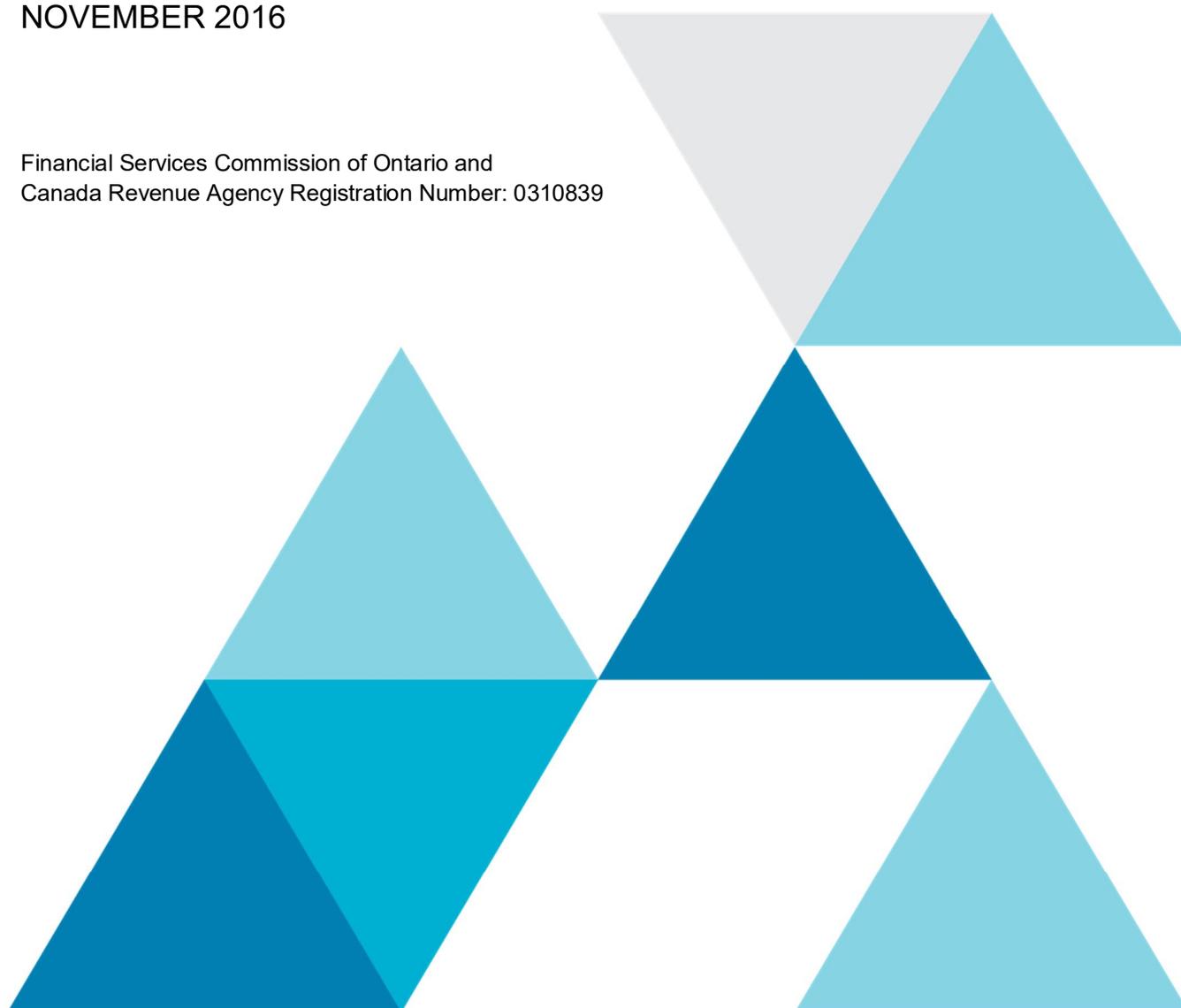


THE UNIVERSITY OF OTTAWA RETIREMENT PENSION PLAN

**REPORT ON THE ACTUARIAL VALUATION FOR
FUNDING PURPOSES AS AT JANUARY 1, 2016**

NOVEMBER 2016

Financial Services Commission of Ontario and
Canada Revenue Agency Registration Number: 0310839



Note to reader regarding actuarial valuations:

This valuation report may not be relied upon for any purpose other than those explicitly noted in the Introduction, nor may it be relied upon by any party other than the parties noted in the Introduction. Mercer is not responsible for the consequences of any other use. A valuation report is a snapshot of a plan's estimated financial condition at a particular point in time; it does not predict a pension plan's future financial condition or its ability to pay benefits in the future. If maintained indefinitely, a plan's total cost will depend on a number of factors, including the amount of benefits the plan pays, the number of people paid benefits, the amount of plan expenses, and the amount earned on any assets invested to pay the benefits. These amounts and other variables are uncertain and unknowable at the valuation date. The content of the report may not be modified, incorporated into or used in other material, sold or otherwise provided, in whole or in part, to any other person or entity, without Mercer's permission. All parts of this report, including any documents incorporated by reference, are integral to understanding and explaining its contents; no part may be taken out of context, used, or relied upon without reference to the report as a whole.

To prepare the results in this report, actuarial assumptions are used to model a single scenario from a range of possibilities for each valuation basis. The results based on that single scenario are included in this report. However, the future is uncertain and the plan's actual experience will differ from those assumptions; these differences may be significant or material. Different assumptions or scenarios within the range of possibilities may also be reasonable, and results based on those assumptions would be different. Furthermore, actuarial assumptions may be changed from one valuation to the next because of changes in regulatory and professional requirements, developments in case law, plan experience, changes in expectations about the future, and other factors.

The valuation results shown in this report also illustrate the sensitivity to one of the key actuarial assumptions, the discount rate. We note that the results presented herein rely on many assumptions, all of which are subject to uncertainty, with a broad range of possible outcomes, and the results are sensitive to all the assumptions used in the valuation.

Should the plan be wound up, the going concern funded status and solvency financial position, if different from the wind-up financial position, become irrelevant. The hypothetical wind-up financial position estimates the financial position of the plan assuming it is wound up on the valuation date. Emerging experience will affect the wind-up financial position of the plan assuming it is wound up in the future. In fact, even if the plan were wound up on the valuation date, the financial position would continue to fluctuate until the benefits are fully settled.

Decisions about benefit changes, granting new benefits, investment policy, funding policy, benefit security, and/or benefit-related issues should not be made solely on the basis of this valuation, but only after careful consideration of alternative economic, financial, demographic, and societal factors, including financial scenarios that assume future sustained investment losses.

Funding calculations reflect our understanding of the requirements of Ontario Pension Benefits Act, the Income Tax Act, and related regulations that are effective as of the valuation date. Mercer is not a law firm, and the analysis presented in this report is not intended to be a legal opinion. You should consider securing the advice of legal counsel with respect to any legal matters related to this report.

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Summary of Results

	01.01.2016 (\$ 000s)	01.01.2014 (\$ 000s)
Going Concern Financial Status		
Smoothed value of assets	\$1,993,544	\$1,594,163
Going concern funding target	\$1,803,879	\$1,621,561
Funding excess (shortfall)	\$189,665	(\$27,398)
Funded ratio	111%	98%
Hypothetical Wind-up Financial Position		
Wind-up assets	\$2,045,232	\$1,731,415
Wind-up liability	\$3,381,477	\$2,470,610
Wind-up excess (shortfall)	(\$1,336,245)	(\$739,195)
Wind-up ratio	60%	70%
Funding Requirements in the Year Following the Valuation ¹		
Total current service cost	\$67,802	\$62,584
Estimated members' required contributions	(\$25,619)	(\$17,859)
Estimated employer's current service cost	\$42,183	\$44,725
Employer's current service cost as a percentage of members' pensionable earnings	12.09%	14.12%
Minimum special payments	\$0 ²	\$2,789
Estimated minimum employer contribution	\$42,183	\$47,514
Estimated maximum eligible employer contribution	\$1,378,428	\$783,920
Next required valuation date	January 1, 2019	January 1, 2017

¹ Provided for reference purposes only. Contributions for subsequent years are indicated in this report. Contributions must be remitted to the Plan in accordance with the Minimum Funding Requirements and Maximum Eligible Contributions sections of this report.

² From January 1, 2017, annual minimum special payments of \$8,578,000 will be required.

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Introduction

To the University of Ottawa

At the request of the University of Ottawa (the “University”), we have conducted an actuarial valuation of the University of Ottawa Retirement Pension Plan (the “Plan”), sponsored by the University, as at the valuation date, January 1, 2016. We are pleased to present the results of the valuation.

Purpose

The purpose of this valuation is to determine:

- The funded status of the Plan as at January 1, 2016 on going concern, hypothetical wind-up, and solvency bases;
- The minimum required funding contributions from 2016, in accordance with the *Ontario Pension Benefits Act* (the “Act”); and
- The maximum permissible funding contributions from 2016, in accordance with the *Income Tax Act*.

The information contained in this report was prepared for the internal use of the University, and for filing with the Financial Services Commission of Ontario (“FSCO”) and with the Canada Revenue Agency (“CRA”), in connection with our actuarial valuation of the Plan. This report will be filed with FSCO and with CRA. This report is not intended or suitable for any other purpose.

In accordance with pension benefits legislation, the next actuarial valuation of the Plan will be required as at a date not later than January 1, 2019, or as at the date of an earlier amendment to the Plan.

