2.00% per year plus an allowance of 1.00% per year for the effect of productivity growth (or 0.00% per year for two years and 3.00% per year thereafter). For the previous valuation, it was assumed that salaries would increase by 2.00% for three years from the valuation date, and then increase at the assumed rate of inflation of 2.00% per year plus an allowance of 1.00% per year for the effect of productivity (or 2.00% per year for three years and 3.00% per year thereafter). The current and previous assumptions of no increase are used to reflect actual anticipated short-term salary experience. The current ultimate assumption was adopted to better reflect historic levels of real wage growth.

In addition to the base rate, we assume rates of increase as a result of individual employee merit and promotion derived from Plan experience for the years 1989 to 1993, and further supplemented with a review performed in 2013 looking at increases from 2003 to 2012. The merit and promotion scale is based on plan experience over the years 2003-2012 and Board inputs. For the previous valuation, the same merit and promotion increase was used.

## Increases in the Maximum Pensionable Earnings Limit

According to the terms of the Plan, in order to comply with the *Income Tax Act*, pensionable earnings for service on and after January 1, 1992 are limited. For 2018 the pensionable earnings limit for post 1991 service is \$163,992 (\$147,222 plus 30% of the 2018 YMPE).

It is assumed that the pensionable earnings limit will increase at 3.00% per year commencing in 2019. This is comprised of an annual increase of 2.00% on account of inflation, plus 1.00% on account of productivity, which is consistent with historical real economic growth. For the previous valuation, we assumed the rate of increase of the limit to be 3.00% per year.

## Increases in YMPE

As the benefits paid to a member from the Plan are dependent on the future YMPE, it is necessary to make an assumption regarding the future increases in the YMPE. The assumed increase in the YMPE is assumed to increase 3.00% per year. This is comprised of an annual increase of 2.00% on account of inflation, plus 1.00% on account of productivity, which is consistent with historical real economic growth. For the previous valuation, we assumed the rate of increase of the limit to be 3.00% per year.

## Expenses

Non-investment expenses expected to be paid from the Plan in the future are assumed to be \$39.1 million which is assumed to be the same as the actual non-investment expenses paid in 2017. In the previous valuation a non-investment expense of \$39.5 million was assumed. This amount is included in the normal cost rate.

## Demographic Assumptions

### Mortality

The mortality rates are based on the CPM Public sector tables (CPM2014Publ), with plan specific multipliers based on an experience study conducted in 2013 reflecting actual plan experience over the years 2003 - 2012. These multipliers are shown in following table:

Age	Male	Female
<55	100%	100%
56 – 64	80%	70%
65 – 74	120%	90%
75 – 84	110%	95%
85+	100%	100%

The mortality table is used in conjunction with generational projection scale CPM-B.

The February 2017 Longevity Index Report for LAPP completed by ClubVita verified that the current assumption is appropriate and the additional complexity of using hundreds of member-specific mortality assumptions is not warranted.

In previous valuation the same mortality assumption is used.

In late 2017, the CIA task force on mortality improvement released a report documenting observed mortality improvements since the 2014 report and proposed higher long-term mortality improvement rates than CMP-B. This new mortality improvement scale, called MI-2017, would generally result in higher life expectancies than CPM-B.

The impact of adopting MI-2017 as a mortality projection scale was reviewed as part of this valuation. It is important to point out that mortality improvements cannot be predicted with certainty. Improvement scales are based on past experience with tapering of improvements over time and are driven by factors that are difficult to predict.

### Retirement

Retirement rates are used to estimate when members will commence receipt of their pension from LAPP. Retirement rates are typically developed taking into account the past experience of the Plan. Accordingly, the rates of retirement have been developed based on Plan experience from 2003 to 2012 and are considered best-estimate rates of retirement based on the plan provisions.

This assumption is the same as the rates that were used in the previous valuation.

## Termination of Employment

A member's benefit entitlement under the Plan is affected by whether the member terminates employment prior to retirement for reasons other than death. In order to account for this in the calculation of the actuarial liability, an assumption regarding the probability that a member will terminate employment for reasons other than death has been made.

