Board of Governors
PENSION & BENEFITS COMMITTEE
Friday 15 May 2020
9:30 a.m. to 12:00 noon

This meeting will be held via Microsoft Teams

Non-members may arrange to join the electronic meeting by contacting Melissa Holst, mjholst@uwaterloo.ca

		OPEN SESSION	**ACTION**
9:30	1.	Approval of the 20 March 2020 Minutes (Open Session)* and Business Arising	Decision
	2.	Execution Against the Work Plan* [Grivicic]	Information
	3.	Update on Government Pension Plan Initiatives [Shapira]	Information
9:35	4.	Annual Audit of the Pension Plan Fund Financial Statements* [Sarah Hadley, Blaine Hertzberger of EY]	Decision
	5.	Previous Years' Fees and Expenses* [Sarah Hadley]	Information
10:00	6.	Draft Actuarial Valuation as at 1 January 2020* [Byron, Shapira]	Recommendation to BOG
10:45	7.	Quarterly Risk Management Dashboard – Q1 2020* [Byron)	Information
10:55	8.	Update re: Holistic Benefits Working Group	Information
11:00	9.	Board-approved 2019-20 Provisional Operating Budget Overview* [Rush]	Information
	10.	Other Business	
		CONFIDENTIAL SESSION	
11:10	11.	Approval of the 20 March 2020 Minutes (Confidential)+ and Business Arising	Decision
		Next Meeting: Friday 12 June 2020, 9:30 a.m. – 12:00 noon	

*attached
** to be distributed
+ distributed separately

11 May 2020
revised 14 May 2020

Mike Grivicic
Associate University Secretary

Please convey regrets to Melissa Holst at 519-888-4567 x36125 or mjholst@uwaterloo.ca

Future Agenda Items

a. Pension Contribution for Members of LTD
b. Level of LTD coverage vs. practical requirements

University of Waterloo
Board of Governors
PENSION & BENEFITS COMMITTEE
Minutes of the 20 March 2020 Meeting
[in agenda order]

Present: Peter Barr, Terrence Birmingham, Ted Bleaney, Mike Grivicic (secretary), Michael Herz, Dennis Huber, Ranjini Jha, David Kibble, Jim Rush, David Saunders, Michael Steinmann, Mary Thompson, Marilyn Thompson, Ken Vetzal

Consultant: Linda Byron, Allan Shapira

Resources: Sarah Hadley, Lee Hornberger

Organization of Meeting: Peter Barr took the chair, and Mike Grivicic acted as secretary. The secretary advised that a quorum was present. With the meeting being held entirely by teleconference, the chair provided some guidance to facilitate the consideration of the meeting's business. At the suggestion of the consultant and with agreement by consensus from members, item #6 was deferred to the next meeting.

1. APPROVAL OF THE 21 FEBRUARY 2020 MINUTES (OPEN SESSION) AND BUSINESS ARISING
Members agreed to amend the text of the motion in item #4 to strike the text after the word "provision", and observed that Aon will still bring forward draft revised pension plan text to the next meeting. A motion was heard to approve the minutes as amended. Saunders and Bleaney. Carried.
a. Update re: Communication of RPP Changes to Members. No discussion on this item.

2. EXECUTION AGAINST THE WORK PLAN
This item was received for information.

3. UPDATE ON GOVERNMENT PENSION PLAN INITIATIVES
Shapira observed that with the simultaneous drop in markets and interest rates, there have been discussions around the province potentially providing some form of systemic pension funding relief. A potential filing of the actuarial valuation based on the 1 January 2020 date could be advantageous.

4. GROUP BENEFITS PROGRAM – ANNUAL RENEWAL
Hornberger reviewed items (a)-(d) in order and provided an overview for each item.
a. Life Insurance – Premium Rate. The unrestricted deposit account (UDA) balance is projected to stand at $1.83 million on 30 April 2020, and while the full amount could be withdrawn by the university, the funds have been accumulated through contributions from both the university and employees. In recent years, the UDA has been used to subsidize the premium required by Sun Life Financial. Members observed that the subsidy only applies to basic life coverage as the university does not carry a share of the results for optional life coverage. A motion was heard to approve option 2, to maintain the 20% subsidy to the premium rate from the UDA, as presented. Jha and Huber. Carried.
b. Long Term Disability. A two-year rate guarantee was negotiated last year. Since the benefit is fully paid for by employees, Aon analyzed whether a rate change would have been warranted if the two-year rate guarantee was not in place; based on their analysis a position of no change is appropriate based on the university's claims experience. The level of insured earnings is increased to $182,971 effective 1 May 2020.
c. Healthcare Benefits – ASO Fees/Charges. A two-year expense level guarantee was negotiated last year for all fees are charges except for GMA and pooling; for the latter, Aon was able to negotiate a reduction of the pooling charge with Canada Life. A motion was heard to approve the ASO fees and charges effective 1 May 2020 as presented. Bleaney and Saunders. Carried.
d. Healthcare Benefits – Budget Rates. A motion was heard to approve the budget rates as presented. Huber and Kibble. Carried.

5. ACTUARIAL VALUATION RESULTS (RPP AND PPP) AND REVIEW OF CONTRIBUTION AND PROTOCOL CALCULATIONS (RPP AND PPP)
Byron discussed the valuation results: change to CPM2014Public mortality tables including improvements under Scale MI-2017, as well as changes to format of retirement assumptions; valuation results buoyed by $228M investment gains in 2019; going concern surplus of $72M before provision for adverse deviation (PfAD), and

going concern switches to a deficit of $73.7M after PfAD; slight increase to special payments from 2021 onward; impact of changes to discount rate, PfAD, change to the hard dollar cap, and migration from age 64 retirement rate assumption to retirement rate table on slide 12; solvency ratio is 0.90, above the key 0.85 level in the regulator framework. Members discussed: time will be needed to manage the current pension funding climate, though there appears to be enough funding in the system to weather the situation; on slide 17, the member contributions exceed the university current service cost for the year 2022 by $135,000 which reflects full implementation of the new contribution rates but does not reflect other university contributions; it is unlikely that if the university were to file this valuation that it would disqualify the plan from availing of potential provincial relief; the plan's investments are such that equities are currently approaching the lower end of the range as described in the SIPP. By consensus, members agreed to direct that Aon bring a valuation for recommendation to the Board of Governors to the next PB meeting.

6. UNIVERSITY OF WATERLOO PENSION PLAN, SUGGESTED WORDING CHANGE TO ARTICLE 12 – TRANSFERS OF MONIES TO AND FROM PENSION FUND

This item was deferred to the next meeting.

7. OTHER BUSINESS

a. Annual Committee Self-Assessment. Completed self-assessments can be sent to the secretary.

With no further business in open session, the committee proceeded into confidential session.

NEXT MEETING

The next meeting is scheduled for Friday 15 May 2020, 9:30 a.m. – 12:00 noon in NH 3318.

24 March 2020

Mike Grivicic
Associate University Secretary

Execution against Work Plan

Pension & Benefits Committee, Board of Governors, University of Waterloo

The below represents the annual responsibilities of the P&B Committee and has been prepared as an aid to planning only. The committee's activities are much broader, however, and include: legislative changes, plan changes and improvements; selection of managers and service providers; and requests from the UW community regarding pension and benefits plans.

Task	**Frequency (Target month)**	**16 May 2019**	**14 June 2019**	**20 Sept 2019**	**18 Oct 2019**	**15 Nov 2019**	**13 Dec 2019**	**17 Jan 2020**	**21 Feb 2020**	**20 Mar 2020**	**15 May 2020**
Approval of Actuarial Valuation Assumptions	Annual (Jan)							✓			
Investment Status of PPP	Annual (Jan)							✓			
Cost-of-living Increase for Pensioners	Annual (Feb)								✓		
Pensions for Deferred Members	Annual (Feb)								✓		
Salaries for Pension Purposes for Individuals on Long-term Disability	Annual (Feb)								✓		
Actuarial Valuations (RPP and PPP), with posting to website once approved	Annual (Mar)									✓	
Review of Contribution and Protocol Caps (RPP and PPP)	Annual (Mar)									✓	
Benefits Plan Premium Renewals	Annual (Mar)									✓	
Indexing of Long-term Disability Plan Benefits and Maxima	Annual (Mar)									✓	
Annual Committee Self-Assessment	Annual (Mar)									✓	
Budget Overview	Annual (May)	✓									✓
Previous Years' Fees and Expenses	Annual (May)	✓									✓
Annual Audit of the Pension Plan Fund Financial Statements	Annual (May)	✓									✓

D = deferred

Task	**Frequency**	**16 May 2019**	**14 June 2019**	**20 Sept 2019**	**18 Oct 2019**	**15 Nov 2019**	**13 Dec 2019**	**17 Jan 2020**	**21 Feb 2020**	**20 Mar 2020**	**15 May 2020**
Benefits Utilization Report	Annual (June)		✓								
Annual review re: benefits added/removed from insured plans in the market	Annual (June)		✓								
Review of Committee Terms of Reference	Annual (June)										
Indexing of Plan Maxima – Health, Dental, Retiree Life Insurance	Annual (Nov)					✓					
Employee and Family Assistance Program – report on utilization	Annual (Nov)					✓					
Maximum pension limits and caps adjustments, based on average industrial wage increase (AIW)	Annual (Dec)						✓				
Total Fund Overview	Quarterly	✓			✓		✓				
Investment Manager Review	Semi-annually										
Approval of the Statement of Investment Policies and Procedures (SIPP)	Annual					✓					
Annual Report to the Community	Annual								✓		
Actuarial Filing Minimum every three years - most recent filings in 2017 and 2018											

The University of Waterloo Pension Plan for Faculty and Staff

December 31, 2019

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Members of the Pension & Benefits Committee of
The University of Waterloo Pension Plan for Faculty and Staff

May 8, 2020

We are pleased to provide the required communications related to our audit of the pension plan of the University of Waterloo Pension Plan for Faculty and Staff (the Plan).

Our audit was designed to express an opinion on the statement of net assets available for benefits and the statement of changes in net assets available for benefits as at December 31, 2019 and for the year then ended. We received the full support and assistance of your personnel in conducting our audit. Open and candid dialogue with you is a critical step in the audit process and in the overall governance process and we appreciate this opportunity to share the insights from our audit with you.

This report is intended solely for the information and use of the Pension & Benefit Committee and management. It is not intended to be, and should not be, used by anyone other than these specified parties. We disclaim any responsibility to any third party who may rely on it. Further, this report is a by-product of our audit and indicates matters identified during the course of our audit. Our audit did not necessarily identify all matters that may be of interest to the Pension & Benefits Committee in fulfilling its responsibilities.

If you have any questions or comments, please do not hesitate to contact us.

Sincerely

Ernst & Young LLP

Chartered Professional Accountants
Licensed Public Accountants

Blaine Hertzberger, CPA, CA, LPA
Partner
519 571 3339

EY services

Our primary deliverable was to express an opinion on the statement of net assets available for benefits and the statement of changes in net assets available for benefits of the Plan. We have completed substantially all of our audit procedures and expect to issue an unqualified audit opinion upon finalization of the following matters:

- Receipt of signed letter of representation from management
- Approval of the financial statements by the Pension & Benefits Committee

Auditor's responsibility under Canadian Auditing Standards (CAS)

The financial statements are the responsibility of management. Our audit is designed in accordance with the CAS to obtain reasonable, rather than absolute, assurance about whether the financial statements are free of material misstatement.

Independence

We confirm our independence to management and the Pension & Benefits Committee pursuant to CAS 260. We are not aware of any relationships that may reasonably be thought to bear on our independence and we reconfirm our independence up to the date of this report.

Summary of the audit approach

For the purpose of the audit of the financial statements, our audit plan is developed after considering the inherent risks and control risks and the effectiveness of the internal controls related to the Plan. A variety of factors are considered when establishing the audit scope including size, specific risks, the volumes and types of transactions processed, changes in the business environment, and other factors. Our audit strategy focuses on those financial statement items that may be more vulnerable to material misstatement, including the risk of fraud. Our procedures for your Plan were primarily of a substantive nature.

Our principal areas of focus were:

- Completeness and measurement of pension contributions
- Measurement and occurrence of benefit payments
- Completeness and occurrence of investment income, and
- Valuation of investments

While the majority of our procedures were substantive procedures, we have relied on the Service Organization Control (SOC1) report issued for CIBC Mellon, the Fund's custodian, and BNY Mellon, a subservice provider to CIBC Mellon providing custody and valuation services.

At the conclusion of the audit, we formulate our opinion on the financial statements of the Fund as to their fair presentation in all material respects. Our estimation of materiality requires professional judgment and necessarily takes into account qualitative as well as quantitative considerations. Materiality for net assets can be set at 1-2%. Materiality for the 2019 audit was set at approximately 1.8% (2018 – 1.9%) of net assets, or $34,000,000 (2018 - $32,000,000).

Critical policies, estimates, areas of audit emphasis, and significant risks

Disclosure requirements

There were no changes made to the disclosure requirements in fiscal 2019.