Terms of Engagement

In accordance with our terms of engagement with the University of Ottawa, our actuarial valuation of the Plan is based on the following material terms:

- It has been prepared in accordance with applicable pension legislation and actuarial standards of practice in Canada.
- As instructed by the University of Ottawa, the going concern discount rate reflects a margin for adverse deviations of 0.41% per year.

- We have reflected the University decisions for determining the solvency funding requirements, summarized as follows:
 - The same plan wind-up scenario was hypothesized for both hypothetical wind-up and solvency valuations.
 - Certain excludable benefits were excluded from the solvency liabilities.
 - Solvency smoothing was used.
 - The one-year deferral of new solvency special payments was used.

See the Valuation Results sections of the report for more information.

Events since the Last Valuation at January 1, 2014

Pension Plan

Since the date of the last valuation, the Plan was amended to reflect increases in members' contribution rates effective January 1, 2015 and January 1, 2016. Such increases were reflected in the last valuation as at January 1, 2014.

As a result of these increases, the contribution level for all active members of the Plan at January 1, 2016 is 5.45% of earnings up to 85% of the 1999 YMPE indexed at 55% of the percentage increase in the YMPE since 2003, and 8.45% of the excess earnings up to total contributory earnings of 120% of the maximum salary paid to a professor.

In 2016, further increases in members' contribution rates effective January 1, 2017, January 1, 2018 and January 1, 2019 were ratified with various groups of active participants. The resulting contribution rates, which are reflected in the current valuation, are as follows:

	2017	2018	2019 and beyond
Contribution rate:	(below / above YMPE threshold ³)		
APUO	6.05% / 9.30%	6.60% / 10.15%	6.60% / 10.15%
SSUO, Non-Union, 772A & 772B	6.05% / 9.30%	6.60% / 10.15%	7.15% / 11.00%
PIPSC	6.05% / 9.30%	6.05% / 9.30%	6.05% / 9.30%

It should be noted that the members' contribution rates for some of the above groups are still under negotiation and may be subject to change. Any future increase in such rates will be reflected in a future complete or partial valuation report, as appropriate.

There have been no other special events that would have an impact on the valuation results at January 1, 2016 since the last valuation date.

This valuation reflects the provisions of the Plan as at January 1, 2016 including the changes described above to the members' contribution rates for which the Plan will be amended. We are not aware of any other pending definitive or virtually definitive amendments coming into effect during the period covered by this report that would have an impact on the results of the valuation. The Plan provisions are summarized in Appendix F.

³ 1999 YMPE indexed at 55% of the percentage increase in the YMPE since 2003

Assumptions

We have used the same going concern valuation assumptions and methods as were used for the previous valuation, except for the following:

	Current valuation	Previous valuation
Actuarial basis for benefits assumed to be settled through a lump sum – discount rate:	2.60% per year	1.43% per year for 10 years, 2.17% per year thereafter

A summary of the going concern methods and assumptions is provided in Appendix C.

The hypothetical wind-up and solvency assumptions have been updated to reflect market conditions at the valuation date. A summary of the hypothetical wind-up and solvency methods and assumptions is provided in Appendix D.

Regulatory Environment and Actuarial Standards

There have been no changes to the Act or the relevant regulations which impact the funding of the Plan.

The Government of Ontario has announced its intentions to make changes to the funding requirements for pension plans registered in Ontario. Since then Bill 120 received Royal assent. However, the intended changes to the funding requirements which impact the funding of single-employer pension plans will be contained in regulations which have not yet been adopted.

At its meeting on June 9, 2015, the Actuarial Standards Board (ASB) decided to promulgate the use of the following mortality table with respect of the computation of pension commuted values (“CIA CV Standard”), effective October 1, 2015: *Mortality rates equal to the 2014 Canadian Pensioners Mortality Table (CPM2014) combined with mortality improvement scale CPM Improvement Scale B (CPM-B)*. The change affects the mortality assumption used to value the solvency and wind-up liabilities for benefits assumed to be settled through a lump sum transfer. It also affects the mortality assumption used to determine the commuted values payable upon termination for members assumed to elect a lump-sum transfer under the going-concern basis. The financial impact of the change in the CIA CV Standard was already reflected in the previous actuarial valuation on a going-concern basis, and is reflected on a solvency and hypothetical wind-up basis for the first time in the current valuation.

Subsequent Events

After checking with representatives of the University, to the best of our knowledge there have been no events subsequent to the valuation date other than the increase in members’ contribution rates described above which, in our opinion, would have a material impact on the results of the valuation. Our valuation reflects the financial position of the Plan as of the valuation date and does not take into account any experience after the valuation date.

Impact of Case Law

This report has been prepared on the assumption that all claims on the Plan after the valuation date will be in respect of benefits payable to members of the Plan determined in accordance with the Plan terms and that all Plan assets are available to provide for these benefits. It is possible that court and regulatory decisions and changes in legislation could give rise to additional entitlements to benefits under the Plan and cause the results in this report to change. By way of example, we bring your attention to the following decisions:

- The Ontario Court of Appeal's 2003 decision in *Aegon Canada Inc. and Transamerica Life Canada versus ING Canada Inc.* restricted the use of original plan surplus where two or more pension plans were merged.
- The Supreme Court of Canada's 2004 decision in *Monsanto Canada Inc. versus Superintendent of Financial Services* upheld the requirement, with retroactive effect, to distribute surplus on partial plan wind-up under the *Pension Benefits Act (Ontario)*.

We are not in a position to assess the impact that such decisions or changes could have on the assumption that all plan assets on the valuation date are available to provide for benefits determined in accordance with the Plan terms. If such a claim arises subsequent to the date of this report, the consequences will be dealt with in a subsequent report. We are making no representation as to likelihood of such a claim.

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Valuation Results – Going Concern

Financial Status

A going concern valuation compares the relationship between the value of Plan assets and the present value of expected future benefit cash flows in respect of accrued service, assuming the Plan will be maintained indefinitely.

The results of the current valuation, compared with those from the previous valuation, are summarized as follows:

	01.01.2016 (\$ 000s)	01.01.2014 (\$ 000s)
Assets		
Market value of assets	\$2,045,560	\$1,731,763
Present value of future buy-back contributions	\$422	\$402
Asset smoothing adjustment	(\$52,438)	(\$138,002)
Smoothed value of assets	\$1,993,544	\$1,594,163
Going concern funding target		
• Active members	\$878,702	\$807,097
• Pensioners and survivors	\$871,693	\$766,241
• Deferred pensioners	\$51,853	\$46,153
• Additional voluntary contributions ⁴	\$1,631	\$2,070
Total	\$1,803,879	\$1,621,561
Funding excess (shortfall)	\$189,665	(\$27,398)

The going concern funding target includes a provision for adverse deviations.

⁴ Additional voluntary contributions made by members as allowed under prior plan provisions.

Reconciliation of Financial Status (\$ 000s)

Funding excess (shortfall) as at previous valuation		(\$27,398)
Interest on funding excess (shortfall) at 6.25% per year		(\$3,532)
Employer's special payments, with interest		\$5,930
Expected funding excess (shortfall)		(\$25,000)
Net experience gains (losses)		
• Investment return	\$203,983	
• Increases in pensionable earnings, YMPE and maximum pension	\$2,900	
• Indexation	\$3,602	
• Mortality	(\$2,452)	
• Retirement	\$2,766	
• Termination	(\$4,289)	
• Interest on employee contributions	(\$393)	
• Impact of demographic changes on employer's current service contribution	\$1,503	
Total experience gains (losses)		\$207,620
Impact of changes in assumptions (discount rate for lump sum settlements)		\$5,067
Net impact of other elements of gains and losses		\$1,978
Funding excess (shortfall) as at current valuation		\$189,665

Current Service Cost

The current service cost is an estimate of the present value of the additional expected future benefit cash flows in respect of pensionable service that will accrue after the valuation date, assuming the Plan will be maintained indefinitely.

The current service cost during the year following the valuation date, compared with the corresponding value determined in the previous valuation, is as follows:

	2016 (\$ 000s)	2014 (\$ 000s)
Total current service cost	\$67,802	\$62,584
Estimated members' required contributions	(\$25,619)	(\$17,859)
Total estimated employer's current service cost	\$42,183	\$44,725
Employer's current service cost expressed as a percentage of members' pensionable earnings ⁵	12.09%	14.12%

⁵ Based on a projected payroll of \$349,048,000 for 2016 and \$316,801,000 for 2014 which includes individual earnings up to 120% of the maximum professor salary, excludes earnings for members on disability and on leave without pay, and reflects earnings for part-timers.

The key factors that have caused a change in the employer's current service cost since the previous valuation are summarized in the following table:

Employer's current service cost as at previous valuation	14.12%
Demographic changes	(0.44%)
Plan amendments	(1.49%)
Changes in assumptions	(0.10%)
Employer's current service cost as at current valuation	12.09%

Discount Rate Sensitivity

The following table summarizes the effect on the going concern funding target and current service cost shown in this report of using a discount rate which is 1% lower than that used in the valuation. For the purposes of the illustration, we have not changed the interest rate used to determine commuted values upon termination of employment.