The termination rates were developed based on a prior review of Plan experience from 2002 to 2013. The termination rates are based on age and service for a 2-year select period and based on age only thereafter as low service employees continue to demonstrate higher termination rates than their higher service counterparts. Note that the termination rates are also sex distinct, as males and females have historically exhibited different termination behavior.

This assumption is the same as the rates that were used in the previous valuation.

## Option Elections on Termination

As the Plan's termination benefit is different for participants electing a cash transfer, an assumption is required. We have assumed that 25% of members will elect a deferred annuity, and 75% will elect a commuted value transfer or cash on termination. This assumption is unchanged from the previous valuation.

In recognition of the lower prevailing discount rates and to determine commuted values, we have employed a different discount rate basis used to calculate termination benefits for those electing a deferred annuity versus those that elect a lump-sum transfer value. Commuted value transfer values are determined in accordance with the CIA standards.

## Disability

As both the number of members in approved LTD plans and the incidence of disability claims on the Plan are not material we believe it is appropriate to assume a nil disability incidence.

## Proportion of Members with Pension Partners and Pension Partner Age Differential

For retired members, the actual marital status and pension partner age are used.

We assumed that 70% of participants would have a pension partner at the relevant time. This assumption is unchanged from the previous valuation. All pension partners are assumed to be the opposite gender of the participant. Male partners were assumed to be three years older than their female partners based on an analysis of recent retirements. The remaining 30% of participants were assumed to have no pension partner. While the definition of pension partner includes same-sex relationships, this assumption adequately provides for all such contingencies.

## Demographic Margins for Adverse Deviations

All demographic assumptions are considered best estimate so no margins for conservatism or provisions for adverse deviation have been built into the going concern demographic assumptions.

## Other

### Actuarial Cost Method

An actuarial cost method is a technique used to allocate in a systematic and consistent manner the expected cost of a pension plan over the years of service during which plan members earn benefits under the Plan. By funding the cost of a pension plan in an orderly and rational manner, the security of benefits provided under the terms of the plan in respect of service that has already been rendered is significantly enhanced.

The projected accrued benefit actuarial cost method has been used for this valuation. Under this method, the actuarial present value of benefits in respect of service prior to the valuation date, but based on pensionable earnings projected to retirement, is compared with the actuarial asset value, revealing either an actuarial excess or an unfunded actuarial liability.

With respect to service after the valuation date, the expected value of benefits for service in the year following the valuation date (i.e., the normal cost) is expressed as a percentage of the expected value of participating payroll for that year. The normal cost contributions are determined each year by applying this percentage to the actual participating payroll for the year.

When calculating the actuarial present value of benefits at the valuation date, the present value of all retirement, withdrawal and pre-retirement death benefits are included. For each member, the retirement, withdrawal and pre-retirement death benefits for a particular period of service are first projected each year into the future taking into account future vesting, early retirement entitlements and minimum pension/value entitlements. These projected benefits for each future year are then capitalized, multiplied by the probability of the member leaving the Plan in that year and discounted with interest and survivorship to the valuation date. The actuarial present value of benefits for the particular period of service is then determined by summing the present values of these projected benefits.

The pattern of future contributions necessary to pre fund future benefit accruals for any one particular individual will increase gradually as a percentage of their pensionable earnings as the individual approaches retirement. For a stable population (i.e., one where the demographics of the group remain constant from year to year), the normal cost will remain relatively level as a percentage of payroll. The projected unit credit actuarial cost method therefore allocates contributions among different periods in an orderly and rational manner for a stable population group.

In the event of future adverse experience, contributions in addition to the normal cost calculated under the projected unit credit actuarial cost method may be required to ensure that the Plan assets are adequate to provide the benefits. Conversely, favourable experience may generate an actuarial excess which may serve to reduce future contribution requirements.

## Asset Valuation Method

The actuarial value of assets (“AVA”) methodology used described in Appendix A, was used to moderate fluctuations in contribution rates. The method used tracks market value, and would asymptotically approach market value if rates of return matched assumptions. The method chosen does not deviate materially from market value, and additionally, we have set a corridor for the method to produce actuarial values between 90% and 110% of market value should the method produce an AVA outside of this range. The method does not have undue influence on investment transactions, i.e., sale of an asset will not have an impact on the AVA. A 5-year period of averaging was chosen which is within the typical range of an economic cycle.