Auditing the valuation of fixed income investments

Canadian auditing standards require us to perform additional procedures to audit the valuation of investments with higher valuation risk or measurement uncertainty risk by performing the following:

- Document an understanding of management's investment strategy
- Understand how the investment portfolio is priced and which pricing sources are used
- Understand the types of securities that compose the portfolio and evaluate them to determine the appropriate classification as higher or lower estimation uncertainty, and
- For securities classified as higher uncertainty estimation, if applicable, perform additional procedures to gain comfort over the appropriateness of the valuations.

EY reviewed the individual fixed income securities held in the plans for any that may be considered to have higher estimation uncertainty and performed additional procedures where necessary. Based on procedures performed in 2019, there were no fixed income investments identified that exhibited higher estimation uncertainty. The bonds and short-term investments held by the Plan are valued based on quoted bids from recognized investment dealers and therefore, are classified as level 2. We did not identify any issues with the valuation of fixed income investments.

Auditing the valuation of equity investments

We updated our understanding of how the fair values of the Plan's investments have been determined and tested the fair values to assess the appropriateness of these fair values. We confirmed all investments held at year-end with the custodian (CIBC Mellon) and respective investment managers. In addition, we obtained the CIBC Mellon and BYN Mellon Service Organization Control report and were able to place reliance on the custodian's controls as no significant deficiencies were identified within the reports.

On a sample basis, we tested the market values of equity investments held by the Plan. EY noted no issues with the investment valuation when compared to independent market information. The equity investments held by the Plan are lower estimation uncertainty since they are exchange traded or there is daily pricing and therefore they are classified as level 1 in the fair value hierarchy disclosure. All pooled fund investments held by the Plan are valued based on inputs that have observable market data and are classified as Level 2. We obtain fund manager statements to support the market value of the pooled funds. As a result of the procedures performed, we did not identify any issues with the valuation of equity or pooled fund investments.

Employer contributions

We updated our understanding of the employer contributions process. With reference to the latest actuarial funding valuation report as of January 1, 2018 we verified that the employer contributions made by the Plan were in accordance with the recommendations of the actuary.

We tested and recalculated on a sample basis the employee and employer contributions. No issues were noted.

Benefit payments

We confirmed our understanding of the benefit payments process and examined, on a test basis, benefit payments to verify they were accurately processed. We performed an analytical review of benefit payments and investigated variances from the prior year. In addition, we confirmed that members who withdrew from the pension plan in the current year, but had not yet received payment were properly accrued for at year-end. No issues were noted.

Accounting estimates

There are no significant judgments or estimates required to prepare the financial statements where actual amounts are likely to be significantly different from the estimates.

Fraud considerations and the risk of management override

We are responsible for planning and performing our audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether caused by error or by fraud (CAS 240, *The Auditor's Responsibilities Relating to Fraud in an Audit of Financial Statements*).

Our audit procedures encompassed the requirements of CAS 240: brainstorming, gathering information to facilitate the identification of and response to fraud risks and performing certain procedures to address the risk of management override, including examining journal entries, reviewing accounting estimates and evaluating the business rationale of significant unusual transactions.

We are not aware of any fraud or non-compliance with laws and regulations involving senior management or any fraud or non-compliance with laws and regulations that could cause a material misstatement of the financial statements.

Summary of audit differences (SAD)

During the course of our audit, we accumulate differences between amounts and disclosures recorded by the Plan, and amounts and disclosures that we believe are required to be recorded under Canadian accounting standards for pension plans. In fiscal 2019, no audit adjustments were identified during the audit.

Summary of significant disclosure deficiencies

During the course or our audit, we identify those significant disclosures required in the financial statements of the Plan, that we believe were not adequately reflected. We did not identify any significant disclosure deficiencies.

Other required communications

- There were no major issues discussed with the Pension & Benefits Committee or those charged with governance in connection with our initial or recurring retention as the auditors, including, among other matters, any discussions regarding the application of accounting principles and auditing standards, the scope of the audit, financial statement disclosures and the wording of the auditors' report.
- There were no disagreements with management about matters that individually or in the aggregate could be significant to the Plan's financial statements or the auditors' report.
- We are not aware of any instances where management consulted with other accountants about auditing or accounting matters.
- There were no serious difficulties encountered in dealing with management related to the performance of the audit.
- We are not aware of any significant unusual transactions recorded by the Fund or of any significant accounting policies used by the Plan related to controversial or emerging areas for which there is a lack of authoritative guidance.
- We are not aware of any related party transactions that are not in the normal course of operations and that involve significant judgments made by management concerning measurement or disclosure.
- There were no material alternative accounting treatments that have been discussed with management during the current audit period.
- There were no significant matters arising during the audit in connection with the Plan's related parties.
- There are no other findings or issues arising from the audit that are, in our judgment, significant and relevant to those charged with governance regarding the oversight of the financial reporting process.
- Based on our inquiries of management and those charged with governance, we are not aware of any subsequent events which might affect the financial statements other than those disclosed in the notes to the financial statements.

Letter of representation

Ernst & Young LLP May 15, 2020

In connection with your audit of the financial statements of University of Waterloo Pension Plan for Faculty and Staff (the "Plan") as of December 31, 2019, we recognize that obtaining representations from us concerning the information contained in this letter is a significant procedure in enabling you to form an opinion whether the financial statements present fairly, in all material respects, in all material respects, the net assets available for benefits and changes in net assets available for the benefits of the Plan in accordance with the financial reporting provisions of the financial reporting framework described in note 1 of the financial statements (the disclosed basis of accounting).

We understand that the purpose of your audit of our financial statements is to express an opinion thereon and your audit was conducted in accordance with Canadian generally accepted auditing standards, which involves an examination of the accounting system, internal control and related data to the extent you considered necessary in the circumstances.

Certain representations in this letter are described as being limited to matters that are material. Items are considered material, regardless of size, if they involve an omission or misstatement of financial statement information that, in the light of surrounding circumstances, makes it probable that the judgment of a reasonable person relying on the information would be changed or influenced by the omission or misstatement.

Accordingly, we make the following representations, as of May 15, 2020, which are true to the best of our knowledge and belief:

Financial statements and financial records

1. We have fulfilled our responsibilities, as set out in the terms of the audit engagement letter dated October 3, 2019, for the preparation of the financial statements in accordance with the disclosed basis of accounting.
2. We acknowledge that, as members of management of the Plan, we are responsible for the fair presentation of the financial statements. We believe the financial statements referred to above present fairly, in all material respects, the net assets available for benefits and changes in net assets available for benefits of the Plan in accordance with the disclosed basis of accounting.
3. The significant accounting policies adopted in the preparation of the financial statements are fully and fairly described in the financial statements.
4. As members of Management of the Plan, we believe that the Plan has a system of internal controls adequate to permit the preparation of accurate financial statements in accordance with the disclosed basis of accounting.
5. We are not aware of any significant deficiencies in the design or operation of internal control over financial reporting. There have been no significant changes in internal control since December 31, 2019.

Non-compliance with laws and regulations, including fraud

1. We acknowledge that we are responsible to determine that the Plan's activities are conducted in accordance with laws and regulations and that we are responsible to identify and address any non-compliance with applicable laws and regulations, including fraud.

2. We acknowledge that we are responsible for the design, implementation and maintenance of internal controls to prevent and detect fraud and error.
3. We have disclosed to you the results of our assessment of the risk that the financial statements may be materially misstated as a result of fraud.
4. We have disclosed to you all known actual or suspected non-compliance with laws and regulations whose effects should be considered when preparing the financial statements.

Uncorrected misstatements

1. There are no unrecorded audit differences (including the effects of correcting or reversing prior year audit differences) relating to the current year financial statements.

Independence

1. We are not aware of any capital lease, material cooperative arrangement, or other business relationship between the Plan or Plan sponsor and Ernst & Young LLP or any other member firm of the global Ernst & Young organization.
2. We are not aware of any reason that Ernst & Young LLP would not be considered to be independent for purposes of the Plan's audit.

Conflicts of interest

1. There are no instances where any officer or employee of the Plan sponsor has an interest in a company with which the Plan does business that would be considered a "conflict of interest." Such an interest would be contrary to the Plan sponsor's policy.

Completeness of information

1. We have provided you with:
   (a) Access to all information of which we are aware that is relevant to the preparation of the financial statements such as records, documentation and other matters;
   (b) Additional information that you have requested from us for the purpose of the audit; and
   (c) Unrestricted access to persons from whom you determined it necessary to obtain audit evidence
2. We have made available to you all financial records and related data and all minutes of the meetings of the Pension Committee (or summaries of actions of recent meetings for which minutes have not yet been prepared) held through the year to the date of this letter.
3. We also have made available to you all significant contracts, including amendments, and agreements and have communicated to you all significant oral agreements. We have complied with all aspects of contractual agreements that would have a material effect on the financial statements in the event of non-compliance.
4. There are no transactions of a material nature, individually or in the aggregate, that have not been properly recorded in the accounting records underlying the financial statements.
5. We confirm the completeness of information provided regarding the identification of related parties. We have disclosed to you the identity of the Plan's related parties and all related party relationships and

transactions of which we are aware, including sales, purchases, loans, transfers of assets, liabilities and services, leasing arrangements, guarantees, non-monetary transactions and transactions for no consideration for the year, as well as related balances due to or from such parties at the year end. These transactions have been properly measured and disclosed in the financial statements.

6. We have disclosed to you all significant Plan benefits and have made available to you all significant summary Plan descriptions, benefit communications, and all other relevant information, including Plan changes, which constitute the Plan. We have no intentions to terminate the Plan.

Recognition, measurement and disclosure

1. We believe that the significant assumptions underlying accounting estimates, including those measured at fair value, and disclosures used in the preparation of the financial statements are reasonable and appropriate in the circumstances.

2. We have no plans or intentions that may materially affect the carrying value or classification of assets and liabilities reflected in the financial statements.

Risks and measurement uncertainties

1. We have disclosed the assumptions that we have made about the future, and all other major sources of estimation uncertainties, including the effects of the COVID-19 pandemic, which have a significant risk of resulting in a material adjustment to the carrying amounts of assets and liabilities within the next financial year.

Ownership of assets

1. The Plan has satisfactory title to all assets appearing in the statement of net assets available for benefits, and there are no liens or encumbrances on the Plan's assets, nor has any asset been pledged. All assets to which the Plan has satisfactory title appear in the statement of net assets available for benefits.

Oral or written guarantees

1. There are no oral or written guarantees, including guarantees of the debt of others.

Events of default under debt agreements

1. No events of default have occurred with respect to any of the Plan's debt agreements.

Contributions

1. All contributions receivable represent valid claims against the debtors indicated.

2. All contributions are recorded on an accrual basis.

3. All contributions for employee services rendered for the year have been recorded as of that year. No amount has been included in contributions for employee services that have not been rendered.

Investment assets and investment liabilities

1. All investments which are owned by the Plan are recorded in the accounts and are invested in accordance with the Plan's stated investment policies.

2. The Plan has properly measured all investment assets and investment liabilities at fair value at the date of net assets available for benefits.

3. All investment income and changes in fair value, consisting of realized and unrealized gains and losses, for the year are appropriately recorded in the financial statements.
4. The methods and significant assumptions used to determine fair values of financial instruments, including derivatives, are based on information provided by our custodian. Our valuation methodologies have been consistently applied from period to period and we believe that the methods and significant assumptions used are reasonable, reflect those we believe would be used by market participants, and result in a measure of fair value that is appropriate for financial statement measurement and disclosure purposes. In addition, our disclosures related to fair value measurement are complete and adequate.
5. We have disclosed all information regarding the nature and extent of risks arising from financial instruments to which we are exposed at the year end, including relevant quantitative and qualitative disclosures for each type of identified risk.

Liabilities and contingencies

1. Except for the pension obligations of the Plan, all liabilities and contingencies, including those associated with guarantees, whether written or oral, have been disclosed to you and are appropriately reflected in the financial statements.
2. We have informed you of all outstanding and possible claims, whether or not they have been discussed with legal counsel.
3. We are unaware of any known or probable instances of non-compliance with the requirements of regulatory or governmental authorities, including their financial reporting requirements, and there have been no communications from regulatory agencies or government representatives concerning investigations or allegations of non-compliance.
4. We are unaware of any violations or possible violations of laws or regulations the effects of which should be considered for disclosure in the financial statements or as the basis of recording a contingent loss.
5. We have not consulted a lawyer concerning claims or possible claims.

Purchase commitments

1. At the year end, the Plan had no unusual commitments or contractual obligations of any sort which were not in the ordinary course of business and which might have an adverse effect upon the Plan and/or which may require a provision for an onerous contract (e.g., contracts or purchase agreements above market price; repurchase or other agreements not in the ordinary course of business; material commitments for the purchase of property, plant and equipment, etc.).