Scenario	Valuation Basis (\$ 000s)	Reduce Discount Rate by 1% (\$ 000s)
Going concern funding target	\$1,803,879	\$2,090,894
Current service cost		
• Total current service cost	\$67,802	\$84,177
• Estimated members' required contributions	(\$25,619)	(\$25,619)
• Estimated employer's current service cost	\$42,183	\$58,558

Vested Unfunded Reserves

As part of the Plan's pension reform in 1999/2000, five notional accounts referred to as reserves were established and were to be used to provide for potential reduction in the University and employee contributions. In addition, there was a portion of the going-concern surplus allocated to Plan members for refund of prior contributions. Certain amounts were allocated to each reserve and were to vest on specific dates, based on some conditions. Some amounts vested on January 1, 1999 and January 1, 2002. No additional amounts vested after January 1, 2002 and no amounts are scheduled to vest in the future.

The use of these reserves was however suspended on January 1, 2004, given that the plan had a going-concern deficit on that date.

The vested reserves are accumulated each year with interest calculated at the net return on the smoothed value of assets, and they are reduced by the amount of contribution reduction, as applicable. The net return for 2014 and 2015 are 12.6% and 11.6% respectively, based on the asset smoothing method used in the last filed actuarial valuation report, as per the plan text. Vested reserves as of January 1, 2016 are based on the vested balances of the reserves as at January 1, 2007 and are presented below for disclosure purposes. The unfunded reserves do not reflect the contribution holidays taken in 2007 and 2008.

Reserves	January 1, 2016 (\$ 000s)
Surplus allocation (for unlocated members)	\$189
Employee contribution reduction reserve	\$24,954
Unallocated reserve	\$48,965
Excess reserve	\$8,642
Future Supplemental reserve	\$5,244
Total	\$87,994

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Valuation Results – Hypothetical Wind-up

Financial Position

When conducting a hypothetical wind-up valuation, we determine the relationship between the respective values of the Plan's assets and its liabilities assuming the Plan is wound up and settled on the valuation date, assuming benefits are settled in accordance with the Act and under circumstances producing the maximum wind-up liabilities on the valuation date.

The hypothetical wind-up financial position as of the valuation date, compared with that at the previous valuation, is as follows:

	01.01.2016 (\$ 000s)	01.01.2014 (\$ 000s)
Assets		
Market value of assets	\$2,045,560	\$1,731,763
Present value of future buy-back contributions	\$422	\$402
Termination expense provision	(\$750)	(\$750)
Wind-up assets	\$2,045,232	\$1,731,415
Present value of accrued benefits for:		
• Active members	\$1,857,218	\$1,308,434
• Pensioners and survivors	\$1,390,693	\$1,063,078
• Deferred pensioners	\$131,935	\$97,028
• Additional voluntary contributions	\$1,631	\$2,070
Total wind-up liability	\$3,381,477	\$2,470,610
Wind-up excess (shortfall)	(\$1,336,245)	(\$739,195)

Wind-up Incremental Cost to January 1, 2019

The wind-up incremental cost is an estimate of the present value of the projected change in the hypothetical wind-up liabilities from the valuation date until the next scheduled valuation date, adjusted for the benefit payments expected to be made in that period.

The hypothetical wind-up incremental cost determined in this valuation, compared with the corresponding value determined in the previous valuation, is as follows:

	01.01.2016 (\$ 000s)	01.01.2014 (\$ 000s)
Number of years covered by report	3 years	3 years
Total hypothetical wind-up liabilities at the valuation date (A)	\$3,381,477	\$2,470,610
Present value of projected hypothetical wind-up liability at the next required valuation (including expected new entrants) plus benefit payments until the next required valuation (B)	\$3,941,712	\$2,788,794
Hypothetical wind-up incremental cost (B – A)	\$560,235	\$318,184

The incremental cost is not an appropriate measure of the contributions that would be required to maintain the financial position of the Plan on a hypothetical wind-up basis unchanged from the valuation date to the next required valuation date, if actual experience is exactly in accordance with the going concern valuation assumptions. This is because it does not reflect the fact that the expected return on plan assets (based on the going concern assumptions) is greater than the discount rate used to determine the hypothetical wind-up liabilities.

Discount Rate Sensitivity

The following table summarizes the effect on the hypothetical wind-up liabilities shown in this report of using a discount rate which is 1% lower than that used in the valuation:

Scenario	Valuation Basis (\$ 000s)	Reduce Discount Rate by 1% (\$ 000s)
Total hypothetical wind-up liability	\$3,381,477	\$4,103,538

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Valuation Results – Solvency

Overview

The Act also requires the financial position of the Plan to be determined on a solvency basis. The financial position on a solvency basis is determined in a similar manner to the Hypothetical Wind-up Basis, except for the following:

Exceptions	Reflected in valuation based on the terms of engagement
The circumstance under which the Plan is assumed to be wound up could differ for the solvency and hypothetical wind-up valuations.	The same circumstances were assumed for the solvency valuation as were assumed for the hypothetical wind-up valuation.
Certain benefits can be excluded from the solvency financial position. These include: <ul style="list-style-type: none"> (a) any escalated adjustment (e.g. indexing), (b) certain plant closure benefits, (c) certain permanent layoff benefits, (d) special allowances other than funded special allowances, (e) consent benefits other than funded consent benefits, (f) prospective benefit increases, (g) potential early retirement window benefit values, and (h) pension benefits and ancillary benefits payable under a qualifying annuity contract. 	The following benefits were excluded from the solvency liabilities shown in this valuation: <ul style="list-style-type: none"> – Future indexation of benefits
The financial position on the solvency basis needs to be adjusted for any Prior Year Credit Balance.	Not applicable.
The solvency financial position can be determined by smoothing assets and the solvency discount rate over a period of up to 5 years.	Solvency assets and liabilities were smoothed over 3 years.
The benefit rate increases coming into effect after the valuation date can be reflected in the solvency valuation.	Not applicable.

Financial Position

The financial position on a solvency basis, compared with the corresponding figures from the previous valuation, is as follows:

	01.01.2016 (\$ 000s)	01.01.2014 (\$ 000s)
Assets		
Market value of assets	\$2,045,560	\$1,731,763
Present value of future buy-back contributions	\$422	\$402
Termination expense provision	(\$750)	(\$750)
Net assets	\$2,045,232	\$1,731,415
Liabilities		
Total hypothetical wind-up liabilities	\$3,381,477	\$2,470,610
Difference in circumstances of assumed wind-up	\$0	\$0
Value of excluded benefits	(\$1,209,668)	(\$838,210)
Liabilities on a solvency basis	\$2,171,809	\$1,632,400
Surplus (shortfall) on a market value basis (1)	(\$126,577)	\$99,015
Impact of smoothing adjustment		
Liability decrease (increase) (2)	\$140,883	\$0
Asset increase (decrease) (3)	(\$52,438)	\$0
Surplus (shortfall) on a solvency basis ((1) + (2) + (3))	(\$38,132)	\$99,015
Solvency ratio	0.98	1.06
Transfer ratio	0.60	0.70

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Minimum Funding Requirements

The Act prescribes the minimum contributions that the University must make to the Plan. The minimum contributions in respect of a defined benefit component of a pension plan are comprised of going concern current service cost and special payments to fund any going concern or solvency shortfalls.

On the basis of the assumptions and methods described in this report, the rule for determining the minimum required employer monthly contributions, as well as an estimate of the employer contributions, from the valuation date until the next required valuation are as follows:

Employer's contribution rule			Estimated employer's contributions	
Period beginning	Monthly current service cost ^{6,7}	Minimum monthly special payments	Monthly current service cost ⁷	Total minimum monthly contributions ⁷
01.01.2016	12.09%	\$0	\$3,515,250	\$3,515,250
01.01.2017	11.32%	\$714,800	\$3,394,000	\$4,108,800
01.01.2018	10.61%	\$714,800	\$3,276,800	\$3,991,600
01.01.2019	10.31%	\$714,800	\$3,280,100	\$3,994,900

The estimated contribution amounts above are based on projected members' pensionable earnings. Therefore, the actual employer's current service cost may be different from the above estimates and, as such, the contribution requirements should be monitored closely to ensure contributions are made in accordance with the Act.

The development of the minimum special payments is summarized in Appendix A.

⁶ Expressed as a percentage of members' pensionable earnings.

⁷ Taking into account increases in member's contributions for applicable groups effective January 1, 2017, January 1, 2018 and January 1, 2019.

Other Considerations

Differences Between Valuation Bases

There is no provision in the minimum funding requirements to fund the difference between the hypothetical wind-up and solvency shortfalls, if any.

In addition, although minimum funding requirements do include a requirement to fund the going concern current service cost, there is no requirement to fund the expected growth in the hypothetical wind-up or solvency liability after the valuation date, which could be greater than the going concern current service cost.

Timing of Contributions

Funding contributions are due on a monthly basis. Contributions for current service cost must be made within 30 days following the month to which they apply. Special payment contributions must be made in the month to which they apply.

Retroactive Contributions

The University must contribute the excess, if any, of the minimum contribution recommended in this report over contributions actually made in respect of the period following the valuation date. This contribution, along with an allowance for interest, is due no later than 60 days following the date this report is filed.

Payment of Benefits

The Act imposes certain restrictions on the payment of lump sums from the Plan when the transfer ratio revealed in an actuarial valuation is less than one. If the transfer ratio shown in this report is less than one, the plan administrator should ensure that the monthly special payments are sufficient to meet the requirements of the Act to allow for the full payment of benefits, and otherwise should take the prescribed actions.

Additional restrictions are imposed when:

- The transfer ratio revealed in the most recently filed actuarial valuation is less than one and the administrator knows or 'ought to know' that the transfer ratio of the Plan has declined by 10% or more since the date the last valuation was filed.
- The transfer ratio revealed in the most recently filed actuarial valuation is greater than or equal to one and the administrator knows or 'ought to know' that the transfer ratio of the Plan has declined to less than 0.9 since the date the last valuation was filed.