## Other Methodologies

We have prepared a list of additional assumptions and methods used in the valuation of the Plan. This list is intended to assist users of this report in understanding the specific benefits valued. Small differences in methods and assumptions in a plan of this size can sometimes have effects in the millions of dollars. Appendix C of the report deals with data omission so they will not be repeated here.

- It is administrative practice for the Plan that indexation of deferred and immediate pension commences January 1 of the year following termination or retirement;
- Normal cost contributions are based on pensionable earnings below the maximum earnings limit described earlier in the report;
- The pensionable earnings for calculating normal cost percentage is nil for participants with 35 years of combined pensionable service;
- Decrements are assumed to occur in the middle of the year; and
- For deferred benefits on termination (post-1991 service), the pensions were deferred to 55 with the early reduction factor calculated from the earlier of age 65 and the attainment of 85 points.

## Appendix E: Solvency Assumptions and Methods

### Valuation Assumptions

	December 31, 2017	December 31, 2016
<b>Economic Assumptions</b>		
Discount Rate		
Transfer value basis		
— <i>Without indexation</i>		
Active and deferred members not retirement eligible	2.6% per year for 10 years; 3.4% per year thereafter	2.2% per year for 10 years; 3.5% per year thereafter
Annuity purchase basis		
— <i>Without indexation</i>		
Retirement eligible active and deferred members and all retired members, survivors and beneficiaries	3.04% per year	3.21% per year
Transfer value basis		
— <i>With indexation</i>		
Active and deferred members not retirement eligible	1.90% per year for 10 years; 2.30% per year thereafter	1.50% per year for 10 years; 2.20% per year thereafter
Annuity purchase basis		
— <i>With indexation</i>		
Retirement eligible active and deferred members and all retired members, survivors and beneficiaries	1.15% per year	1.20% per year

	December 31, 2017	December 31, 2016
<b>Demographic Assumptions</b>		
Mortality table	2014 Canadian Pensioners' Mortality Table with generational improvements using Scale CPM-B	Same
Termination rates	Not applicable	Same
Retirement age		
Active and deferred vested members	100% at the age which maximizes the value of member's entitlement	Same
Retired members and beneficiaries	Not applicable	Same
Termination of employment	Terminate with full vesting	Same
Marital status		
Non-retired pension partner proportion	70%	Same
Non-retired pension partner age differential	Males three years older	Same
Retired members	Actual marital status and ages are used	Same
<b>Other</b>		
Wind up expenses	\$65,000,000	Same
Actuarial cost method	Unit credit	Same
Asset valuation method	Market value of assets adjusted to reflect contributions, benefit payments, transfers and fees/expenses in transit as of the valuation date	Same
<b>Solvency Incremental Normal Cost</b>		
The assumptions for the expected benefit payments and decrement probabilities, service accruals, and projected changes in benefits and/or pensionable earnings	Same as going concern	Same as going concern

Based on the CIA's Guidance and information such as pension legislation, Plan provisions and Plan experience, we have made the following assumptions regarding how the Plan's benefits would be settled on Plan wind up:

	<b>Percent of Liability Assumed to be Settled By Purchase of Annuities</b>	<b>Percent of Liability Assumed to be Settled By Lump-Sum Transfer</b>
<b>Active members</b>		
Not retirement eligible	0%	100%
Retirement eligible	100%	0%
<b>Deferred vested members</b>		
Not retirement eligible	0%	100%
Retirement eligible	100%	0%
<b>Retired members and beneficiaries</b>	100%	0%

## Benefits Valued

<b>Solvency Valuation</b>	
<b>Vesting</b>	We have treated all accrued benefits as vested on Plan wind up.
<b>Post-valuation date benefit increases</b>	Benefits are based on the average earnings and service at the valuation date.
<b>Indexing</b>	According to Plan provisions, the benefits to which a member would be entitled to if the Plan was terminated on the valuation date would include pension indexing of 60% of Alberta CPI. This indexing rate has been accounted for in the With Indexation discount rates summarized earlier in this Section.