Use of the work of specialists

1. We agree with the findings of specialists in evaluating the actuarial valuation and have adequately considered the qualifications of the specialists in determining the amounts and disclosures included in the financial statements and the underlying accounting records. We did not give or cause any instructions to be given to specialists with respect to the values or amounts derived in an attempt to bias their work, and we are not otherwise aware of any matters that have had an effect on the independence or objectivity of the specialists.

Subsequent events

1. The financial statements were approved and authorized for issuance by Pension Committee on May 15, 2020. The financial statements reflect adjusting subsequent events up until this date, but none after this date. The financial statements have not been adjusted for non-adjusting subsequent events (such as declines in market values of investments after year end). Non-adjusting subsequent events occurring prior to May 15, 2020 have been disclosed where material, including all events or circumstances that could influence the economic decisions that users make on the basis of the financial statements, including events related to the COVID-19 pandemic.

Comparative figures

1. In connection with your audit of the comparative financial statements for the year ended December 31, 2018, we represent, to the best of our knowledge and belief, the following:

   - There have been no significant errors or misstatements, or changes in accounting policies that would require a restatement of the amounts from the financial statements for the year ended December 31, 2018 which are shown as comparative amounts in the financial statements for the year ended December 31, 2019. Any differences in the comparative amounts from the amounts in the financial statements for the year ended December 31, 2018 are solely the result of reclassifications for comparative purposes.

Dennis Huber – VP Administration & Finance	Date
Sarah Hadley –Director of Finance	Date
Lee Hornberger – Director, HR Total Compensation	Date
Sue McGrath – Manager, Pension Services	Date

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The insights and quality services we deliver help build trust and confidence
in the capital markets and in economies the world over. We develop outstanding leaders who team to deliver on our promises to all of our stakeholders. In so doing, we play a critical role in building a better working
world for our people, for our clients and for our communities.
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University of Waterloo Pension Plan for Faculty and Staff

[Ontario Registration Number 0310565]

Financial statements

December 31, 2019

Independent auditor's report

To the Pension and Benefits Committee of the
University of Waterloo

Opinion

We have audited the accompanying financial statements of the **University of Waterloo Pension Plan for Faculty and Staff** [the "Plan"] [Ontario Registration Number 0310565], which comprise the statement of net assets available for benefits as at December 31, 2019, and the statement of changes in net assets available for benefits for the year then ended, and a summary of significant accounting policies and other explanatory information.

In our opinion, the accompanying financial statements present fairly, in all material respects, the net assets available for benefits of the Plan as at December 31, 2019, and the changes in its net assets available for benefits for the year then ended. The financial statements have been prepared by management based on the financial reporting provisions of Regulation 909, Section 76 of the *Pension Benefits Act* (Ontario).

Basis for opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the *Auditor's responsibilities for the audit of the financial statements* section of our report. We are independent of the Plan in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Emphasis of matter – Basis of accounting and restriction on use

Without modifying our opinion, we draw attention to note 1 to the financial statements, which describes the basis of accounting. The financial statements are prepared to assist the Pension and Benefits Committee to meet the requirements of the Financial Services Regulatory Authority of Ontario. As a result, the financial statements may not be suitable for another purpose. Our report is intended solely for the Pension and Benefits Committee and the Financial Services Regulatory Authority of Ontario and should not be used by parties other than the Pension and Benefits Committee or the Financial Services Regulatory Authority of Ontario.

Management's responsibility for the financial statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with the financial reporting provisions of Regulation 909, Section 76 of the *Pension Benefits Act* (Ontario), and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Plan's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Plan or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing the Plan's financial reporting process.

Auditor's responsibilities for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Plan's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Plan's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Plan to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Waterloo, Canada
May 15, 2020

University of Waterloo Pension Plan for Faculty and Staff

[Ontario Registration Number 0310565]

Statement of net assets available for benefits

As at December 31

	2019	2018
	$	$
Assets		
Investment income receivable	**3,936,893**	3,297,331
HST receivable	**286,881**	—
Investments, at fair value *[note 4[a]]*	**1,936,865,955**	1,691,003,976
Total assets	**1,941,089,729**	1,694,301,307
Liabilities		
Benefits payable		
Retirement	**211,909**	16,696
Termination	**11,116**	424,803
Management and administrative fees payable *[note 7[b]]*	**2,364,823**	1,225,264
Total liabilities	**2,587,848**	1,666,763
Net assets available for benefits	**1,938,501,881**	1,692,634,544

See accompanying notes

University of Waterloo Pension Plan for Faculty and Staff

Statement of changes in net assets available for benefits

Year ended December 31

	2019 $	2018 $
Increase in net assets		
Employee contributions		
Required	**35,175,455**	33,072,572
Employer contributions		
Current service	**43,799,000**	42,315,000
Special	**15,628,379**	13,434,655
Transfers from other plans *[note 8]*	**1,696,800**	1,392,021
Interest income *[note 4[d]]*	**23,975,600**	21,694,956
Dividend income *[note 4[d]]*	**24,266,185**	28,786,607
Realized gains on investments	**40,443,207**	92,926,431
Unrealized gains on investments	**143,144,887**	—
Unrealized foreign exchange gains	**—**	7,310,418
Total increase in net assets	**328,129,513**	240,932,660
Decrease in net assets		
Benefits expenses		
Retirement benefits	**64,355,003**	60,236,575
Termination benefits	**8,567,056**	7,586,600
Death benefits	**1,839,652**	4,930,495
Unrealized losses on investments	**—**	146,790,803
Unrealized foreign exchange losses	**3,553,254**	—
Management and administrative expenses *[note 7[a]]*	**3,947,211**	4,956,500
Total decrease in net assets	**82,262,176**	224,500,973
Net increase in net assets for the year	**245,867,337**	16,431,687
Net assets available for benefits, beginning of year	**1,692,634,544**	1,676,202,857
Net assets available for benefits, end of year	**1,938,501,881**	1,692,634,544

See accompanying notes

University of Waterloo Pension Plan for Faculty and Staff

Notes to financial statements

December 31, 2019

1. Basis of presentation

These financial statements of the University of Waterloo Pension Plan [the "Plan"] have been prepared on a going concern basis and in accordance with the significant accounting policies set out below that comply with the financial reporting provisions prescribed by the Financial Services Regulatory Authority of Ontario for financial statements under Regulation 909, Section 76 of the *Pension Benefits Act* (Ontario). The basis of accounting used in these financial statements materially differs from Canadian accounting standards for pension plans in Section 4600, *Pension Plans*, in Part IV of the CPA Canada Handbook in part because it excludes the Plan's pension obligations and related disclosures. Consequently, these financial statements do not purport to show the adequacy of the Plan's assets to meet its pension obligations. These financial statements present the information of the Plan as a separate reporting entity independent of the Sponsor and Plan participants.

In accordance with Section 4600, Canadian accounting standards for private enterprises in Part II of the CPA Canada Handbook have been adopted for policies that do not relate to the Plan's investment portfolio to the extent that those standards do not conflict with the requirements of Section 4600.

2. Description of the Plan

The Plan is a contributory defined benefit pension plan covering employees of the University of Waterloo [the "University" or the "Sponsor"]. The Board of Governors of the University is the administrator of the Plan [the "Administrator"]. The University's Pension and Benefits Committee has been appointed by the Board of Governors to administer the Plan. CIBC Mellon Trust Company is the custodian and trustee of the Plan. The assets of the Plan are held "in trust" within CIBC Mellon Trust Company. Aon has served as the actuary of the Plan during 2019. The Plan is registered under the *Pension Benefits Act* (Ontario) under Registration Number 0310565.

Funding policy

The Plan is open to all full-time and part-time salaried employees who meet certain eligibility requirements. Under the terms of the Plan, the employees are required to contribute 6.25% of base earnings up to the Canada Pension Plan's Yearly Maximum Pensionable Earnings ["YMPE"] limit plus 8.95% of base earnings exceeding the YMPE and up to two times the YMPE, plus 9.95% of base earnings exceeding two times the YMPE. The University contributes the balance of the cost required to fund the Plan, as determined by an actuarial valuation of the Plan. Changes to employee contribution rates into the plan are described in note 10.

Funding valuation

The most recent actuarial valuation, filed with the Financial Services Regulatory Authority of Ontario, was as of January 1, 2018 and was prepared by Aon. The rate of compensation increase used was 4.00% per year and the discount rate was 5.6%. The next required actuarial valuation is as of January 1, 2021.

Notes to financial statements

December 31, 2019

Benefits

On the normal retirement date, a member is entitled to an annual pension benefit equal to 1.4% of his or her Final Average Earnings ["FAE"] up to the YMPE average, plus 2.0% of his or her FAE in excess of the YMPE average multiplied by his or her years of credited service. FAE is the member's average annual base earnings during the averaging period's continuous months of highest earnings during the member's last 10 years of employment at the University. The averaging period for FAE is a 60-month averaging period. The YMPE average is determined by averaging the YMPE in the year of retirement plus the YMPE in the four preceding years.

Effective May 1, 2014, the Plan adjusted its guaranteed indexation related to post-retirement cost of living adjustments. Any pension benefits earned as at December 31, 2013 will be indexed at 100% of the Consumer Price Index ["CPI"] to a maximum of 5%, and any pension benefit earned as of an employee's date of retirement less the pension benefit earned as at December 31, 2013 will be indexed at 75% of CPI to a maximum of 5%.

Vested retirement benefits of the Plan are payable upon satisfaction of early retirement eligibility requirements [as early as age 55] and prior to the member's normal retirement date [age 65]. Vested retirement benefits are also payable in the case of termination of employment prior to retirement. A death benefit is payable to the beneficiary of a member as designated.

Income taxes

The Plan is a Registered Pension Trust as defined in the *Income Tax Act* (Canada) and, as such, is not subject to income taxes.

3. Summary of significant accounting policies

Recognition of contributions and benefits

All contributions from the Sponsor and the Plan participants are reflected in the year of the related participant's earnings.

Contributions and benefits payable are recognized on the accrual basis of accounting. Termination benefits payable consist of amounts owing but not yet paid to employees who were terminated from the Plan before the year end. Retirement benefits payable consist of amounts owing but not yet paid to employees who retired before the year end.

Lump-sum payments or transfers out of the Plan are accounted for in the period in which the election to effect such payment or transfer is made.

December 31, 2019

Investments

Investments are recorded at fair market value on the statement of net assets available for benefits.

Fair value is the amount of consideration that would be agreed upon in an arm's length transaction between knowledgeable, willing parties who are under no compulsion to act. The fair value of investment assets is determined as follows:

[a] Cash and short-term deposits are valued at amortized cost which approximates fair value.
[b] Bonds, debentures, equities, preferred shares and derivative financial instruments are valued by reference to quoted market prices.
[c] Investments in pooled funds are valued based on fair value information provided by the fund managers.

Investment liabilities are stated at fair value and represent liabilities that are incurred by the Plan in investment related activities. These may include, but are not limited to, derivatives in a liability position, repurchase agreements, financial instruments sold but not yet purchased, and cash collateral received from counterparties.

Net realized gains or losses on disposal and unrealized changes in fair value for the year are recognized in the statement of changes in net assets available for benefits. Interest earned on investments is recorded on an accrual basis. Dividend income is recorded on the ex-dividend date. Transaction costs are expensed as incurred.

Foreign currency translation

Investments denominated in foreign currencies are translated into Canadian dollars at rates of exchange as at the year-end date. Transactions of investments denominated in foreign currencies are translated into Canadian dollars at rates of exchange applicable on the transaction dates.

Use of estimates

The preparation of financial statements requires the Plan's Administrator to make estimates and assumptions. These estimates and assumptions affect the reported amounts of assets and liabilities and disclosure of contingencies as at the date of the financial statements, and the reported amounts of increases and decreases in net assets available for benefits during the reporting period. Actual results could differ from those estimates.