As such, the administrator should monitor the transfer ratio of the Plan and, if necessary, take the prescribed actions.

Letters of Credit

Minimum funding requirements in respect of solvency deficiencies that otherwise require monthly contributions to the pension fund may be met, in the alternative, by establishing an irrevocable letter of credit subject to the conditions established by the Act. Required solvency special payments in excess of those met by a letter of credit must be met by monthly contributions to the pension fund.

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Maximum Eligible Contributions

The *Income Tax Act* (the “ITA”) limits the amount of employer contributions that can be remitted to the defined benefit component of a registered pension plan.

In accordance with Section 147.2 of the ITA and *Income Tax Regulation* 8516, for a plan which is underfunded on either a going concern or on a hypothetical wind-up basis, the maximum permitted contributions are equal to the employer’s current service cost, including the explicit expense allowance if applicable, plus the greater of the going concern funding shortfall and hypothetical wind-up shortfall.

For a plan which is fully funded on both going concern and hypothetical wind-up bases, the employer can remit a contribution equal to the employer’s current service cost, including the explicit expense allowance if applicable, as long as the surplus in the plan does not exceed a prescribed threshold. Specifically, in accordance with Section 147.2 of the ITA, for a plan which is fully funded on both going concern and hypothetical wind-up bases, the plan may not retain its registered status if the employer makes a contribution while the going concern funding excess exceeds 25% of the going concern funding target.

Notwithstanding the above, any contributions that are required to be made in accordance with pension benefits legislation are eligible contributions in accordance with Section 147.2 of the ITA and can be remitted.

Schedule of Maximum Contributions

The University is permitted to fully fund the greater of the going concern and hypothetical wind-up shortfalls (\$1,336,245,000), as well as make current service cost contributions. The portion of this contribution representing the payment of the hypothetical wind-up shortfall can be increased with interest at 2.95% per year from the valuation date to the date the payment is made, and must be reduced by the amount of any deficit funding made from the valuation date to the date the payment is made.

Assuming the University contributes the greater of the going concern and hypothetical wind-up shortfall of \$1,336,245,000 as of the valuation date, the rule for determining the estimated maximum eligible annual contributions, as well as an estimate of the maximum eligible contributions until the next valuation, are as follows:

Employer's contribution rule			Estimated employer's contributions
Year beginning	Monthly current service cost ^{8,9}	Deficit Funding	Monthly current service cost ⁹
01.01.2016	12.09%	n/a	\$3,515,250
01.01.2017	11.32%	n/a	\$3,394,000
01.01.2018	10.61%	n/a	\$3,276,800
01.01.2019	10.31%	n/a	\$3,280,100

The employer's current service cost in the above table was estimated based on projected members' pensionable earnings. The actual employer's current service cost will be different from these estimates and, as such, the contribution requirements should be monitored closely to ensure compliance with the ITA.

⁸ Expressed as a percentage of members' pensionable earnings.

⁹ Taking into account increases in member's contributions for applicable groups effective January 1, 2017, January 1, 2018 and January 1, 2019.

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Actuarial Opinion

In our opinion, for the purposes of the valuations,

- The membership data on which the valuation is based are sufficient and reliable.
- The assumptions are appropriate.
- The methods employed in the valuation are appropriate.

This report has been prepared, and our opinions given, in accordance with accepted actuarial practice in Canada. It has also been prepared in accordance with the funding and solvency standards set by the Ontario Pension Benefits Act.

ORIGINAL REPORT SIGNED BY:

Marc Bouchard

Frédéric Gendron

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November 29, 2016

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Date

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APPENDIX A

Prescribed Disclosure

Definitions

The Act defines a number of terms as follows:

Defined Term	Description	Result
Transfer Ratio	The ratio of: (a) Solvency Assets minus the lesser of the Prior Year Credit Balance and the minimum required employer contributions until the next required valuation; to (b) the sum of the Solvency Liabilities and liabilities for benefits, other than benefits payable under qualifying annuity contracts that were excluded in calculating the Solvency Liabilities.	0.60
Prior Year Credit Balance	Accumulated excess of contributions made to the pension plan in excess of the minimum required contributions (note: only applies if the University chooses to treat the excess contributions as a Prior Year Credit Balance).	\$0
Solvency Assets	Market value of assets including accrued or receivable income and excluding the value of any qualifying annuity contracts.	\$2,045,982,000
Solvency Asset Adjustment	The sum of: (a) the difference between smoothed value of assets and the market value of assets (b) the present value of going concern special payments (including those identified in this report) within 6 years following the valuation date (c) the present value of any previously scheduled solvency special payments (excluding those identified in this report)	(\$52,438,000) \$0 \$0
		(\$52,438,000)
Solvency Liabilities	Liabilities determined as if the plan had been wound up on the valuation date, including liabilities for plant closure benefits or permanent layoff benefits that would be immediately payable if the employer's business were discontinued on the valuation date of the report, but, if elected by the plan sponsor, excluding liabilities for, (a) any escalated adjustment, (b) excluded plant closure benefits, (c) excluded permanent layoff benefits, (d) special allowances other than funded special allowances, (e) consent benefits other than funded consent benefits, (f) prospective benefit increases, (g) potential early retirement window benefit values, and (h) pension benefits and ancillary benefits payable under a qualifying annuity contract.	\$2,171,809,000

Defined Term	Description	Result
Solvency Liability Adjustment	The amount by which Solvency Liabilities are adjusted as a result of using a solvency valuation interest rate that is the average of market interest rates calculated over the period of time used in the determination of the smoothed value of assets.	(\$140,883,000)
Solvency Deficiency	The amount, if any, by which the sum of:	
	(a) the Solvency Liabilities	\$2,171,809,000
	(b) the Solvency Liability Adjustment	(\$140,883,000)
	(c) the Prior Year Credit Balance	\$0
		\$2,030,926,000
	Exceeds the sum of	
	(d) the Solvency Assets net of estimated termination expenses ¹⁰	\$2,045,232,000
	(e) the Solvency Asset Adjustment	(\$52,438,000)
		\$1,992,794,000
		\$38,132,000

Timing of Next Required Valuation

In accordance with the Act the next valuation of the Plan would be required at an effective date within one year of the current valuation date if:

- The ratio of solvency assets to solvency liabilities is less than 85%.
- The employer elected to exclude plant closure or permanent lay-off benefits under Section 5(18) of the regulations, and has not rescinded that election.

Otherwise, the next valuation of the Plan would be required at an effective date no later than three years after the current valuation date.

Accordingly, the next valuation of the Plan will be required as of January 1, 2019.

Special Payments

Based on the results of this valuation, the Plan is not fully funded. In accordance with the Act, any going concern deficits must be amortized over a period not exceeding 15 years, beginning on a date not later than 12 months after January 1, 2016, and any solvency deficits must be amortized over a period not exceeding 5 years, also beginning on a date not later than 12 months after January 1, 2016.

¹⁰ In accordance with accepted actuarial practice, for purposes of determining the financial position, the market value of plan assets was reduced by a provision for estimated termination expenses payable from the Plan's assets that may reasonably be expected to be incurred in terminating the Plan and to be charged to the Plan.

As such, special payments must be made as follows:

Type of payment	Start date	End date	Monthly Special Payment	Present Value	
				Going Concern Basis	Solvency Basis ¹¹
New solvency	01.01.2017	12.31.2021	\$714,800	n/a	\$38,132,000
Total			\$714,800	n/a	\$38,132,000

As the Plan does not have a going concern deficit, going concern special payments of \$232,400 per month revealed in the previous valuation are no longer required. The solvency deficiency will be amortized from January 1, 2017 to December 31, 2021 by special payments of \$714,800 per month.

¹¹ Calculation considers both solvency and going concern special payments (six years only), if any, and is based on the average solvency discount rate.

Pension Benefit Guarantee Fund (PBGF) Assessment

The PBGF assessment base and liabilities are derived as follows:

Solvency assets	\$2,045,982,000 (a)
PBGF liabilities	\$2,171,809,000 (b)
Solvency liabilities	\$2,171,809,000 (c)
Ontario asset ratio	100% (d) = (b) ÷ (c)
Ontario portion of the fund	\$2,045,982,000 (e) = (a) x (d)
PBGF assessment base	\$125,827,000 (f) = (b) – (e)
Amount of additional liability for plant closure and/or permanent layoff benefits which is not funded and subject to the 2% assessment pursuant to s.37(4)	\$0 (g)

The PBGF assessment is calculated as follows:

\$5 for each Ontario member	\$32,015 (h)
0.5% of PBGF assessment base up to 10% of PBGF liabilities	\$629,135 (i)
1.0% of PBGF assessment base between 10% and 20% of PBGF liabilities	\$0 (j)
1.5% of PBGF assessment base over 20% of PBGF liabilities	\$0 (k)
Sum of (h), (i), (j) and (k)	\$661,150 (l)
\$300 for each Ontario member	\$1,920,900 (m)
Lesser of (l) and (m)	\$661,150 (n)
2.0% of additional liabilities ((g) x 2%)	\$0 (o)
Total Guarantee Fund Assessment ((n) + (o), no less than \$250) (before applicable tax)	\$661,150 (p)

APPENDIX B

Plan Assets

The pension fund is held by the trustee/custodian RBC Investor & Treasury Services. In preparing this report, we have relied upon audited financial statements for the period from January 1, 2014 to December 31, 2015, except that we have reflected interest on the outstanding surplus allocation payments to un-located members and we have reflected in-transit benefit payments payable to terminated members. The differences in assets are additional outstanding payments of \$797,000 as of January 1, 2014, \$162,000 as of January 1, 2015 and \$1,060,000 as of January 1, 2016, reducing the respective asset values by the same amounts.