## Justification for Valuation Assumptions

Solvency lump-sum discount rate for 10 years (Non-indexed)	$= V122542^1 + 90 \text{ bps}$ $= 1.73\% + 0.90\%$ $= \mathbf{2.63\% \text{ (rounded to 2.60\%) per year}}$
Solvency lump-sum discount rate for 10 years (Fully indexed)	$= V122542^1 \times (V122553^1 / V122544^1) + 90 \text{ bps}$ $= 1.73\% \times (0.60\% / 2.24\%) + 0.90\%$ $= \mathbf{1.36\% \text{ (rounded to 1.40\%) per year}}$
Solvency lump-sum discount rate thereafter (Non-indexed)	$= V122544^1 + 0.5 \times (V122544^1 - V122542^1) + 90 \text{ bps}$ $= 2.24\% + 0.5 \times (2.24\% - 1.73\%) + 0.90\%$ $= \mathbf{3.40\% \text{ (rounded to 3.40\%) per year}}$
Solvency lump-sum discount rate thereafter (Fully indexed)	$= V122553^1 + 0.5 \times [V122553^1 - (V122542^1 \times$ $(V122553^1 / V122544^1))] + 90 \text{ bps}$ $= 0.60\% + 0.5 \times [0.60\% - (1.73\% \times (0.60\% / 2.24\%))] + 0.90\%$ $= \mathbf{1.57\% \text{ (rounded to 1.60\%) per year}}$
Solvency annuity purchase discount rate (Non-indexed)	$= V39062 + \text{Duration Adjustment}$ $= 2.22\% + 0.82\%$ $= \mathbf{3.04\% \text{ per year}}$
Solvency annuity purchase discount rate (Fully indexed)	$= V39057 - 70\text{bps}$ $= 0.57\% - 0.70\%$ $= \mathbf{-0.13\% \text{ per year}}$
Solvency annuity purchase discount rate (60% indexed)	$= (0.6 \times \text{Fully indexed solvency annuity purchase discount rate}) + ((1 - 0.6) \times \text{Non-indexed solvency annuity purchase discount rate})$ $= (0.6 \times -0.13\%) + ((1 - 0.6) \times 3.12\%)$ $= \mathbf{1.17\% \text{ per year (rounded to 1.15\%)}}$

The indexed rates currently used in the valuation were derived by reducing the non-indexed rates by 60% of the CPI (as determined by dividing the non-indexed rates by the indexed rates and subtracting by 1).

The CIA's Guidance indicates that the cost of purchasing non-indexed annuities would be estimated based on the duration of the liabilities expected to be settled through annuity purchase. The duration of this Plan was estimated to be 11.49 and the resulting duration adjustment to the unadjusted CANSIM series V39062 interest rate is 0.82%.

The CIA's Guidance has determined that an appropriate proxy for estimating the cost of purchasing a group annuity where pensions are fully indexed to the rate of change in the CPI would be determined using an interest rate equal to the unadjusted yield on Government of Canada real-return long-term bonds (CANSIM series V39057) reduced arithmetically by 70 bps.

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<sup>1</sup> CANSIM Series (annualized)

We have set the aforementioned assumptions based on guidance prepared by the Canadian Institute of Actuaries Committee on Pension Plan Financial Reporting (“PPFRC”) in the Educational Note Assumptions for Hypothetical Wind Up and Solvency Valuations with Effective Dates Between December 31, 2017 and December 30, 2018 (“CIA Guidance”) released on March 5, 2018.

For benefit entitlements that are expected to be settled by purchase of annuities, we based the assumptions on information compiled by the PPFRC from insurance companies active in the group annuity market.

For benefit entitlements that are expected to be settled by lump-sum transfer, we based the assumptions on the Canadian Institute of Actuaries Standards of Practice for Pension Commuted Values, effective June 29, 2015, using rates corresponding to a valuation date of December 31, 2017.

### Pensionable Earnings

To estimate active and disabled members’ best average earnings, we have used actual historical member earnings.

### Pre-retirement Mortality

We have made no allowance for pre-retirement mortality. The impact of including such an assumption would not have a material impact on the valuation, since the value of the death benefit is approximately equal to the value of the accrued pension.

### Termination Rates

All participants who are actively employed on the valuation date are assumed to terminate their employment on this date and subsequently retire from the Plan in accordance with the retirement age assumption summarized above.