Notes to financial statements

December 31, 2019

4. Investments

[a] Summary of investments

Investments comprised of the following:

	2019		2018	
	Fair value	**Cost**	**Fair value**	**Cost**
	$	$	$	$
Equities				
Canadian companies	**283,194,312**	**195,187,467**	227,751,127	168,730,351
Foreign equity pooled funds	**757,289,579**	**554,482,525**	632,016,302	520,731,096
	1,040,483,891	**749,669,992**	859,767,429	689,461,447
Bonds, cash and short-term deposits				
Canadian fixed term bonds	**329,857,064**	**328,248,731**	320,295,927	326,361,260
Bond pooled funds	**338,116,553**	**321,325,399**	316,840,611	311,473,073
Cash and short-term deposits	**228,408,447**	**228,408,352**	194,100,009	194,099,977
	896,382,064	**877,982,482**	831,236,547	831,934,310
	1,936,865,955	**1,627,652,474**	1,691,003,976	1,521,395,757

December 31, 2019

[b] Investment managers

The investments are managed by the following investment managers:

	2019		2018	
	Fair value	Cost	Fair value	Cost
	$	$	$	$
TD Asset Management				
Bonds				
Canadian fixed term bonds	**329,857,064**	**328,248,731**	320,295,927	326,361,260
Bond pooled funds	**338,116,553**	**321,325,399**	316,840,611	311,473,073
Foreign equity pooled funds	**260,227,049**	**246,829,122**	214,698,877	239,819,041
Cash and short-term deposits	**12,451,846**	**12,451,846**	2,742,463	2,742,463
	940,652,512	**908,855,098**	854,577,878	880,395,837
University of Waterloo Managed Fund				
Equities				
Canadian equities [infrastructure and real estate]	**173,755,480**	**94,505,166**	170,415,522	112,326,779
Cash and short-term deposits	**190,355,803**	**190,355,559**	162,669,694	162,669,684
	364,111,283	**284,860,725**	333,085,216	274,996,463
Sionna				
Equities				
Canadian Companies	**109,438,832**	**100,682,301**	57,335,605	56,403,572
Cash and short-term deposits	**4,039,115**	**4,039,115**	1,504,263	1,504,263
	113,477,947	**104,721,416**	58,839,868	57,907,835
Oldfield Partners				
Equities				
Foreign equity pooled funds	**165,270,155**	**83,265,421**	148,979,836	79,868,083
	165,270,155	**83,265,421**	148,979,836	79,868,083
Walter Scott & Partners				
Equities				
Foreign equity pooled funds	**331,792,375**	**224,387,982**	268,337,589	201,014,012
	331,792,375	**224,387,982**	268,337,589	201,014,012
Operating fund at CIBC Mellon Trust Company				
Cash and short-term deposits	**21,561,683**	**21,561,832**	27,183,589	27,183,567
	21,561,683	**21,561,832**	27,183,589	27,183,567
Total investments	**1,936,865,955**	**1,627,652,474**	1,691,003,976	1,521,365,797

[c] Significant investments

The Plan contains the following individual investments, which exceed 1% of the cost or market value of the total investments as at December 31, 2019:

	Fair value $	Cost $
Short-term deposits		
CIBC Mellon cash sweep 0.45%	**29,068,031**	**29,068,031**
Royal Bank BA 1.82% due January 15, 2020	**190,300,196**	**190,300,196**
Pooled funds		
TD Emerald Canadian Bond Index Fund	**338,116,553**	**321,325,399**
TD Emerald Pooled US Equity Fund	**160,576,465**	**148,164,371**
TD Emerald International Equity Fund	**99,650,584**	**98,664,752**
Overstone Global Equity Fund	**165,270,155**	**83,265,421**
Walter Scott & Partners Global Equity Fund	**331,792,375**	**224,387,982**
Canadian equities		
Brookfield Infrastructure Partners	**109,344,685**	**38,191,485**
Ishares S&P/TSX Capped REIT	**64,410,727**	**56,313,639**

[d] Investment income by type

	2019 $	2018 $
Dividend income		
Canadian equities	**7,692,592**	10,278,494
Foreign companies	—	3,416,477
Foreign pooled funds	**16,573,593**	15,091,636
	24,266,185	28,786,607
Interest income		
Bonds, cash and short-term deposits	**3,935,279**	2,670,226
Canadian fixed term bonds	**10,243,603**	9,357,450
Pooled funds	**9,796,718**	9,667,280
	23,975,600	21,694,956

[e] Forward foreign exchange contracts

There were no forward foreign exchange contracts as at December 31, 2019 or December 31, 2018.

5. Fair value measurements

Canadian accounting standards for pension plans require disclosure of a three-level hierarchy for fair value measurements based on the transparency of inputs to the valuation of an asset or liability as at the financial statement date. The three levels are defined as follows:

Level 1: Fair value is based on quoted market prices in active markets for identical assets or liabilities. Level 1 assets and liabilities generally include equity securities traded in an active exchange market.

Level 2: Fair value is based on observable inputs other than Level 1 prices, such as quoted market prices for similar [but not identical] assets or liabilities in active markets, quoted market prices for identical assets or liabilities in markets that are not active, and other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities. Level 2 assets and liabilities include debt securities with quoted prices that are traded less frequently than exchange-traded instruments and derivative contracts whose value is determined using a pricing model with inputs that are observable in the market or can be derived principally from or corroborated by observable market data. This category generally includes pooled funds, hedge funds, Government of Canada, provincial and other government bonds, Canadian corporate bonds, and certain derivative contracts.

Level 3: Fair value is based on non-observable inputs that are supported by little or no market activity and that are significant to the fair value of the assets or liabilities. This category generally includes private equity investments and securities that have liquidity restrictions.

	2019			
	Level 1	**Level 2**	**Level 3**	**Total**
	$	$	$	$
Assets				
Cash and short-term deposits	**—**	**228,408,446**	**—**	**228,408,446**
Equities	**283,194,312**	**—**	**—**	**283,194,312**
Pooled funds	**—**	**1,095,406,133**	**—**	**1,095,406,133**
Bonds	**—**	**329,857,064**	**—**	**329,857,064**
	283,194,312	**1,653,671,643**	**—**	**1,936,865,955**

	2018			
	Level 1	**Level 2**	**Level 3**	**Total**
	$	$	$	$
Assets				
Cash and short-term deposits	—	194,100,010	—	194,100,010
Equities	227,751,127	—	—	227,751,127
Pooled funds	—	948,856,912	—	948,856,912
Bonds	—	320,295,927	—	320,295,927
	227,751,127	1,463,252,849	—	1,691,003,976

6. Financial risks and risk management

The Plan's investment performance is subject to financial risks as a result of its investing activities. These financial risks could impact net assets available for benefits. These financial risks include credit risk, liquidity risk, interest rate risk, other price risk and foreign exchange risk. The Administrator manages these risks in accordance with the Statement of Investment Policies and Procedures [the "SIPP"]. The SIPP includes aggregate investment limits by asset class in order to achieve the Plan's investment objectives at an acceptable level of risk. In addition, the SIPP outlines individual investment limits and diversification objectives within different asset classes and permitted investment categories within the asset classes. The Pension and Benefits Committee monitors adherence to the policy and the performance of investment managers relative to the applicable benchmarks and action is taken as deemed necessary.

Credit risk

Credit risk relates to the potential exposure that the other party to a financial instrument will fail to discharge an obligation and cause the Plan to incur a financial loss. Concentration of credit risk exists when a significant proportion of the portfolio is invested in securities with similar characteristics or subject to similar economic, political or other conditions.

The SIPP restrictions require Canadian bonds or debentures to be rated a minimum of BBB or equivalent, establishes a cap of U.S. denominated fixed income securities, and bans the purchase of foreign currency fixed income securities. In addition, the SIPP states that no single investment holding shall represent more than 10% of the market value of the Plan's assets.

All of the Plan's fixed term investments are invested in Canadian short-term bonds. The credit risk of the Canadian short-term bonds as at December 31, 2019 and as at December 31, 2018 are detailed in the following chart:

Credit ratings	**AAA**	**AA**	**A**	**BBB**	**Total**
As at December 31 2019	**2.3%**	**20.8%**	**39.0%**	**37.9%**	**100%**
As at December 31 2018	1.0%	31.9%	27.0%	40.1%	100%

December 31, 2019

Liquidity risk

Liquidity risk is the risk that the Plan may be unable to meet pension payment obligations as they come due. The SIPP requires that all investments should be reasonably liquid so that they can be converted into cash on short notice. As such, the Plan's exposure to liquidity risk is considered negligible.

The following is a maturity analysis of the fixed-term bonds held by the Plan:

	2019	**2018**
	$	$
<1 year	**1,612,145**	4,205,208
1–5 years	**257,522,989**	258,765,207
5–10 years	**68,058,377**	57,325,512
Over 10 years	**2,663,552**	—
Total	**329,857,064**	320,295,927

Interest rate risk

Interest rate risk refers to the adverse consequences of interest rate changes on the Plan's net assets available for benefits and changes in net assets available for benefits. This risk arises as changes in market interest rates affect the fair market value of the Plan's assets as well as the returns that the plan can earn. The SIPP outlines a range of 30%–70% for fixed income securities. The Administrator adjusts the investment mix in the portfolio in response to changes in market interest rates.

The following analysis summarizes the impact on the Plan's net assets available for benefits, following reasonably possible changes in interest rates to each bond category to which the Plan has a significant exposure.

			Impact of change in interest rates	
	Market value	**Duration**	**-1%**	**+1%**
Canadian fixed term bonds	329,857,064	2.75	9,071,069	(9,071,069)
Bond pooled funds	338,116,553	7.97	26,947,889	(26,947,889)
			36,018,958	(36,018,958)

Other price risk

Other price risk is the risk that the value of the investments will fluctuate as a result of changes in market prices. As the Plan records all investments at fair value, investment values reflected in the statement of net assets available for benefits represent the maximum exposure to market risk. The SIPP outlines a range of 30% – 70% for equities. The Administrator adjusts the investment mix in the portfolio in response to changes in market conditions.

Foreign exchange risk

The Plan is exposed to foreign currency fluctuations to the extent that its foreign investments are denominated in foreign currencies. Fluctuations in the value of the Canadian dollar against foreign currencies can have an impact on the fair value of foreign investments. The SIPP allows for hedging of portfolio assets denominated in foreign currencies into Canadian dollars as a strategy to mitigate foreign exchange risk.

The following sensitivity analysis summarizes the impact on the Plan's net assets available for benefits, following reasonably possible changes in foreign currency exchange rates, for each currency to which the Plan has a significant exposure.

	Impact of change in exchange rates	
	+5%	**-5%**
Euro (€)	4,827,063	(4,827,063)
United States dollar ($)	19,051,839	(19,051,839)
British pound sterling (£)	3,162,547	(3,162,547)
Japanese yen (¥)	4,566,094	(4,566,094)

Market risk for equity investments

The table below demonstrates the sensitivity of the fair value of the Plan's investments in equities to a possible change of 10% in the relevant equity indices. The beta of each equity mandate, a measure of volatility, has been applied in estimating this sensitivity.

	Fluctuation of	**Impact of % change in fair value on net assets**	**Sensitivity** $
Equities			
Canadian	Stock Market Indices	+10%	23,445,857
		-10%	(23,445,857)
Pooled Funds	Stock Market Indices	+10%	71,499,414
		-10%	(71,499,414)

December 31, 2019

7. Management and administrative expenses

[a] Management and administrative expenses

Management and administrative expenses consist of the following:

	2019 $	2018 $
Investment management	**2,418,538**	3,040,795
Custodial	**222,408**	273,298
Actuarial	**306,678**	235,266
Administration	**721,895**	691,602
Audit	**18,448**	19,352
Non-recoverable Harmonized Sales Tax	**259,244**	696,187
	3,947,211	4,956,500

[b] Management and administrative fees payable

Management and administrative fees payable consist of the following:

	2019 $	2018 $
Investment management	**961,798**	773,683
Custodial	**21,767**	39,683
Actuarial	**127,830**	48,136
Administration	**720,969**	341,953
Audit	**21,357**	21,809
HST	**511,102**	—
	2,364,823	1,225,264

[c] Contributions

There are no required contributions past due at December 31, 2019.

8. Transfers from other plans

Transfers from other plans represent transfers into the Plan from external pension plans of a previous employer.

Notes to financial statements

December 31, 2019

9. Capital management

The capital of the Plan is represented by the net assets available for benefits. The Plan's objectives when managing its capital are to [i] safeguard its ability to continue as a going concern including compliance with regulatory requirements under the *Pension Benefits Act* (Ontario), and [ii] satisfy its obligations to pay benefits to the Plan participants. In meeting these objectives, the Sponsor periodically reviews the funding and investment policies of the Plan, the results of the actuarial funding valuation and the level of benefits provided to participants.

The Administrator has adopted a SIPP, which states investment objectives, guidelines and benchmarks used in investing the capital of the Plan, permitted categories of investments, asset mix diversification and rate of return expectations. The SIPP was last updated effective November 1, 2018. The amendments to the SIPP reflect updated information on how environmental, social and governance factors are considered in selecting and monitoring investment managers and other minor text amendments to harmonize the document with current regulations.

The portfolio return expectations for the Plan per the SIPP is that the annualized rate of return of the Plan must exceed the annualized rate of increase in the CPI by at least 360 basis points ["bps"], net of the associated investment management fees over any 10-year period. Reporting from the actuary of the Plan as at December 31, 2018 shows a return of 8% on the total pension fund, excluding the currency overlay, for the last 10-year period. The Bank of Canada reports total average annual CPI of 1.95% for the relevant 10-year period. The return on the total pension fund for the last 10-year period achieves the portfolio return expectations for the Plan per the SIPP.

The SIPP prescribes asset categories that the Plan can invest in along with a targeted asset allocation for each of these categories. The following table presents the asset categories, the permitted asset mix allocation, and the asset mix allocation as at December 31, 2019.

Asset categories	**Asset mix allocation**	**Asset mix allocation as at December 31, 2019**
Cash and short-term deposits	0 - 15%	12%
Fixed income	30 - 70%	34%
Equities	30 - 70%	45%
Alternatives [Infrastructure and Real Estate Equity]	0 - 20%	9%
		100%

The investments fell within the targeted asset mix ranges as specified in the SIPP at December 31, 2019.