Reconciliation of Market Value of Plan Assets

The pension fund transactions since the last valuation are summarized in the following table:

	2014 (\$ 000s)	2015 (\$ 000s)
January 1	\$1,731,763	\$1,878,575
PLUS		
Members' contributions	\$22,173	\$22,694
University's contributions	\$48,149	\$46,876
Investment income	\$47,219 ¹²	\$64,213
Net capital gains (losses)	\$111,798	\$124,570
	\$229,339	\$258,353
LESS		
Pensions paid	\$62,875	\$67,015
Lump-sums paid	\$7,922	\$11,818
Administration and investment fees	\$11,730	\$12,535
	\$82,527	\$91,368
December 31	\$1,878,575	\$2,045,560
Gross rate of return ¹³	9.2%	10.1%
Rate of return net of expenses ¹³	8.5%	9.4%

We have tested the pensions paid, the lump-sums paid, and the contributions for consistency with the membership data for the Plan members who have received benefits or made contributions. The results of these tests were satisfactory.

¹² Reflects beginning of year adjustment due to difference from draft to audited financial statements at December 31, 2013.

¹³ Assuming mid-period cash flows.

Investment Policy

The plan administrator has adopted a statement of investment policy and procedures (“SIPP”). This policy is intended to provide guidelines for the manager(s) as to the level of risk that is consistent with the Plan’s investment objectives. A significant component of this investment policy is the asset mix.

The plan administrator is solely responsible for selecting the plan’s investment policies, asset allocations, and individual investments.

The constraints on the asset mix in the SIPP and the actual asset mix at the valuation date are provided for information purposes:

	Investment Policy			Actual Asset Mix as at January 1, 2016
	Minimum	Target	Maximum	
Canadian Equities	5%	8%	20%	8.4%
Foreign Equities	35%	42%	50%	41.9%
Nominal Fixed Income	15%	20%	35%	19.6%
Real Return Assets ¹⁴	15%	30%	40%	29.3%
Cash and cash equivalents	0%	0%	10%	0.8%
		100%		100%

Because of the mismatch between the Plan’s assets (which are invested in accordance with the above investment policy) and the Plan’s liabilities (which tend to behave like long bonds) the Plan’s financial position will fluctuate over time. These fluctuations could be significant and could cause the Plan to become underfunded or overfunded even if the University contributes to the Plan based on the funding requirements presented in this report.

¹⁴ Includes real estate, infrastructure and hedge funds.

APPENDIX C

Methods and Assumptions – Going Concern

Valuation of Assets

For this valuation, we have used an adjusted market-value method to determine the smoothed value of assets. Under this method, total fund returns (net of expenses paid by the plan) in excess or below the expected return will be smoothed over three years, with the smoothed value of assets to be between 90% and 105% of the market value of assets. As a result, the smoothed value produced as at January 1, 2016 recognizes the following portions of excess returns that arose during the past three years:

Year	Percentage of Gains (Losses) Recognized
2015:	1/3
2014:	2/3
before 2014:	3/3

The smoothed values produced by this method are related to the market value of the assets, with the advantage that, over time, the market-related asset values will tend to be more stable than market values. To the extent that more capital gains than losses will arise over the long term, the smoothed value will tend to be lower than the market value.

The smoothed value of the assets at January 1, 2016 was derived as follows:

Market value of assets		\$2,045,560,000
LESS		
Unrecognized capital gains	2015: \$59,124,000 x 2/3 =	\$39,416,000
(losses) realized or unrealized	2014: \$39,067,000 x 1/3 =	\$13,022,000
		<u>\$52,438,000</u>
PLUS		
Present value of future buy-back contributions		\$422,000
Smoothed value of assets		<u>\$1,993,544,000</u>

Going Concern Funding Target

Over time, the real cost to the employer of a pension plan is the excess of benefits and expenses over member contributions and investment earnings. The actuarial cost method allocates this cost to annual time periods.

For purposes of the going concern valuation, we have continued to use the projected unit credit actuarial cost method. Under this method, we determine the present value of benefit cash flows expected to be paid in respect of service accrued prior to the valuation date, based on projected final average earnings. This is referred to as the funding target. For each individual plan member, accumulated contributions with interest, plus 50% of the present value of pensions, are established as a minimum actuarial liability.

The funding excess or funding shortfall, as the case may be, is the difference between the market or smoothed value of assets and the funding target. A funding excess on a market value basis indicates that the current market value of assets and expected investment earnings are expected to be sufficient to meet the cash flows in respect of benefits accrued to the valuation date as well as expected expenses – assuming the plan is maintained indefinitely. A funding shortfall on a market value basis indicates the opposite – that the current market value of the assets is not expected to be sufficient to meet the plan's cash flow requirements in respect of accrued benefits, absent additional contributions.

As required under the Act, a funding shortfall must be amortized over no more than 15 years through special payments. A funding excess may, from an actuarial standpoint, be applied immediately to reduce required employer current service contributions unless precluded by the terms of the plan or by legislation.

The actuarial cost method used for the purposes of this valuation produces a reasonable matching of contributions with accruing benefits. Because benefits are recognized as they accrue, the actuarial cost method provides an effective funding target for a plan that is maintained indefinitely.

Current Service Cost

The current service cost is the present value of projected benefits to be paid under the plan with respect to service expected to accrue during the period until the next valuation.

The employer's current service cost is the total current service cost reduced by the members' required contributions.

The employer's current service cost has been expressed as a percentage of the members' pensionable earnings to provide an automatic adjustment in the event of fluctuations in membership and/or pensionable earnings.

Under the projected unit credit actuarial cost method, the current service cost for an individual member will increase each year as the member approaches retirement. However, the current service cost of the entire group, expressed as a percentage of the members' pensionable earnings, can be expected to remain stable as long as the average age distribution of the group remains constant.

Actuarial Assumptions – Going Concern Basis

The present value of future benefit payment cash flows is based on economic and demographic assumptions. At each valuation we determine whether, in our opinion, the actuarial assumptions are still appropriate for the purposes of the valuation, and we revise them, if necessary.

Emerging experience will result in gains or losses that will be revealed and considered in future actuarial valuations.

The table below shows the various assumptions used in the current valuation in comparison with those used in the previous valuation¹⁵.

Assumption	Current valuation	Previous valuation
Discount rate:	6.25%	6.25%
Explicit expenses:	\$0	\$0
Inflation:	2.00%	2.00%
ITA limit / YMPE increases:	3.00%	3.00%
Pensionable earnings increases:	3.00% + scale ¹⁶	3.00% + scale ¹⁶
Post-retirement pension increases:	1.70%	1.70%
Interest on employee contributions:	6.25%	6.25%
Retirement rates:	Age-related table	Age-related table
Termination rates:	Age-related table	Age-related table
Mortality rates:	95% of the rates of the 2014 Public Sector Canadian Pensioners Mortality Table (CPM2014Publ)	95% of the rates of the 2014 Public Sector Canadian Pensioners Mortality Table (CPM2014Publ)
Mortality improvements:	Fully generational using CPM Improvement Scale B (CPM-B)	Fully generational using CPM Improvement Scale B (CPM-B)
Disability rates:	None	None
Form of benefit elected:	Retirement: 100% of eligible members receive a pension from the plan Termination: 70% of eligible members receive a pension from the plan and 30% elect a lump sum transfer	Retirement: 100% of eligible members receive a pension from the plan Termination: 70% of eligible members receive a pension from the plan and 30% elect a lump sum transfer
Actuarial basis for benefits assumed to be settled through a lump sum:	Discount rate: 2.60% Mortality rates: CPM2014 with fully generational improvements using CPM-B	Discount rate: 1.43% per year for 10 years, 2.17% per year thereafter Mortality rates: CPM2014 with fully generational improvements using CPM-B
Eligible spouse at retirement:	80%	80%
Spousal age difference:	Male 2 years older	Male 2 years older

¹⁵ Economic rates indicated in the table are annual rates.

¹⁶ Progress through the ranks (PTR) and promotional increases – see section *Pensionable Earnings* below for more detail.

The assumptions are best-estimate with the exception that the discount rate includes a margin for adverse deviations, as shown below.

Age Related Tables

Based on the plan experience over the years 2008 to 2012, we have assumed that members will terminate or retire based on the following annual rates. The rates represent the probability of terminating or retiring in the following year.

Age	Termination (Sample rates)		Retirement *
	Male	Female	
25	10%	10%	0%
30	7%	8%	0%
35	6%	6%	0%
40	4%	5%	0%
45	3%	4%	0%
50	3%	3%	0%
55 to 60	0%	0%	20%
61 to 64	0%	0%	10%
65	0%	0%	35%
66 to 69	0%	0%	15%
70	0%	0%	100%

* Rates are only applied from unreduced retirement age. Experience shows that retirement rates at reduced retirement ages are small. Because pension amounts are reduced by actuarial equivalence, the impact of early retirement prior to eligibility to an unreduced pension is minimal.

Pensionable Earnings

The benefits ultimately paid will depend on each member's final average earnings. To calculate the pension benefits payable upon retirement, death, or termination of employment, we have taken salary rates as at January 1, 2016 and assumed that such pensionable earnings will increase on May 1 at the assumed rate.