### Assumptions Not Needed

The following are not relevant to the solvency valuation:

- Increases in pensionable earnings;
- Increases in Year’s Maximum Pensionable Earnings;
- Increases in *Income Tax Act* maximum pension limit (we used the 2017 maximum); and
- Disability rates.

### Estimated Wind Up Expenses

Plan wind up expenses would normally include such items as fees related to preparation of the actuarial wind up report, fees imposed by a pension supervisory authority, legal fees, administration, custodial and investment management expenses. We have assumed these fees would be \$65,000,000.

### Actuarial Cost Methods

Unit credit (accrued benefit) cost method as prescribed.

## Asset Valuation Method Considerations

Assets for solvency purposes have been determined using market value with adjustments for:

- In-transit items at the valuation date; and
- Expenses for Plan termination as outlined above.

## Incremental Cost on a Solvency Basis

The incremental cost on a solvency basis represents the present value, at the calculation date (time 0), of the expected aggregate change in the solvency liabilities between time 0 and the next calculation date (time t), adjusted upwards for expected benefit payments between time 0 and time t.

An educational note was published in December 2010 by the Canadian Institute of Actuaries Committee on PPFRC to provide guidance for actuaries on the calculation of this new information.

The calculation methodology can be summarized as follows:

- The present value at time 0 of expected benefit payments between time 0 and time t, discounted to time 0,  
plus
- Projected solvency liabilities at time t, discounted to time 0, allowing for, if applicable to the pension plan being valued:
  - Expected decrements and related changes in membership status between time 0 and time t,
  - Accrual of service to time t,
  - Expected changes in benefits to time t,
  - A projection of pensionable earnings to time t,
 minus
- The solvency liabilities at time 0.

The projection calculations take into account the following assumptions and additional considerations:

- The assumptions for the expected benefit payments and decrement probabilities (except for mortality), service accruals, and projected changes in benefits and/or pensionable earnings would be consistent with the assumptions used in the pension plan's going concern valuation. The expected mortality is assumed to be consistent with the mortality assumption used in the solvency valuation.
- The assumptions used to calculate the projected liability at time t are consistent with the assumptions for the solvency liabilities at time 0, assuming that interest rates remain at the levels applicable at time 0, that the select period is reset at time t for interest rate assumptions that are select and ultimate and that the Standards of Practice for the calculation of commuted values and the guidance for estimated annuity purchase costs in effect at time 0 remain in effect at time t.
  - Active and inactive plan members as of time 0 and assumed new entrants over the period between time 0 and time t are considered in calculating the incremental cost.

- We have made an allowance for new entrants over the incremental cost period. Members who retire, terminate or die are immediately replaced by a new entrant matching a profile created based on actual historic Plan experience of new entrants over the past three years. The demographic profile and earnings of these new entrants are consistent with new active members hired over the past three years.

## Appendix F: Summary of Plan Provisions

This funding valuation was based on plan design information provided by the Board as of December 31, 2017. The following is a summary of the main provisions of the Plan.

<b>Jurisdiction of Registration</b>	Alberta Public Sector Pension Plans Act
<b>Eligibility for Membership</b>	Open to full- and part-time employees who meet criteria specified in the Plan.
<b>Vesting</b>	Members are vested following completion of two years of pensionable service.
<b>Normal Retirement</b>	
Eligibility	Age 65.
Benefit	2.0% of pensionable salary, multiplied by years of pensionable service prior to January 1, 1966, PLUS 1.4% of pensionable salary up to the average YMPE plus 2.0% of pensionable salary above the average YMPE, multiplied by pensionable service after December 31, 1965.
<b>Early Retirement</b>	
Eligibility	Permitted for a participant who has attained the age of 55 and accrued two years of service.
Benefit	A participant's pension is reduced by 3% for each year that the early retirement age precedes the earlier of age 65 and the age at which 85 points would be reached, based on pensionable service to the date of termination.  No reduction is applied if the participant has accrued 85 points (that is, age plus pensionable service is greater than or equal to 85) or has attained age 65.

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## Termination of Employment

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Eligible participants (members with at least two years of pensionable service) receive a deferred pension. This pension is deferred to the earlier of age 65 or attainment of 85 points, based on pensionable service to date of termination.

In lieu of the deferred pension, the participant may elect to transfer the commuted value of the deferred pension plus excess contributions to an acceptable registered retirement vehicle.