10. Subsequent events

Effective May 1, 2020, and phased in over 3 years, employee contribution rates into the plan will change as follows:

Portion of Salary	May 1, 2019	May 1, 2020	May 1, 2021	May 1, 2022
Less than 1x YMPE	6.25%	6.95%	7.40%	7.80%
Between 1x and 2x YMPE	8.95%	9.95%	10.60%	11.20%
Greater than 2x YMPE	9.95%	9.95%	10.60%	11.20%

Notes to financial statements

December 31, 2019

Subsequent to December 31, 2019, the global pandemic related to the COVID-19 outbreak has caused significant disruption to businesses resulting in a global economic slowdown with governments around the world taking actions to curtail the spread of the disease. Global equity and fixed income markets have experienced significant uncertainty and volatility. The duration and magnitude of the impact of the COVID-19 outbreak and the impact on the economy and the financial effect on the Plan and the sponsor are not known at this time. These impacts could include decreased values in the investment portfolio, and declines in investment performance.

Pension Plan Management and Administrative Fees Incurred in 2019[1]
with 4 prior years of comparative information

Expense Category	2019 ('000s)	2018 ('000s)	2017 ('000s)	2016 ('000s)	2015 ('000s)
Investment Management Fees [2]					
TD Asset Management	500	598	504	504	494
Oldfield	1315	1157	1072	876	881
Trilogy Global Advisors	0	672	1023	856	857
Walter Scott and Partners Ltd.	1648	1555	1411	1254	1342
Sionna Investment Managers	270	216	209	185	178
Total Investment Management Fees	**$3,733**	**$4,198**	**$4,219**	**$3,675**	**$3,752**
Custodian Fees	222	273	211	213	216
Aon Hewitt	307	235	280	301	262
Administration Fees	722	692	663	850	433
Ernst & Young - Audit Fees	19	19	20	20	18
Total Pre-Tax Management and Administrative Fees	**$5,003**	**$5,417**	**$5,393**	**$5,059**	**$4,681**
HST [3]	**259**	**696**	**554**	**398**	**490**
Total Management and Administrative Fees [4]	**$5,262**	**$6,113**	**$5,947**	**$5,457**	**$5,171**

[1] Amounts from the audited annual financial statements

[2] Trilogy investment liquidated August 2018 and proceeds reinvested in TDAM mandates
The amount invested with Sionna was increased by $43m (from available cash within the pension) in September 2019

[3] UW recovers HST paid by the pension fund where possible through HST rebates
HST recoveries are recorded when the returns are filed; additional historical recoveries were achieved in 2019

[4] This total exceeds the total management and administrative expenses in the financial statements by the amount of Oldfield fees noted above. The Oldfield fees are deducted directly from the investment pool and this presentation (netting against investment income) is followed in the financial statements

Actuarial Valuation as at January 1, 2020 for University of Waterloo Pension Plan

Canada Revenue Agency Registration Number: 0310565

May 2020

DRAFT

Empower Results®

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Executive Summary

An actuarial valuation has been prepared for the University of Waterloo Pension Plan (the "Plan") as at January 1, 2020 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 January 1, 2023.

Summary of Principal Results

Financial Position

	January 1, 2020	January 1, 2018
Going Concern		
Assets	$ 1,938,502,000	$ 1,675,862,000
Liabilities	1,868,707,000	1,653,560,000
Financial Position	$ 69,795,000	$ 22,302,000
Adjustments[1]	(145,837,000)	(98,514,000)
Surplus/(Unfunded Liability)	**$ (76,042,000)**	**$ (76,212,000)**
Solvency		
Assets[2]	$ 1,938,002,000	$ 1,675,362,000
Liabilities	2,146,037,000	1,857,556,000
Financial Position	$ (208,035,000)	$ (182,194,000)
Adjustments[1]	50,680,000	52,020,000
Surplus/(Unfunded Liability)	**$ (157,355,000)**	**$ (130,174,000)**
Hypothetical Wind Up		
Assets[1]	$ 1,938,002,000	$ 1,675,362,000
Liabilities	2,909,749,000	2,700,223,000
Surplus/(Unfunded Liability)	**$ (971,747,000)**	**$ (1,024,861,000)**

Legislative Ratios

	January 1, 2020	January 1, 2018
Funded ratio[3]	1.04	1.01
Solvency ratio	0.90	0.90
Transfer ratio	0.67	0.62

[1] Adjustments include Provision for Adverse Deviation (PfAD), prior year credit balance, and all solvency liability and solvency asset adjustments, where applicable
[2] Net of estimated wind up expenses
[3] Before application of PfAD

Normal Cost

	January 1, 2020	January 1, 2018
Total normal cost	$ 81,378,000	$ 69,210,000
Required member contributions	(39,855,000)	(32,650,000)
Provision for non-investment expenses	1,500,000	1,500,000
PfAD	6,611,000	4,255,000
University Normal Cost	**$ 49,634,000**	**$ 42,315,000**
As a % of pensionable earnings	9.82%	9.55%
As a % of member contributions	124.5%	129.6%

Minimum Contribution Requirements

Considering the funding and solvency status of the Plan, the minimum University contributions for the period from January 1, 2020 to December 31, 2022 in accordance with legislative requirements, are as follows:

	January 1, 2020 to December 31, 2020	January 1, 2021 to December 31, 2021	January 1, 2022 to December 31, 2022
Total normal cost	$ 81,378,000	$ 84,633,000	$ 88,019,000
Required member contributions	(39,855,000)	(44,269,000)	(48,463,000)
Provision for non-investment expenses	1,500,000	1,560,000	1,622,000
PfAD	6,611,000	6,875,000	7,150,000
University normal cost	$ 49,634,000	$ 48,799,000	$ 48,328,000
Special payments toward amortizing unfunded liability	8,772,000	9,264,000	9,264,000
Adjustments	-	-	-
Minimum Required University Contribution	**$ 58,406,000**	**$ 58,063,000**	**$ 57,592,000**
Additional contribution to bring University contribution to Funding Commitment	4,565,000	7,427,000	10,517,000
Total Required University Contribution under University Funding Commitment[1]	**$ 62,971,000**	**$ 65,490,000**	**$ 68,109,000**
As a % of required member contributions	158.0%	147.9%	140.5%

[1] The University has committed to maintaining a contribution of 12.45% of pensionable earnings throughout valuation period

Membership Data

	January 1, 2020	January 1, 2018
Active and transferred members	4,891	4,476
Disabled members	90	86
Suspended members	2	9
Retired members and beneficiaries	2,092	1,932
Deferred vested members	586	537
Total	**7,661**	**7,040**

Key Assumptions

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

Going Concern	**January 1, 2020**	**January 1, 2018**
Discount rate	5.60% per year	5.60% per year
PfAD	9.00% of non-indexed liabilities and normal cost	6.95% of non-indexed liabilities and normal cost
Inflation rate	2.00% per year	Same
Increase in pensionable earnings	4.00% per year	Same
Mortality table	2014 Canadian Pensioners' Public Sector Mortality ("CPM2014Public") Table with mortality improvement Scale MI-2017	2014 Canadian Pensioners' Combined Mortality ("CPM2014") Table with mortality improvement Scale MI-2017
Increase in Year's Maximum Pensionable Earnings	2.75% per year	Same
Increase in *Income Tax Act* maximum pension	2.75% per year	Same
Retirement rates	See Table A	Age 64, but no earlier than one year after valuation date

Solvency/ Hypothetical Wind Up	**January 1, 2020**	**January 1, 2018**
Discount rate—Solvency	Annuity purchases: 2.96% per year Transfers: 2.50% per year for 10 years, 2.60% per year thereafter	Annuity purchases: 3.30% per year Transfers: 2.80% per year for 10 years, 3.30% per year thereafter
Discount rate—Hypothetical Wind Up (Pre-2014 Accrued Pension)	Annuity purchases: -0.29% per year Transfers: 1.20% per year for 10 years, 1.20% per year thereafter	Annuity purchases: -0.13% per year Transfers: 1.30% per year for 10 years, 1.50% per year thereafter
Discount rate—Hypothetical Wind Up (Post-2013 Accrued Pension)	Annuity purchases: 0.52% per year Transfers: 1.50% per year for 10 years, 1.60% per year thereafter	Annuity purchases: 0.66% per year Transfers: 1.70% per year for 10 years, 1.90% per year thereafter
Mortality table	2014 Canadian Pensioners' Combined Mortality ("CPM2014") Table with mortality improvement Scale CPM-B	Same

Section 1: Introduction

Purpose and Terms of Engagement

We have been engaged by the University of Waterloo (the "University") Pension and Benefits Committee (the "Committee"), to conduct an actuarial valuation of the Plan, registered in Ontario, as at January 1, 2020 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. Specifically, the purposes of the valuation are to:

- Determine the financial position of the Plan on a going concern basis as at January 1, 2020;
- Determine the financial position of the Plan as at January 1, 2020 on a solvency and hypothetical wind up basis;
- Determine the funding requirements of the Plan as at January 1, 2020; and
- Provide the necessary actuarial certification required under the *Pension Benefits Act* (Ontario) (the "*Act*") and the *Income Tax Act.*

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 January 1, 2023.

Summary of Changes Since the Last Valuation

The last such actuarial valuation in respect of the Plan was performed as at January 1, 2018. Since the time of the last valuation, we note that the following events have occurred:

- Effective May 1, 2020, the plan has been amended to increase the required member contributions in accordance with the following table:

	Contribution Rate on Earnings		
Effective Date	**Not in Excess of Year's Maximum Pensionable Earnings (YMPE)**	**In Excess of YMPE but not in Excess of Two Times the YMPE**	**In Excess of Two Times the YMPE**
January 1, 2013	6.25%	8.95%	9.95%
May 1, 2020	6.95%	9.95%	9.95%
May 1, 2021	7.40%	10.60%	10.60%
May 1, 2022	7.80%	11.20%	11.20%

- The plan has been amended such that the $3,200[1] hard dollar pension cap will increase effective January 1, 2021 to $3,400, and then increase thereafter each calendar year commencing January 1, 2022 by one-third (1/3) of the percentage increase in the Average Industrial Wage, calculated on an annual basis.
- The assumed mortality table has been changed from the 2014 Canadian Pensioners' Combined Mortality ("CPM2014") Table with mortality improvement Scale MI-2017 to the 2014 Canadian Pensioners' Public Sector Mortality ("CPM2014Public") Table with mortality improvement Scale MI-2017.
- The assumed retirement age has been changed from 100% at age 64 to a retirement table with rates varying by age.

University 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 January 1, 2018;
- A copy of the Statement of Investment Policies and Procedures for the Plan;
- Membership data compiled as at January 1, 2020 by the University;
- Asset data taken from the Plan's unaudited and audited financial statements; and
- A copy of the latest Plan text and amendments up to and including May 1, 2020.

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

[1] Per year of credited service

Subsequent Events

As noted previously, the Plan was amended to change the required member contributions and the pension cap. This amendment has been incorporated in the valuation results contained in this report.

As of the date of this report, we have not been made aware of any other 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 January 1, 2020 will result in gains or losses which will be reflected in the next actuarial valuation report.
- Due to the COVID-19 pandemic, the financial markets experienced significant volatility after the valuation date. As with other experience emerging after the valuation date, the financial impact of this event on the Plan will be reflected in the next actuarial valuation report.
- 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.

The selection of the applicable actuarial assumptions and methods reflect the Plan's funding objectives, as communicated by the University, actuarial standards of practice, and pension standards.

On the basis of the Plan provisions, membership data, going concern assumptions and methods, and asset information described in the Appendices, the going concern financial position of the Plan as at January 1, 2020 is shown in the following table. The results as at January 1, 2018 are also shown for comparison purposes.

Going Concern Financial Position

	January 1, 2020	January 1, 2018
Actuarial Value of Assets	**$ 1,938,502,000**	**$ 1,675,862,000**
Going Concern Liabilities		
Active members	$ 1,014,559,000	$ 892,146,000
Disabled and suspended members	17,412,000	15,975,000
Deferred vested members	40,261,000	37,052,000
Retired members and beneficiaries	779,799,000	695,394,000
Additional voluntary contribution balances	491,000	356,000
Member flex contributions	967,000	1,253,000
Cost of living increase effective May 1st	15,218,000	11,384,000
Total Liabilities	**$ 1,868,707,000**	**$ 1,653,560,000**
Going Concern Position	**$ 69,795,000**	**$ 22,302,000**
Additional liabilities due to PfAD	(145,837,000)	(98,514,000)
Prior year credit balance	-	-
Surplus/(Unfunded Liability)	**$ (76,042,000)**	**$ (76,212,000)**

The PfAD is not required to be applied to the liabilities in respect of future indexation of $248,299,000 as at January 1, 2020 and $236,097,000 as at January 1, 2018.

Going Concern Normal Cost

On the basis of the Plan provisions, membership data, going concern assumptions and methods, asset information and legislative requirement described in the Appendices, the going concern normal cost of the Plan as at January 1, 2020 is shown in the following table. The normal cost as at January 1, 2018 is also shown for comparison purposes.