We have considered that salary increases consist of two elements. The first represents that part of the increase which corresponds to the increase in the general level of salaries. This is usually called "economic salary increase". The second represents increases resulting from progress through the ranks (PTR) and promotion, which would presumably occur regardless of the economic trend.

Economic Salary Increases

Economic salary increases are assumed equal to 3.0% per year from 2016, based on assumed inflation of 2.0% plus an expected 1.0% for productivity gains.

PTR and Promotional Increases

The PTR and promotional salary increases assumption is based on the Plan experience during the years 2008 to 2012.

The following table shows examples of the rates of PTR or promotional increases for the following year for specimen years of service. As is common, these rates are relatively high as a percentage of salary at the lower years of service and reduce as the service increases.

The annual rates are the same for male and female employees.

Service at valuation date	Assumed rate of increase for following year
1 year	3.5%
3 years	3.4%
5 years	3.2%
10 years	2.8%
15 years	2.4%
20 years	2.0%
25 years	1.6%
30 years	1.2%
35 years	0.8%

Rationale for Assumptions

A rationale for each of the assumptions used in the current valuation is provided below.

Discount Rate

We have discounted the expected benefit payment cash flows using the expected investment return on the market value of the fund net of fees and less a margin for adverse deviations. Other bases for discounting the expected benefit payment cash flows may be appropriate, particularly for purposes other than those specifically identified in this valuation report.

The discount rate is comprised of the following:

- Estimated returns for each major asset class consistent with market conditions on the valuation date and the target asset mix specified in the Plan's investment policy.
- Implicit provision for passive investment expenses¹⁷.
- Implicit provision for non-investment expenses determined as the average expenses paid from the fund over the recent years and taking into account input from the Plan administrator.
- A margin for adverse deviations of 0.41%

The discount rate was developed as follows:

Assumed investment return	6.84%
Passive investment expense provision	(0.05%)
Implicit non-investment expense provision	(0.13%)
Margin for adverse deviation	(0.41%)
Net discount rate	6.25%

Inflation

The inflation assumption is based on market expectations of long-term inflation implied by the yields on nominal and real return bonds at the valuation date and is consistent with the Bank of Canada's inflation target.

Income Tax Act Pension Limit and Year's Maximum Pensionable Earnings

The assumption is based on historical real economic growth and the underlying inflation assumption.

Pensionable Earnings

The long term economic increases are equal to the inflation assumption plus an expected 1% for productivity gains. The PTR and promotional increases scale is based on experience over the years 2008 to 2012.

Post-Retirement Pension Increases

The assumption is based on the Plan formula and inflation assumption above. The assumed rate of indexation was determined after analyzing the average level of indexation expected in the future based on a stochastic model that reflects volatility of inflation rates, with a target inflation of 2% per year.

Retirement Rates

The assumption is based on experience over the years 2008 to 2012.

Termination Rates

The assumption is based on experience from 2008 to 2012.

¹⁷ Additional return due to active management, net of related fees, is assumed to be nil.

Mortality Rates

The assumption for the mortality rates is based on the Canadian Pensioners' Mortality (CPM) study published by the Canadian Institute of Actuaries in February 2014.

Due to the size of the Plan, specific data on plan mortality experience is insufficient to determine the mortality rates. The CPM mortality rates from the public sector have been adjusted after considering plan-specific characteristics, such as the type of employment, the industry experience, the pension and employment income for the plan members, and data in the CPM study. Specifically, we have applied the adjustment for Educational institutions proposed in the Canadian Institute of Actuaries Final Report on Canadian Pensioners' Mortality published in February 2014.

There is broad consensus among actuaries and other longevity experts that mortality improvement will continue in the future, but the degree of future mortality improvement is uncertain. The mortality improvement scale published in the CPM study represents one reasonable outlook for future improvement. We have used the CPM mortality improvement scale B without adjustment.

Based on the assumption used, the life expectancy of a member age 60 at the valuation date is 27.7 years for males and 29.7 years for females.

Interest on Employee Contributions

The assumption is based on Plan terms and the underlying investment return assumption.

Disability Rates

Use of a different assumption would not have a material impact on the valuation.

Form of benefit elected and cost of future lump sums

The assumption for the percentage of eligible plan participants that will elect to receive their benefit as a lump sum transfer from the plan is based on experience from 2008 to 2012.

The cost of future lump sums will depend on the level of market interest rates at the time the lump sum is paid and any changes in the applicable actuarial standards for the determination of pension plan commuted values. The assumed cost of future lump sums is based on the average expected level of market interest rates over the period during which lump sums are expected to be paid, taking into account market conditions on the valuation date. We have also assumed that future lump sums elected by eligible plan participants will be calculated using the new mortality basis applicable under the actuarial standards since October 2015.

Eligible Spouse

The assumption is based on an industry standard for non-retired members (actual status used for retirees).

Spousal Age Difference

We have used a typical assumption for the spousal age difference.

APPENDIX D

Methods and Assumptions – Hypothetical Wind-up and Solvency

Hypothetical Wind-up Basis

The Canadian Institute of Actuaries requires actuaries to report the financial position of a pension plan on the assumption that the plan is wound up on the effective date of the valuation, with benefits determined on the assumption that the pension plan has neither a surplus nor a deficit. For the purposes of the hypothetical wind-up valuation, the plan wind-up is assumed to occur in circumstances that maximize the actuarial liability.

To determine the actuarial liability on the hypothetical wind-up basis, we have valued those benefits that would have been paid had the Plan been wound up on the valuation date, with all members fully vested in their accrued benefits.

There are no benefits under the plan contingent upon the circumstances of the plan wind-up or contingent upon other factors. In particular, there are no additional benefits that would be immediately payable if the employer's business were discontinued on the valuation date. Therefore, it was not necessary to postulate a scenario upon which the hypothetical wind-up valuation is made. Therefore, no benefits payable on plan wind-up were excluded from our calculations.

Upon plan wind-up, members are given options for the method of settling their benefit entitlements. The options vary by eligibility and by province of employment, but in general, involve either a lump sum transfer or an immediate or deferred pension.

The value of benefits assumed to be settled through a lump sum transfer is based on the assumptions described in Section 3500 – *Pension Commuted Values* of the Canadian Institute of Actuaries' Standards of Practice applicable for January 1, 2016.

Benefits provided as an immediate or deferred pension are assumed to be settled through the purchase of annuities based on an estimate of the cost of purchasing annuities.

We have estimated the cost of settlement through purchase of annuities in accordance with the *Canadian Institute of Actuaries Educational Note: Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates Between December 31, 2015 and December 30, 2016*.

For solvency purposes, indexation after the valuation date was excluded. It may not be possible to settle the liabilities through the purchase of annuities due to the size of the Plan and the limited annuity market in Canada. In accordance with the *Canadian Institute of Actuaries Educational Note: Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates Between December 31, 2015 and December 30, 2016*, we have assumed that the settlement of such liabilities would be priced on the same basis as the smaller group annuities that are available in the market.

For wind-up purposes, no benefits were excluded. There is limited data available to provide credible guidance on the cost of a purchase of indexed annuities in Canada. In accordance with the *Canadian Institute of Actuaries Educational Note: Assumptions for Hypothetical Wind-up and Solvency Valuations with Effective Dates Between December 31, 2015 and December 30, 2016*, we have assumed that an appropriate proxy for estimating the cost of such purchase is to use an assumed interest rate net of inflation based on the indexed rates derived from yields on the real return bonds of the Government of Canada, reduced by 0.70%. In practice, it may be difficult to purchase indexed annuity liabilities exceeding \$200 million. The assumed indexation rate was determined after analyzing the average level of indexation expected in the future based on the implicit inflation rate¹⁸, historical distribution of inflation rates, and the indexation rate formula under the Plan.

The Educational Note provides guidance on estimating the cost of annuity purchases assuming a typical group of annuitants. That is, no adjustments for sub- or super-standard mortality are considered. However, it is expected that insurers will consider plan experience and certain plan-specific characteristics when determining the mortality basis for a particular group. The Educational Note states that the actuary would be expected to make an adjustment to the regular annuity purchase assumptions where there is demonstrated substandard or super-standard mortality or where an insurer might be expected to assume so. In such cases, the actuary would be expected to make an adjustment to the mortality assumption in a manner consistent with the underlying annuity purchase basis. Given the uncertainty surrounding the actual mortality basis that would be typical of a group annuity purchase, it is reasonable to assume that there is a range of bases that can be expected not to be materially different from the actual mortality basis. Therefore, an adjustment to the regular annuity purchase assumptions would be warranted when the plan's assumed basis falls outside that range.

In this context, we have determined that an adjustment to the mortality rates used in the regular annuity purchase assumptions is required.

We have not included a margin for adverse deviation in the solvency and hypothetical wind-up valuations.

¹⁸ Derived from the difference in long-term Government of Canada nominal bond and real return bond yields.