Excess contributions, if any, are paid.

Reciprocal transfers are available for both pre-1992 and post-1991 service.

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## Preretirement Death

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### **Non-vested members:**

Preretirement death benefit is a refund of member contributions.

### **Vested Members:**

No pension partner:

Transfer of commuted value plus excess contribution, if any.

Pension partner:

Transfer of commuted value or pension for life determined as though the participant had retired on the day before death and elected a J&S 100% optional form pension, plus excess contribution, if any.

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## Disability

If the participant is not receiving benefits from an LTD plan and the participant is permanently and totally disabled, the participant is entitled to an immediate unreduced pension based on pensionable service and salary to the date of disability. If the participant is partially disabled, the pension is reduced in the same manner as an early retirement pension.

If the participant is receiving benefits from an LTD plan, participation in this plan depends on whether or not the LTD plan is an approved plan. If the LTD plan is an approved plan, participation in this plan continues, but no pension is payable concurrently with the LTD benefit. For the purpose of determining contributions and benefits, pensionable salary will be the pensionable salary immediately preceding disability, increased by subsequent general wage increases applicable for that member's class.

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If the LTD plan is not approved, the member is considered to be on a disability leave. The member is eligible to “buy back” this period of leave, as outlined in the plan, upon return to active employment.

<b>Normal Form of Payment</b>	The normal form is a lifetime pension guaranteed for 60 months. Optional forms of pension are available on an actuarially equivalent basis.
<b>Cost-of-Living Increases</b>	Cost-of-living increases based on 60% of the Alberta CPI apply to both deferred pensions and pensions-in-payment, both before and after retirement.
<b>Definitions</b>	
Pensionable earnings	Average pensionable salary is the member’s average annual salary in the five consecutive years of pensionable service in which such average is the highest. Average YMPE is the average of the Year’s Maximum Pensionable Earnings over the same period used to determine the highest average pensionable salary.  Pensionable salary for service on and after January 1, 1992 will be limited in each year. For 2018 the limit is 147,222 plus 30% of the 2018 YMPE. After 2018, this maximum pensionable salary is expected to increase with average industrial wage base increases.
Credited interest	The rate of interest credited to participants’ contributions is the average yield of 5-year personal fixed term chartered bank deposits (CANSIM series V122515) over the most recent 12-month period.
Pensionable service	As defined under the provisions of the Plan, pensionable service shall not exceed 35 years.

## Appendix G: Alberta Pensions Services Corporation Certification

With respect to the Local Authorities Pension Plan, forming part of the actuarial report as at December 31, 2017, I hereby certify that, to the best of my knowledge and belief:

- The membership data and subsequent query answers provided or made available to the actuary are complete and accurate for all persons who are entitled to benefits under the terms of the plan in respect of service up to the date of the valuation;
- The actuary has been notified of all relevant events subsequent to the valuation measurement date.

TROY MANN

\_\_\_\_\_  
Name (print) of Authorized Signatory  
Alberta Pensions Services Corporation

VICE PRESIDENT PENSIONS

\_\_\_\_\_  
Title

ORIGINAL SIGNED BY

\_\_\_\_\_  
Signature

SEPTEMBER 18, 2018

\_\_\_\_\_  
Date

## Appendix H: Local Authorities Pension Plan Certification

With respect to the Local Authorities Pension Plan, forming part of the actuarial report as at December 31, 2017, I hereby certify that, to the best of my knowledge and belief:

- The valuation reflects the terms of the Board engagement with the actuary described in Section 2 of this report, particularly the requirement to include within the going concern valuation a margin of 1.00% in the optimal margin discount rate and inclusion of the maximum margin discount rate.
- The asset data contained in Appendix B of this report is complete and accurate; and
- The actuary has been notified of all relevant events subsequent to the valuation measurement date.

CHRISTOPHER A. BROWN  
\_\_\_\_\_  
Name (print) of Authorized Signatory  
Alberta Local Authorities Pension Plan Corp.

PRESIDENT AND CHIEF EXECUTIVE OFFICER  
\_\_\_\_\_  
Title

ORIGINAL SIGNED BY  
\_\_\_\_\_  
Signature

SEPTEMBER 20, 2018  
\_\_\_\_\_  
Date

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