	January 1, 2020	January 1, 2018
Normal Cost		
Total normal cost	$ 81,378,000	$ 69,210,000
Required member contributions	(39,855,000)	(32,650,000)
Provision for non-investment expenses	1,500,000	1,500,000
Additional normal cost due to PfAD	6,611,000	4,255,000
University Normal Cost	**$ 49,634,000**	**$ 42,315,000**
Total pensionable earnings (in year following valuation date)	$ 505,660,000	$ 443,254,000
University Normal Cost		
As a % of total pensionable earnings	9.82%	9.55%
As a % of member contributions	124.5%	129.6%

The PfAD is not required to be applied to the normal cost in respect of future indexation of $9,426,000 as at January 1, 2020 and $7,994,000 as at January 1, 2018.

Change in Financial Position

The major components of the change in the Surplus/(Unfunded Liability) for the period from January 1, 2018 to January 1, 2020 are summarized in the following table.

	January 1, 2018 to December 31, 2018	January 1, 2019 to December 31, 2019
Surplus/(Unfunded Liability) as at Beginning of Plan Year	**$ (76,212,000)**	**$ (147,281,000)**
Total normal cost in inter-valuation period	(73,465,000)	(77,237,000)
Member contributions in inter-valuation period	33,073,000	35,175,000
University contributions in inter-valuation period	55,750,000	59,427,000
Expected interest on surplus (unfunded liability)	(3,844,000)	(7,907,000)
Surplus/(Unfunded Liability) as at End of Plan Year	**$ (64,698,000)**	**$ (137,823,000)**
Change in Liabilities Due to Experience Gains/(Losses)		
Return on investment earnings greater/lower than expected	(93,665,000)	126,264,000
Increase in salaries	2,669,000	612,000
Increase in ITA maximum pension/YMPE	(7,000)	432,000
Indexation experience	(1,882,000)	923,000
Retirement experience	6,499,000	6,569,000
Mortality experience	(1,043,000)	(355,000)
Termination experience	(917,000)	(1,126,000)
Data adjustments / article 12 transfers	1,601,000	(1,478,000)
Additional year of deferred COLA	(558,000)	(558,000)
Net gain/(loss) due to other experience and miscellaneous items	1,322,000	(643,000)
Going Concern Position After Experience Gains/(Losses) as at End of Plan year	**$ (150,679,000)**	**$ (7,183,000)**
Change in PfAD	(22,212,000)	(6,717,000)
Change in discount rate	25,610,000	(24,656,000)
Change in required member contributions	N/A	(12,000)
Change in RPP hard dollar cap	N/A	(54,245,000)
Change in mortality table	N/A	(13,480,000)
Change in retirement rates assumption	N/A	30,251,000
Surplus/(Unfunded Liability) as at End of Plan Year	**$ (147,281,000)**	**$ (76,042,000)**

Discussion of Changes in Assumptions

Interim actuarial valuations are prepared each year for plan management purposes. Assumptions used in the interim valuations have been shown in the reconciliation of the going concern financial position from January 1, 2018 to December 31, 2019.

The following assumptions were changed from the previous filed valuation:

Economic Assumptions

- The following economic assumptions were changed effective January 1, 2019:
  - Discount rate was changed from 5.60% to 5.70% per year, and
  - The PfAD was changed from 6.95% to 8.50% (as per target asset allocation).

These changes in economic assumptions decreased the going concern liabilities by $3,398,000 and University normal cost by $834,000.

- The following economic assumptions were changed effective January 1, 2020:
  - Discount rate was changed from 5.70% to 5.60% per year
  - The PfAD was changed from 8.50% to 9.00% (as per target asset allocation)

These changes in economic assumptions increased the going concern liabilities by $31,373,000 and the University normal cost by $1,995,000.

Demographic Assumptions

- The following demographic assumptions were changed effective January 1, 2020:
  - Mortality table was changed from the 2014 Canadian Pensioners' Combined Mortality ("CPM2014") Table with mortality improvement Scale MI-2017 to the 2014 Canadian Pensioners' Public Sector Mortality (CPM2014Public") Table with mortality improvement Scale MI-2017
  - Retirement rates were changed from 100% at age 64 to table with variable rates by age

These changes in demographic assumptions decreased the going concern liabilities by $16,771,000 and the University normal cost by $2,299,000.

Discussion of Plan Amendments

The plan has been amended as follows:

- Effective May 1, 2020, the plan has been amended to increase the required member contributions in accordance with the following table:

	Contribution Rate on Earnings		
Effective Date	**Not in Excess of Year's Maximum Pensionable Earnings (YMPE)**	**In Excess of YMPE but not in Excess of Two Times the YMPE**	**In Excess of Two Times the YMPE**
January 1, 2013	6.25%	8.95%	9.95%
May 1, 2020	6.95%	9.95%	9.95%
May 1, 2021	7.40%	10.60%	10.60%
May 1, 2022	7.80%	11.20%	11.20%

- The plan has been amended such that the $3,200[1] hard dollar pension cap will increase effective January 1, 2021 to $3,400, and then increase thereafter each calendar year commencing January 1, 2022 by one-third (1/3) of the percentage increase in the Average Industrial Wage, calculated on an annual basis.

These changes in the plan design increased the going concern liabilities by $54,257,000 and the University normal cost by $4,058,000.

[1] Per year of credited service

Going Concern Valuation Sensitivity Results

In accordance with the Canadian Institute of Actuaries (CIA) Standards of Practice specific to pension plans, the table below presents the sensitivity of the going concern liabilities and the total normal cost (prior to the application of the PfAD) of using a discount rate 1% lower and 1% higher than that used for the going concern valuation.

		Effect	
January 1, 2020		**$**	**%**
Going concern liabilities	$ 1,868,707,000		
Going concern liabilities (discount rate – 1%)	$ 2,164,165,000	$ 295,458,000	15.8%
Going concern liabilities (discount rate + 1%)	$ 1,633,793,000	$ (234,914,000)	(12.6)%
Normal cost	$ 81,378,000		
Normal cost (discount rate – 1%)	$ 101,680,000	$ 20,302,000	24.9%
Normal cost (discount rate + 1%)	$ 66,260,000	$ (15,118,000)	(18.6)%

Plausible Adverse Scenarios

In accordance with the CIA Standards of Practice specific to pension plans, below is summarized scenarios of adverse but plausible assumptions, relative to the best estimate assumptions otherwise selected for the valuation.

Interest Rate Sensitivity

The table below presents the sensitivity of the going concern position and the total normal cost of using interest rates 1% lower than the current level. In order to calculate the impact on the Actuarial Value of Assets, only the fixed income assets (35.2% of total assets) with an assumed duration of 8.08 for overall domestic bond index were considered.

	Base Scenario	**Adverse Scenario**	**Impact ($)**
Actuarial value of assets	$ 1,938,502,000	$ 1,993,703,000	$ 55,201,000
Going concern liabilities	(1,868,707,000)	(2,164,165,000)	(295,458,000)
Going concern position	$ 69,795,000	$ (170,462,000)	$ (240,257,000)
Additional liabilities due to PfAD	(145,837,000)	(167,183,000)	(21,346,000)
Surplus/(Unfunded Liability)	**$ (76,042,000)**	**$ (337,645,000)**	**$ (261,603,000)**
Total normal cost (including provisions of non-investment expenses and PfAD)	$ 89,489,000	$ 111,320,000	$ 21,831,000

Deterioration in Asset Value

Considering that the asset allocation as of December 31, 2019 is 10.9% cash, 35.2% fixed income, and 53.9% non-fixed income, for the deterioration in asset value we estimate that the adverse scenario is related to a 15% reduction in the non-fixed income asset values and assume no change in future return expectations.

The table below presents the sensitivity of the going concern position and the total normal cost of using the Actuarial Value of Assets with a 15% reduction in non-fixed income asset values.

	Base Scenario	**Adverse Scenario**	**Impact ($)**
Actuarial value of assets	$ 1,938,502,000	$ 1,781,589,000	$ (156,913,000)
Going concern liabilities	(1,868,707,000)	(1,868,707,000)	-
Going concern position	$ 69,795,000	$ (87,118,000)	$ (156,913,000)
Additional liabilities due to PfAD	(145,837,000)	(145,837,000)	-
Surplus/(Unfunded Liability)	**$ (76,042,000)**	**$ (232,955,000)**	**$ (156,913,000)**
Total normal cost (including provisions of non-investment expenses and PfAD)	$ 89,489,000	$ 89,489,000	$ -

Mortality Sensitivity

The table below presents the sensitivity of the going concern position and the total normal cost of using a mortality assumption with a 10% improvement to the base mortality rates rather than that used for the going concern valuation, thereby 90% of 2014 Canadian Pensioners Mortality Public Sector Table with improvements under Scale MI-2017.

	Base Scenario	Adverse Scenario	Impact ($)
Actuarial value of assets	$ 1,938,502,000	$ 1,938,502,000	$ -
Going concern liabilities	(1,868,707,000)	(1,911,476,000)	(42,769,000)
Going concern position	$ 69,795,000	$ 27,026,000	$ (42,769,000)
Additional liabilities due to PfAD	(145,837,000)	(148,580,000)	(2,743,000)
Surplus/(Unfunded Liability)	**$ (76,042,000)**	**$ (121,554,000)**	**$ (45,512,000)**
Total normal cost (including provisions of non-investment expenses and PfAD)	$ 89,489,000	$ 90,920,000	$ 1,431,000

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 liabilities must be calculated based on a postulated scenario that maximizes liabilities on wind up of the Plan. Contingent benefits are included in the liabilities that would be payable under the postulated scenario, unless permitted to be omitted under the definition of solvency liabilities under the Regulations to the *Act.* All assumptions for the solvency valuation are listed in Appendix D.

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 January 1, 2020 is shown in the following table. The solvency financial position of the Plan as at January 1, 2018 is shown for comparison purposes.

Solvency Financial Position

	January 1, 2020	January 1, 2018
Assets		
Solvency assets	$ 1,938,502,000	$ 1,675,862,000
Estimated wind up expenses	(500,000)	(500,000)
Total Assets	**$ 1,938,002,000**	**$ 1,675,362,000**
Solvency Liabilities		
Active members	$ 1,235,747,000	$ 1,046,401,000
Disabled and suspended members	23,248,000	19,559,000
Deferred vested members	53,740,000	46,996,000
Retired members and beneficiaries	831,844,000	742,991,000
Additional voluntary contribution balances	491,000	356,000
Member flex contributions	967,000	1,253,000
Total Liabilities	**$ 2,146,037,000**	**$ 1,857,556,000**
Solvency Position	**$ (208,035,000)**	**$ (182,194,000)**
Prior year credit balance	-	-
Present value of special payments	50,680,000	52,020,000
Solvency Surplus/(Deficiency)	**$ (157,355,000)**	**$ (130,174,000)**
Solvency Ratio	**0.90**	**0.90**

Solvency Asset Adjustment

The present value of scheduled special payments for solvency valuation purposes has been calculated by discounting the annual special payments to be remitted up to the end of their amortization period to a maximum of six years, at the weighted solvency discount rate of 2.80% per year compounded monthly in arrears, which was determined proportionately by the solvency discount rates used to determine the solvency liabilities.

Nature of Deficiency	Effective Date	End Date	Months Included	Annual Special Payment	Present Value as of January 1, 2020
Going concern	January 1, 2019	December 31, 2020	12	$ 8,772,000	$ 8,642,000
Going concern	January 1, 2021	December 31, 2030	60	9,264,000	42,038,000
Present Value of Special Payments					**$ 50,680,000**

Statutory Solvency Financial Position

The minimum funding requirements under the Regulation are based on the statutory solvency financial position as at the valuation date. In calculating the statutory solvency financial position, various adjustments can be made including solvency funding of a reduced solvency deficiency effective for valuations filed after December 31, 2017. The reduced solvency deficiency is based upon 0.85 of the solvency liabilities and 0.85 of the solvency liability adjustment.

	January 1, 2020	January 1, 2018
The amount by which the sum of:		
85% of solvency liabilities	$ 1,824,131,000	$ 1,578,923,000
85% of solvency liability adjustment	0	0
Prior year credit balance	0	0
	$ 1,824,131,000	$ 1,578,923,000
Exceeds the sum of:		
Solvency assets net of wind-up expenses	$ 1,938,002,000	$ 1,675,362,000
Solvency asset adjustment	50,680,000	52,020,000
	$ 1,988,682,000	**$ 1,727,382,000**
Reduced Solvency Deficiency	**Nil**	**Nil**

Solvency Concerns

A report indicates solvency concerns under the *Act* if the ratio of the solvency assets to solvency liabilities is less than 0.85.

Where a report indicates solvency concerns, the effective date of the next valuation that needs to be filed under the *Act* is one year from the valuation date of the valuation that gave rise to the solvency concerns.

Since the ratio of solvency assets to solvency liabilities is equal to 0.90, this report does not indicate solvency concerns.