The assumptions are as follows:

Form of Benefit Settlement Elected by Member	
Lump sum	30% of active members elect to receive their benefit entitlement in a lump sum.
Annuity purchase	All remaining members are assumed to elect to receive their benefit entitlement in the form of a deferred or immediate pension. These benefits are assumed to be settled through the purchase of deferred or immediate annuities from a life insurance company.
Basis for Benefits Assumed to be Settled through a Lump Sum	
Mortality rates:	100% of the rates of the 2014 Canadian Pensioners Mortality Table (CPM2014) with fully generational improvements using CPM Scale B
Interest rate:	1.90% per year for 10 years, 3.60% per year thereafter (2.47% per year for 10 years, 3.97% per year thereafter, for solvency liability adjustment)
Pre-and post-retirement indexation rate:	0.69% per year for 10 years, 1.57% per year thereafter (for wind-up valuation)
Basis for Benefits Assumed to be Settled through the Purchase of an Annuity	
Mortality rates:	100% of the rates of the 2014 Canadian Pensioners Mortality Table (CPM2014) with fully generational improvements using CPM Scale B
Adjustment to mortality rates:	Above mortality rates reduced by 5% to reflect super-standard mortality
Interest rate:	3.10% (3.58% for solvency liability adjustment) per year based on a duration of 12.8 years determined for the liabilities assumed to be settled through the purchase of an annuity.
Pre-and post-retirement indexation rate:	3.04% per year (for wind-up valuation) ¹⁹
Retirement Age	
Maximum value:	Members are assumed to retire at the age which maximizes the value of their entitlement from the Plan, based on the eligibility requirements which have been met at the valuation date
Grow-in:	The benefit entitlement and assumed retirement age of Ontario members whose age plus service equals at least 55 at the valuation date reflect their entitlement to grow into early retirement subsidies
Other Assumptions	
Special payments	Discounted at the average smoothed interest rate of 3.41% per year
Final average earnings:	Based on actual pensionable earnings over the averaging period
Family composition:	Same as for going concern valuation
Maximum pension limit:	\$2,890.00 increasing at 3.00% per year from 2017 (determined on the member's assumed pension commencement date)
Termination expenses:	\$750,000

To determine the hypothetical wind-up position of the Plan, a provision has been made for estimated termination expenses payable from the Plan's assets in respect of actuarial and administration expenses that may reasonably be expected to be incurred in terminating the Plan and to be charged to the Plan.

¹⁹ Reflects inflation and risk premium charged by insurers to guarantee inflation protection.

Because the settlement of all benefits on wind-up is assumed to occur on the valuation date and is assumed to be uncontested, the provision for termination expenses does not include custodial, investment management, auditing, consulting, and legal expenses that would be incurred between the wind-up date and the settlement date or due to the terms of a wind-up being contested.

Expenses associated with the distribution of any surplus assets that might arise on an actual wind-up are also not included in the estimated termination expense provisions.

In determining the provision for termination expenses payable from the Plan's assets, we have assumed that the plan sponsor would be solvent on the wind-up date. We have also assumed, without analysis, that the Plan's terms as well as applicable legislation and court decisions would permit the relevant expenses to be paid from the Plan.

Although the termination expense assumption is a best estimate, actual fees incurred on an actual plan wind-up may differ materially from the estimates disclosed in this report.

Incremental Cost

In order to determine the incremental cost, we estimate the hypothetical wind-up liabilities at the next valuation date. We have assumed that the cost of settling benefits by way of a lump sum or purchasing annuities remains consistent with the assumptions described above. Since the projected hypothetical wind-up liabilities will depend on the membership in the Plan at the next valuation date, we must make assumptions about how the Plan membership will evolve over the period until the next valuation.

We have assumed that the Plan membership will evolve in a manner consistent with the going concern assumptions as follows:

- Members terminate, retire, and die consistent with the termination, retirement, and mortality rates used for the going concern valuation.
- Pensionable earnings, the Income Tax Act pension limit, and the Year's Maximum Pensionable Earnings increase in accordance with the related going concern assumptions.
- Active members accrue pensionable service in accordance with the terms of the Plan.
- To accommodate for new entrants to the Plan over the next three years, we have added to the projected liability an amount based on the liability of new entrants that have joined the Plan since the previous valuation.
- Cost of living adjustments are consistent with the inflation assumption used for the going concern valuation.

Solvency Basis

In determining the financial position of the Plan on the solvency basis, we have used the same assumptions and methodology as were used for determining the financial position of the Plan on the hypothetical wind-up basis, except that:

- in determining the financial position of the Plan on the solvency basis and in accordance with the Act, we have excluded the future indexation of benefits. As such, the pre and post-retirement indexation rate was assumed to be 0%; and
- We have used a smoothing method over three years:
 - The same smoothing method as described in Appendix C on going-concern basis was used to determine the smoothed value of assets for solvency purposes;
 - For benefits assumed to be settled by lump sum transfers, we have averaged the interest rates applicable to January 1, 2016, January 1, 2015 and January 1, 2014 as described in Section 3500 – *Pension Commuted Values* of the CIA' Standards of Practice applicable for January 1, 2016, as if it had become effective throughout the averaging period (that is, no adjustment was made to account for changes in mortality table required over the period); and
 - For benefits assumed to be settled by group annuity purchase, we have averaged the interest rates for group annuity purchase published in the CIA Educational Notes that were applicable on January 1, 2016, January 1, 2015 and January 1, 2014, respectively, with an adjustment to the January 1, 2015 and January 1, 2014 rates to account for the change in the base mortality table between these dates and January 1, 2016. The mortality adjustment was established at 0.5% at January 1, 2014 and January 1, 2015. The resulting smoothed annuity purchase rate of 3.58% corresponds to the average of the rates of 3.10% at January 1, 2016, 3.24% (2.74% + 0.50%) at January 1, 2015 and 4.40% (3.90% + 0.50%) at January 1, 2014. This smoothed rate was used in combination with 100% of the rates of the CPM2014 mortality table, reduced by 5% to reflect super-standard mortality, and generational improvement scale CPM-B.

The solvency position is determined in accordance with the requirements of the Act.

APPENDIX E

Membership Data

Analysis of Membership Data

The actuarial valuation is based on membership data as at January 1, 2016, provided by the University of Ottawa.

We have applied tests for internal consistency, as well as for consistency with the data used for the previous valuation. These tests were applied to membership reconciliation, basic information (date of birth, date of hire, date of membership, gender, etc.), pensionable earnings, credited service, contributions accumulated with interest, and pensions to retirees and other members entitled to a deferred pension. Contributions, lump sum payments, and pensions to retirees were compared with corresponding amounts reported in financial statements. The results of these tests were satisfactory.

If the data supplied are not sufficient and reliable for its intended purpose, the results of our calculation may differ significantly from the results that would be obtained with such data. Although Mercer has reviewed the suitability of the data for its intended use in accordance with accepted actuarial practice in Canada, Mercer has not verified or audited any of the data or information provided.

Plan membership data are summarized below. For comparison, we have also summarized corresponding data from the previous valuation.

	01.01.2016	01.01.2014
Active Members (Academic)		
Number	1,258	1,282
Total annualized pensionable earnings for the following year	\$188,512,000	\$172,395,000
Average annualized pensionable earnings for the following year	\$149,900	\$134,500
Average years of credited service	13.1	12.9
Average age	50.1	49.8
Accumulated contributions with interest ²⁰	\$167,014,000	\$134,267,000
% of female	40%	40%
Active Members (Administrative)		
Number	2,242	2,208
Total annualized pensionable earnings for the following year	\$171,512,000	\$153,036,000
Average annualized pensionable earnings for the following year	\$76,500	\$69,300
Average years of credited service	10.8	10.5
Average age	44.4	44.0
Accumulated contributions with interest ²⁰	\$115,979,000	\$86,345,000
% of female	63%	64%
Deferred Pensioners		
Number	793	752
Total annual pension at the valuation date	\$4,223,000	\$3,687,000
Average annual pension at the valuation date	\$5,300	\$4,900
Average age	49.3	49.1
Pensioners and Survivors		
Number ²¹	2,110	1,943
Total annual lifetime pension ²²	\$70,463,000	\$61,502,000
Average annual lifetime pension	\$33,400	\$31,700
Average age	73.1	72.8

²⁰ Excludes additional voluntary contributions with interest.

²¹ 1,028 Academics, 1,071 Administrative, and 11 individuals identified as "religious" as of January 1, 2016 and 957 Academics, 972 Administrative, and 14 individuals identified as "religious" as of January 1, 2014.

²² Includes Indexation as of January 1, 2014 and January 1, 2016 respectively.

The membership movement for all categories of membership since the previous actuarial valuation is as follows:

	Actives	Deferred Vested	Pensioners and Beneficiaries	Total
Total at 01.01.2014	3,490	752	1,943	6,185
New entrants	463			463
Terminations:				
• Transfers/lump sums	(69)	(93)		(162)
• Deferred pensions	(198)	198		-
Deaths				
• Without survivors	(8)	(2)	(60)	(70)
• With survivors			(47)	(47)
New survivors			47	47
Retirements	(180)	(53)	233	-
Rehire	2	(2)		-
Adjustments		(7)	(6)	(13)
Total at 01.01.2016	3,500	793	2,110	6,403

The distribution of the active members by age and pensionable service as at the valuation date is summarized as follows:

Age	Years of Pensionable Service									Total	
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-45		
20 to 24	25										25
	\$59,839										\$59,839
25 to 29	168	29									197
	\$62,103	\$63,731									\$62,343
30 to 34	206	154	15								375
	\$75,540	\$68,010	\$69,777								\$72,217
35 to 39	207	181	63	8							459
	\$89,242	\$98,443	\$84,228	\$78,425							\$91,993
40 to 44	119	196	133	36	11						495
	\$90,149	\$112,186	\$112,615	\$89,568	\$91,108						\$104,890
45 to 49	99	156	134	96	30	27	1				543
	\$101,756	\$105,039	\$130,393	\$116,565	\$97,529	\$75,449	*				*
50 to 54	87	122	98	72	105	65	28	3			580
	\$103,551	\$103,135	\$129,081	\$123,532	\$103,239	\$92,728	\$85,790	\$64,666			\$107,929
55 to 59	39	73	77	41	77	108	28	11			454
	\$101,069	\$105,715	\$117,720	\$113,113	\$134,454	\$111,787	\$99,302	\$79,474			\$113,307
60 to 64	27	39	32	19	28	45	52	6	4		252
	\$111,859	\$115,215	\$112,200	\$126,742	\$135,790	\$139,101	\$127,872	\$149,406	\$66,386		\$124,544
65 +	6	11	10	10	11	18	22	29	3		120
	\$107,732	\$173,301	\$139,375	\$133,956	\$151,838	\$163,860	\$169,583	\$184,996	\$146,378		\$162,005
Total	983	961	562	282	262	263	131	49	7		3,500
	\$84,824	\$99,078	\$116,551	\$114,616	\$116,769	\$111,583	*	\$149,582	\$100,668		\$102,864
% female	60%	57%	49%	54%	51%	56%	47%	31%	57%		55%

* Pensionable earnings with two members or less are not shown for confidentiality reason.

The distribution of the inactive members by age as at the valuation date is summarized as follows:

Age	Deferred Pensioners		Pensioners and Survivors	
	Number	Average Pension	Number	Average Pension
Up to 44	270	\$3,513	1	*
45 – 49	121	\$5,900	1	*
50 – 54	163	\$6,131	4	*
55 – 59	143	\$8,516	87	\$32,254
60 – 64	60	\$4,016	344	\$29,647
65 – 69	22	\$2,841	451	\$36,317
70 – 74	8	\$3,303	402	\$38,141
75 – 79			343	\$36,390
80 – 84	1	*	215	\$30,393
85 – 89	3	*	173	\$28,822
90 – 94	2	*	69	\$19,611
95 +			20	\$13,129
Total	793	\$5,325	2,110	\$33,395

* Pensions in cells with four or less are not shown for confidentiality reason.

APPENDIX F

Summary of Plan Provisions

Mercer has used and relied on the plan documents, including amendments and interpretations of plan provisions, supplied by the University of Ottawa. If any plan provisions supplied are not accurate and complete, the results of any calculation may differ significantly from the results that would be obtained with accurate and complete information. Moreover, plan documents may be susceptible to different interpretations, each of which could be reasonable, and the results of estimates under each of the different interpretations could vary.

This valuation is based on the plan provisions in effect on January 1, 2016.

In 2016, increases in members' contribution rates effective January 1, 2017, January 1, 2018 and January 1, 2019 were ratified with various groups of active participants. The resulting contribution rates, which are reflected in the current valuation, are as follows:

	2017	2018	2019 and beyond
Contribution rate:	<i>(below / above YMPE threshold²³)</i>		
APUO	6.05% / 9.30%	6.60% / 10.15%	6.60% / 10.15%
SSUO, Non-Union, 772A & 772B	6.05% / 9.30%	6.60% / 10.15%	7.15% / 11.00%
PIPSC	6.05% / 9.30%	6.05% / 9.30%	6.05% / 9.30%

It should be noted that the members' contribution rates for some of the above groups are still under negotiation and may be subject to change.

The following is a summary of the main provisions of the Plan in effect on January 1, 2016. This summary is not intended as a complete description of the Plan.

<i>Background</i>	The Plan became effective September 1, 1963. Benefits are based on a set formula and are entirely paid for by the University.
<i>Eligibility for Membership</i>	An employee hired after age 30 must join the plan on the effective date of employment. An employee hired before age 30 is eligible to join the plan on the first day of any month and must join the plan after two years of service, or attainment of age thirty, whichever is the earliest. Part-time employees are eligible to join the plan after they have, in two consecutive calendar years, worked for 24 continuous months and either earned 35% of the YMPE or worked at least 700 hours in each of these two consecutive calendar years.

²³ 1999 YMPE indexed at 55% of the percentage increase in the YMPE since 2003

<i>Employee Contributions</i>	<ul style="list-style-type: none"> Effective January 1, 2016, members are required to contribute 5.45% of earnings up to 85% of the 1999 YMPE indexed at 55% of the percentage increase in the YMPE since 2003, and 8.45% of the excess earnings up to total contributory earnings of 120% of the maximum salary paid to a professor. Effective January 1, 2017, January 1, 2018 and January 1, 2019, ratified increases in members required contributions for appropriate groups of active participants (see table on previous page). <p>For members in receipt of the University's long-term disability income plan, contributions are not required.</p>
<i>Retirement Dates</i>	<p>Normal Retirement Date</p> <ul style="list-style-type: none"> Academic Staff – The first day of July coincident with or next following the member's 65th birthday. Support Staff – The first day of the month coincident with or next following the member's 65th birthday. <p>Early Retirement Date</p> <ul style="list-style-type: none"> The member may choose to retire as early as age 55.
<i>Normal Retirement Pension</i>	<p>For service before January 1, 2004: The maximum between:</p> <ul style="list-style-type: none"> 1.3% of the average of the 60 highest monthly pensionable earnings up to 85% of the 1999 YMPE and 2% of the excess for each year of credited service; and 1.5 % of the average of the 60 highest monthly pensionable earnings for each year of credited service. <p>For service on or after January 1, 2004: The maximum between:</p> <ul style="list-style-type: none"> 1.3% of the average of the 60 highest monthly pensionable earnings up to 85% of the 1999 YMPE indexed at 55% of the percentage increase in the YMPE since 2003 and 2% of the excess for each year of credited service; and 1.5 % of the average of the 60 highest monthly pensionable earnings for each year of credited service.
<i>Early Retirement Pension</i>	<p>If a member retires early, the member will be entitled to a pension that is calculated the same way as for a normal retirement. An unreduced pension will be payable if the member has attained age 60 or has satisfied the rule of 90 (age + credited service = 90).</p> <p>The pension will be actuarially reduced for the period that the early retirement date precedes the earlier of attainment of age 60 or the rule of 90 (based on credited service assuming that the member would have remained in employment).</p>
<i>Maximum Pension</i>	<p>The total annual pension payable from the Plan upon retirement, death or termination of employment cannot exceed the lesser of:</p> <ul style="list-style-type: none"> 2% of the average of the best three consecutive years of total compensation paid to the member by the University, multiplied by total credited service; and the maximum permitted under the Income Tax Act (\$2,890.00 per year of service in 2016), multiplied by the member's total credited service, reduced for early retirement as per the Income Tax Act, as applicable. <p>The maximum pension is determined at the date of pension commencement.</p>

<i>Death Benefits</i>	<p>Pre-retirement:</p> <ul style="list-style-type: none">• If a member dies before the normal retirement date and before any pension payments have begun, the member's spouse, or beneficiary if there is no spouse, will receive a lump sum settlement equal to the value of the benefits to which the member would have been entitled had employment terminated on the date of death. <p>Post retirement:</p> <ul style="list-style-type: none">• The normal form of payment is a lifetime pension guaranteed for five years if there is no eligible spouse at retirement. If there is an eligible spouse at retirement, the normal form is a lifetime pension guaranteed for five years with a survivor pension of 60% of the original pension amount payable to the surviving spouse after the member's death. However, the member may elect to receive an optional form of pension on an actuarial equivalent basis.
<i>Termination Benefits</i>	<p>If a member's employment terminates for reasons other than death or retirement, the member is entitled to receive a deferred pension equal to the benefit accrued to the date of termination of service, commencing at age 60 or upon attainment of 90 points (based on actual credited service), but not earlier than age 55. A member may elect to receive an actuarially reduced pension as early as age 55.</p> <p>Instead of receiving a pension, a member may, before age 55, transfer the greater of the commuted value of that pension and twice his required contributions with interest into another retirement vehicle in accordance with the pension legislation.</p>
<i>Pension Indexation</i>	<p>Pensions, including deferred pensions, are increased annually from January 1st following the earliest of the date of retirement or termination of service in accordance with changes in the cost of living as measured by the Consumer Price Index (CPI). Pensions are indexed annually by the increase in the CPI minus 1% up to a maximum increase of 8% per annum. However, if the increase in CPI is 3% or less, then indexation is provided up to the lesser of 2% or the actual rate of increase in the CPI. Additional increases to reflect full CPI increases to the date of adjustment may be granted, provided the plan's financial position meets specific conditions.</p>

APPENDIX G

Employer Certification

With respect to the Report on the Actuarial Valuation for Funding Purposes as at January 1, 2016 of the University of Ottawa Retirement Pension Plan, I hereby certify that, to the best of my knowledge and belief:

- The valuation reflects the terms of the University's engagement with the actuary described in Section 2 of this report, particularly the requirement to include a margin of 0.41% in the discount rate used to perform the going concern valuation and the University's decisions in regards to determining the going-concern and solvency funding requirements.
- A copy of the official plan documents and of all amendments made up to January 1, 2016 was provided to the actuary and is reflected appropriately in the summary of plan provisions contained herein.
- The asset information summarized in Appendix B is reflective of the Plan's assets.
- The membership data provided to the actuary included 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, 2016.
- All events subsequent to January 1, 2016 that may have an impact on the Plan have been communicated to the actuary.

ORIGINAL REPORT SIGNED BY:

P. Marc Joyal

Signed

Tom Valks

Signed

P. Marc Joyal

Name

Tom Valks

Name

Vice president, Resources

Title

Chief Investment Officer

Title

November 29, 2016

Date

November 29, 2016

Date



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