Solvency Valuation Sensitivity Results

In accordance with the CIA Standards of Practice specific to pension plans, the table below presents the sensitivity of the solvency liabilities to using a discount rate of 1% lower and 1% higher than that used for the solvency valuation.

		Effect	
January 1, 2020		**$**	**%**
Solvency liabilities	$ 2,146,037,000		
Solvency liabilities (discount rate – 1%)	$ 2,503,719,000	$ 357,682,000	16.7%
Solvency liabilities (discount rate + 1%)	$ 1,873,656,000	$ (272,381,000)	(12.7)%

Incremental Cost on a Solvency Basis

The incremental cost on a solvency basis represents the present value at January 1, 2020 of the expected aggregate change in the solvency liabilities between January 1, 2020 and the next calculation date, that is January 1, 2023. Appendix D 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 can be found in the following table.

	January 1, 2020 to December 31, 2020	**January 1, 2021 to December 31, 2021**	**January 1, 2022 to December 31, 2022**
Incremental cost on a solvency basis	$ 112,021,022	$ 130,162,124	$ 132,942,323

Pension Benefits Guarantee Fund ("PBGF")

The development of the PBGF Assessment Base is as follows:

PBGF Assessment Base	**January 1, 2020**
(1) Solvency assets	$ 1,938,502,000
(2) PBGF liabilities	$ 2,146,037,000
(3) Solvency liabilities	$ 2,146,037,000
(4) Ontario asset ratio: [(2) divided by (3)]	1.0000
(5) Ontario portion of fund: [(1) multiplied by the ratio in (4)]	$ 1,938,502,000
PBGF Assessment Base: [(2) subtract (5); if negative, enter zero]	**$ 207,535,000**

Section 4: Hypothetical Wind Up Valuation Results

Hypothetical Wind Up Financial Position of the Plan

A hypothetical wind up valuation is performed to determine the financial position of the Plan as at the valuation date on a wind up basis, reflecting market settlement rates as of the valuation date. Unlike the solvency valuation, all benefits are included that would be payable under the postulated scenario that would maximize benefits. The hypothetical wind up valuation is determined using benefit entitlements on the assumption that the Plan has neither a surplus nor a deficit. Contingent benefits are included in the liabilities that would be payable under the postulated scenario. Assets are set equal to market value net of estimated wind up expenses. All assumptions for the hypothetical wind up valuation are listed in Appendix D.

On the basis of Plan provisions, membership data, hypothetical wind up assumptions and methods, and asset information described in the Appendices, as well as the requirements of the *Act*, the hypothetical wind up financial position of the Plan as at January 1, 2020 is shown in the following table. The hypothetical wind up financial position of the Plan as at January 1, 2018 is shown for comparison purposes.

Hypothetical Wind Up Financial Position

	January 1, 2020	January 1, 2018
Assets		
Hypothetical wind up assets	$ 1,938,502,000	$ 1,675,862,000
Estimated wind up expenses	(500,000)	(500,000)
Total Assets	**$ 1,938,002,000**	**$ 1,675,362,000**
Hypothetical Wind Up Liabilities		
Active members	$ 1,651,387,000	$ 1,570,940,000
Disabled and suspended members	32,039,000	29,962,000
Deferred vested members	100,039,000	95,096,000
Retired members and beneficiaries	1,124,826,000	1,002,616,000
Additional voluntary contribution balances	491,000	356,000
Member flex contributions	967,000	1,253,000
Total Liabilities	**$ 2,909,749,000**	**$ 2,700,223,000**
Hypothetical Wind Up Surplus/(Deficiency)	**$ (971,747,000)**	**$ (1,024,861,000)**

Transfer Ratio

The transfer ratio is determined as follows:

			January 1, 2020	January 1, 2018
(1)	Hypothetical wind up assets		$ 1,938,502,000	$ 1,675,862,000
	Prior year credit balance	(A)	$ 0	$ 0
	Total University normal cost and required special payments until next mandated valuation	(B)	$ 174,061,000	$ 162,319,000
(2)	Asset adjustment	Lesser of (A) and (B)	$ 0	$ 0
(3)	Hypothetical wind up liabilities		$ 2,909,749,000	$ 2,700,223,000
Transfer Ratio [(1)-(2)] / (3)			**0.67**	**0.62**

Section 5: 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 sets out:

- The development of the rule to determine the normal cost;
- An estimate of the normal cost for the 3 years following the valuation date; and
- The portion of the going concern normal cost that is to be paid by the members.

	January 1, 2020 to December 31, 2020	January 1, 2021 to December 31, 2021	January 1, 2022 to December 31, 2022
Normal Cost			
Total normal cost	$ 81,378,000	$ 84,633,000	$ 88,019,000
Required member contributions	(39,855,000)	(44,269,000)	(48,463,000)
Provision for non-investment expenses	1,500,000	1,560,000	1,622,000
Additional normal cost due to PfAD	6,611,000	6,875,000	7,150,000
University Normal Cost	**$ 49,634,000**	**$ 48,799,000**	**$ 48,328,000**
Total pensionable earnings	$ 505,660,000	$ 525,886,000	$ 546,921,000
University Normal Cost			
As a % of pensionable earnings	9.82%	9.28%	8.84%
As a % of member contributions	124.54%	110.23%	99.72%

In the event an updated funding range in accordance with legislative requirements is not certified before January 1, 2023, the rule for determining the University normal cost contributions outlined in the above table will continue to be appropriate for the plan year commencing on the next valuation date of January 1, 2023. Adjustment to the University contributions may be required once the next actuarial funding range in accordance with legislative requirements is certified.

Development of Special Payments

The following table summarizes previously established amortization schedules of special payments before adjustment to reflect any gains or losses due to the going concern and solvency valuation results.

Nature of Deficiency	Effective Date	End Date	Annual Special Payment
Going concern	January 1, 2019	December 31, 2028	$ 8,772,000
			$ 8,772,000

The following table summarizes the amortization schedules of special payments after adjustment to reflect any gains or losses due to the going concern and solvency valuation results. In accordance with Regulation, the University has decided to defer all new going concern and solvency special payments established as at January 1, 2020 by 12 months. The following table summarizes the amortization schedules of special payments after the aforementioned adjustments.

				Present Value as of January 1, 2020	
Nature of Deficiency	**Effective Date**	**Revised End Date**	**Revised Annual Special Payment**	**For Going Concern Valuation[1]**	**For Solvency Valuation[2]**
Going concern	January 1, 2019	December 31, 2020	$ 8,772,000	$ 8,518,000	$ 8,642,000
Going concern	January 1, 2021	December 31, 2030	9,264,000	67,524,000	42,038,000
				$ 76,042,000	**$ 50,680,000**

[1] The values in the table were developed using the going concern discount rate compounded monthly in arrears

[2] The values in the table were developed using the weighted average solvency discount rate compounded monthly in arrears

Prior Year Credit Balance ("PYCB")

The Plan has no PYCB as at January 1, 2020.

Available Actuarial Surplus

As at January 1, 2020 the Available Actuarial Surplus is calculated as follows:

Going Concern Basis	
(A) Total assets	$ 1,938,502,000
(B) Total liabilities	1,868,707,000
(C) Additional liabilities due to PfAD	145,837,000
(D) Prior year credit balance	-
(E) Available Surplus: maximum (A – B – C – D); 0)	**$ -**
Hypothetical Wind-Up Basis	
(F) Assets in Excess of a Transfer Ratio of 105%	**$ -**
(G) Available Actuarial Surplus: minimum (E; F)	**$ -**

Excess Surplus

The *Income Tax Act* requires that any excess surplus first be applied to reduce or eliminate the University 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.

As of the valuation date there is no excess surplus.

Development of Minimum Required University Contribution

The table below presents the development of the minimum required University contribution for each of the plan years covered by this report.

While we have shown a fixed University normal cost in the table below, the University may actually fund the normal cost as a percentage of member contributions.

	January 1, 2020 to December 31, 2020	January 1, 2021 to December 31, 2021	January 1, 2022 to December 31, 2022
University normal cost	$ 49,634,000	$ 48,799,000	$ 48,328,000
Special payments toward amortizing unfunded liability	8,772,000	9,264,000	9,264,000
Special payments toward amortizing solvency deficiency	-	-	-
Required application of excess surplus	-	-	-
Permitted application of available actuarial surplus	-	-	-
Minimum Required University Contribution	**$ 58,406,000**	**$ 58,063,000**	**$ 57,592,000**
Additional contribution to bring University contribution to Funding Commitment	4,565,000	7,427,000	10,517,000
Minimum Required University Contribution	**$ 62,971,000**	**$ 65,490,000**	**$ 68,109,000**
As a % of required member contributions	158.0%	147.9%	140.5%
As a % of pensionable earnings	12.45%	12.45%	12.45%

Development of Maximum Deductible University Contribution

The table below presents the development of the maximum deductible University contribution for each of the plan years covered by this report.

The maximum deductible University contribution presented in the table below for a given plan year is calculated assuming that the University makes the maximum deductible University contribution in the first plan year covered by this report.

While we have shown a fixed University normal cost in the table below, the University may actually fund the normal cost as a percentage of required member contributions.

	January 1, 2020 to December 31, 2020	January 1, 2021 to December 31, 2021	January 1, 2022 to December 31, 2022
University normal cost	$ 49,634,000	$ 48,799,000	$ 48,328,000
Greater of the Unfunded liability and the hypothetical wind up deficiency/solvency deficiency	971,747,000	-	-
Required application of excess surplus	-	-	-
Maximum Deductible University Contribution	**$ 1,021,381,000**	**$ 48,799,000**	**$ 48,328,000**

If the University wishes to make the maximum deductible University contribution, it is advisable to contact the Plan's actuary before making such contribution to ensure that the contribution will be permissible and deductible and that any regulatory requirements are considered.

Section 6: Actuarial Certificate

Actuarial Opinion, Advice and Certification for the University of Waterloo Pension Plan

Canada Revenue Agency Registration Number: 0310565

Opinion

This actuarial certification forms an integral part of the actuarial valuation report for the Plan as at January 1, 2020. We confirm that we have prepared an actuarial valuation of the Plan as at January 1, 2020 for the purposes outlined in the Introduction section to this report and consequently:

Our advice on funding is the following:

- The University should contribute the amounts within the range of minimum and maximum contribution amounts as outlined in Section 5 of this report, in accordance with legislative requirements.
- The next actuarial valuation for the purpose of developing funding requirements should be performed no later than as at January 1, 2023.

We hereby certify that, in our opinion:

- The contribution range as outlined in this report is expected to be sufficient to satisfy the Plan's funding requirements.
- The University contribution range outlined in this report qualifies as eligible contributions under Section 147.2(2) of the *Income Tax Act.*
- The pre-1990 maximum pension restrictions in Subsection 8504(6) of the Regulations to the *Income Tax Act* do not apply to any members of the Plan.
- 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.

Linda Byron, FCIA, FSA
Senior Partner

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Managing Director

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May 2020

Appendix A: Assets

Asset Data

The Plan's assets are held by CIBC Mellon. The asset information presented in this report is based on the financial statements of the pension fund prepared by CIBC Mellon and statements audited by Ernst & Young.

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 (for retirees, terminated, or deceased members) 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 CIBC Mellon as at January 1, 2020. For comparison purposes, the composition at the previous valuation date of January 1, 2018 is also shown.

	January 1, 2020	**January 1, 2018**
	%	**%**
Canadian equities	5.9%	4.0%
Global equities	39.0%	36.0%
Fixed-income	35.2%	38.0%
Cash	10.9%	11.0%
Real estate	3.4%	3.0%
Infrastructure	5.6%	8.0%
Total Invested Assets	**100.0%**	**100.0%**

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
Canadian equities	9.0%	15.0%	21.0%
Global equities	21.0%	40.0%	49.0%
Fixed-income	30.0%	33.0%	70.0%
Cash	0.0%	2.0%	15.0%
Real estate	0.0%	5.0%	10.0%
Infrastructure	0.0%	5.0%	10.0%
		100.0%	

Reconciliation of Changes in Market Value of Assets

The table below reconciles changes in the market value of assets between January 1, 2018 and January 1, 2020.

	January 1, 2018 to December 31, 2018	January 1, 2019 to December 31, 2019
Market Value of Assets, Beginning of Plan Year	**$ 1,677,543,000**	**$ 1,694,301,000**
Contributions During Plan Year		
Member	$ 33,073,000	$ 35,175,000
University normal cost	42,862,000	45,587,000
University special payments	12,888,000	13,840,000
University ongoing expenses	-	-
Interest on contributions	-	-
Total	**$ 88,823,000**	**$ 94,602,000**
Benefit Payments During Plan Year		
Non-retired members[1]	$ 12,521,000	$ 10,620,000
Retired members	60,264,000	64,361,000
Total	**$ 72,785,000**	**$ 74,981,000**
Transfers During Plan Year		
Into plan	$ 1,392,000	$ 1,697,000
Out of plan	-	-
Total	**$ 1,392,000**	**$ 1,697,000**
Fees/Expenses		
Investment fees/expenses	$ 3,236,000	$ 2,231,000
Non-investment fees/expenses	1,349,000	846,000
Total	**$ 4,585,000**	**$ 3,077,000**
Investment Income	**$ 3,913,000**	**$ 228,261,000**
Market Value of Assets, End of Plan Year	**$ 1,694,301,000**	**$ 1,940,803,000**
Rate of Return, Net of Fees/Expenses	**(0.04)%**	**13.21%**

[1] Includes members who have terminated employment or died

Development of Adjusted Market Value of Assets

The adjusted market value of assets is equal to the market value of assets adjusted to reflect any contributions, benefit payments, transfers and fees/expenses in-transit as of the valuation date. The development of the adjusted market value of assets is shown below.

	January 1, 2018	January 1, 2019	January 1, 2020
Market value of assets	$ 1,677,543,000	$ 1,694,301,000	$ 1,940,803,000
Contributions receivable	-	-	-
Benefits payable	(814,000)	(441,000)	(223,000)
Transfers (payable)/receivable	-	-	-
Fees/expenses payable	(867,000)	(1,225,000)	(2,078,000)
Adjusted Market Value of Assets	**$ 1,675,862,000**	**$ 1,692,635,000**	**$ 1,938,502,000**

Development of Actuarial Value of Assets

The actuarial value of assets is equal to the adjusted market value of assets.

Appendix B: Membership Data

Source of Data

This valuation was based on member data provided by the University as of January 1, 2020. 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 2 years of credited service from January 1, 2018 (unless they transferred in their past service). This test also revealed any members who accrued less than 2 years of credited service;
- A reconciliation of pensionable earnings against the corresponding amounts provided for the last valuation to identify any unusual increases or decreases;
- A reconciliation of accrued benefits against the corresponding amounts provided for the last valuation to identify any unusual benefit accruals;
- A reconciliation of any stated benefit payments since January 1, 2018 (for retired, terminated, or deceased members) 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.

There was no information missing from the data, so no assumptions were required with respect to such data.

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 F of this report.

Membership Summary

The table below reconciles the number of members as of January 1, 2020 with the number of members as of January 1, 2018 and the changes due to experience in the period.

	Active	Disabled	Suspended	Retired and Beneficiaries	Deferred Vested	MMO Deferred	Total
Members, January 1, 2018	**4,476**	**86**	**9**	**1,932**	**534**	**3**	**7,040**
Changes due to:							
New entrants	1,060	-	-	-	-	-	1,060
Termination							
Non-vested	-		-	-	-	-	-
Deferred vested	(151)	(1)	-	-	152	-	-
Lump sum	(259)	(4)	(3)	-	(63)	-	(329)
Death							
No further benefits	(8)	(2)	-	(93)	(1)	-	(104)
Remaining guarantee	-	-	-	-	-	-	-
Surviving beneficiary	-	(1)	-	(31)	-	-	(32)
New beneficiary	-	-	-	32	-	-	32
Retirement	(208)	(18)	-	254	(27)	(1)	-
Disability	(59)	59	-	-	-	-	-
Return from Disability	29	(29)	-	-	-	-	-
Transfer to Suspended	-	-	-	-	-	-	-
Re-Entry Into Plan	11	-	(4)	-	(7)	-	
New Certain Only beneficiary							
Certain Only Payments Ceased				(1)			(1)
Data correction	-	-	-	(1)	(4)	-	(5)
Net change	415	4	(7)	160	50	(1)	621
Members, January 1, 2020	**4,891**	**90**	**2**	**2,092**	**584**	**2**	**7,661**

Active Members (Including Leaves)

	January 1, 2020	January 1, 2018
Number	4,891	4,476
Average age	46.8	47.3
Average credited service	9.9	10.3
Average pensionable earnings	$ 102,157	$ 97,834
Proportion female	52.6%	48.2%

Disabled Members

	January 1, 2020	January 1, 2018
Number	90	86
Average age	55.4	55.4
Average credited service	16.9	16.8
Average pensionable earnings	$ 66,791	$ 61,791
Proportion female	73.3%	73.3%

Suspended Members

	January 1, 2020	January 1, 2018
Number	2	9
Average age	34.4	34.8
Average credited service	3.0	2.1

Deferred Vested Members—Eligible for COLA on All Service

	January 1, 2020	January 1, 2018
Number	305	299
Average age	57.8	56.5
Average annual pension	$ 8,056	$ 7,680
Total annual pension	$ 2,457,031	$ 2,296,176

Deferred Vested Members—Eligible for COLA on Pre-2008 Service

	January 1, 2020	January 1, 2018
Number	115	113
Average age	46.9	45.5
Average annual pension	$ 9,575	$ 8,765
Total annual pension	$ 1,101,035	$ 990,444

Deferred Vested Members—Not Eligible for COLA

	January 1, 2020	January 1, 2018
Number	164	122
Average age	40.4	42.4
Average annual pension	$ 4,262	$ 4,310
Total annual pension	$ 699,034	$ 525,852

Retired Members and Beneficiaries

	January 1, 2020	January 1, 2018
Number	2,092	1,932
Average age	74.6	74.4
Average annual pension	$ 31,643	$ 30,202
Total annual pension	$ 66,196,903	$ 58,349,351

Active/Disabled/Suspended Membership Distribution

The following table provides a detailed summary of the active/disabled membership at the valuation date by years of credited service and by age group. For privacy reasons, average pensionable earnings is not shown for groups with two or less members.

Age	< 5	5–10	10–15	15–20	20–25	25–30	>=30	Total
< 30	281	9						290
	$ 59,408	$ 55,636	$	$	$	$	$	$ 59,291
30–35	367	126	8					501
	$ 74,144	$ 75,008	$ 67,702	$	$	$	$	$ 74,258
35–40	445	196	82	6				729
	$ 80,383	$ 94,312	$ 83,940	$ 103,370	$	$	$	$ 84,717
40–45	275	233	123	51	8			690
	$ 83,497	$ 106,671	$ 120,936	$ 98,499	$ 82,094	$	$	$ 99,089
45–50	177	163	196	134	41			711
	$ 79,924	$ 99,436	$ 121,142	$ 134,960	$ 102,116	$	$	$ 107,412
50–55	132	130	111	150	86	19		628
	$ 73,557	$ 95,664	$ 113,434	$ 115,629	$ 117,614	$ 107,787	$	$ 102,300
55–60	106	102	106	150	198	64	10	736
	$ 87,670	$ 96,493	$ 107,359	$ 111,364	$ 117,276	$ 126,823	$ 110,769	$ 108,240
60–65	60	72	85	69	82	149	42	559
	$ 82,381	$ 95,001	$ 108,302	$ 114,846	$ 120,059	$ 120,766	$ 142,663	$ 112,243
>=65	12	17	16	15	18	19	42	139
	$ 91,197	$ 99,322	$ 98,854	$ 127,072	$ 114,835	$ 153,385	$ 182,450	$ 136,078
Total								
Count	**1,855**	**1,048**	**727**	**575**	**433**	**251**	**94**	**4,983**
Average 2019 Pensionable Earnings	**$ 76,455**	**$ 95,712**	**$ 111,145**	**$ 117,579**	**$ 115,683**	**$ 123,797**	**$ 157,047**	**$ 97,625**

Deferred Vested/Retired Membership Distribution

The following table provides a detailed summary of the deferred vested/retired membership at the valuation date by age group. For privacy reasons, average pensions are not shown for groups with two or less members.

Age	Deferred Vested Members	Retired Members and Beneficiaries
< 50	277	
	$ 5,017	
50–55	97	1
	$ 9,244	$ *
55–60	96	20
	$ 9,801	$ 11,485
60–65	80	162
	$ 11,632	$ 24,246
65[1]–70	34	493
	$ 2,916	$ 26,602
70–75		506
		$ 35,961
75–80		378
		$ 36,964
>=80		529
		$ 31,411
Total		
Count	**584**	**2,092**
Average Lifetime Pension	**$ 7,290**	**$ 31,643**

[1] Includes all deferred vested members over age 65

Appendix C: 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.

	January 1, 2020	**January 1, 2018**
Economic Assumptions		
Discount rate	5.60% per year	Same
Inflation rate	2.00% per year	Same
Post-retirement indexation		
Pre-2014 accrued pensions	2.00% per year	Same
Post-2013 accrued pensions	1.50% per year	Same
Increases in pensionable earnings		
Active members	4.00% per year	Same
Disabled members	2.00% per year	Same
Increases in year's maximum pensionable earnings (“YMPE”)	2.75% per year	Same
Increases in maximum pension limit	$3,092.22 in 2020; increased after 2020 at 2.75% per year subject to a dollar cap of $3,400 which increases at 0.92% per year beginning in 2022	2,944.44 in 2018; then 2.75% per year up to $3,200
Interest on member contributions	3.00% per year	3.00% per year
Interest rate used to calculate 50% rule	1.20% per year for 10 years; 1.20% per year thereafter	1.30% per year for 10 years; 1.50% per year thereafter
Investment expenses	Discount rate is net of investment expenses	Same
Non-investment expenses	$1,500,000 (increased at 4% per year) is added to the University normal cost to cover non-investment expenses	Same
PfAD	9.00% of non-indexed liabilities and normal cost (including provisions for expenses and PfAD)	6.95% of non-indexed liabilities and normal cost (including provisions for expenses and PfAD)

	January 1, 2020	January 1, 2018
Demographic Assumptions		
Mortality table	2014 Canadian Pensioners' Public Sector Mortality ("CPM2014 Public") Table with mortality improvement Scale MI-2017	2014 Canadian Pensioners' Combined Mortality ("CPM2014") Table with mortality improvement Scale MI-2017
Retirement rates	Variable by age (Table A following)	Age 64, but no earlier than one year after the valuation date
Termination rates	Variable by age (Table B following)	Same
Disability rates	None	Same
Methods		
Actuarial cost method	Projected 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

Table A—Retirement Rates

Sample retirement rates per 1,000 are shown in the following table:

Age	Rates per 100
60	5
61	5
62	25
63	10
64	10
65	50
66	25
67	25
68	25
69	50
70	100

Table B—Termination Rates

Sample rates used in this valuation are shown as rates per 100 lives in the following table:

Age	Male and Female
20	10.0
25	10.0
30	5.6
35	3.2
40	2.2
45	1.7
50	1.2
55	0.7
60	0.2
65	0

Justification of Actuarial Assumptions and Methods

Margins for Adverse Deviations

The actuary has discussed the Plan's experience with the University and compared it to the expected experience. This review indicates that the use of the PfAD achieves the University's desire to maintain safety cushions; therefore the decision was made to not to include any additional margins for conservatism. The Provisions for PfAD that is required by Ontario Regulation is discussed later in this section.

Economic Assumptions

Discount Rate

The overall expected return ("best-estimate") of 5.60% was developed based on an inflation rate of 2.00% per year, using best-estimate returns for each major asset class in which the pension fund is invested. 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 following table 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	
Overall expected return	5.64%
Non-investment expenses	0.00%
Passive Investment expenses	(0.07)%
Margin for adverse deviations	0.00%
Unrounded Discount Rate	**5.57%**
Discount Rate	**5.60%**

Inflation Rate

The inflation rate assumption reflects our best estimate of future inflation considering current economic and financial market conditions, and reflects the mid-point of Bank of Canada target inflation

Productivity Increases

The productivity increase assumption reflects our best estimate of future increases considering current economic and financial market conditions, and is consistent with historical real economic growth.

Increases in Pensionable Earnings

The assumption for increases in pensionable earnings reflects the assumed rate of inflation, plus allowances for the effect of productivity growth, individual employee merit and promotion.

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 reflects the assumed rate of inflation plus the productivity increase assumption.

Increases in the Maximum Pension Limit

Pensions are limited to the maximum limits under the *Income Tax Act*. The *Income Tax Act* specifies both a dollar limit, and in addition pensions cannot exceed 2% of indexed highest average compensation per year of credited service. The assumed increase in the dollar limit reflects the assumed rate of inflation plus the productivity increase assumption.

Interest on Member Contributions

Interest is credited on member contributions with the rate credited by chartered banks on five-year personal fixed term deposits. The assumption for interest on member contributions reflects our expected increase in these rates, and is consistent with historical rates.

Expenses

Since the discount rate has been established net of investment expenses, no explicit assumption is required for investment expenses.

An explicit provision for non-investment expenses has been included in the normal cost.

Provision for Adverse Deviation

For the purpose of this valuation, the PfAD is established based on the target asset allocation for each category of investments set out in the Statement of Investment Policies and Procedures (SIPP) in effect at the date of this report.

Asset Mix Component	Investment Categorization under Regulation 76 (12)	Categorization under Regulation 11.2 (8)[1]	Target Asset Allocation (%)
Cash and short term	4	Fixed Income ("L")	2.0%
Fixed-income	15	Fixed Income ("L")	33.0%
Canadian equities	13	Non-Fixed Income	15.0%
Global equities	14	Non-Fixed Income	40.0%
Real Estate (REITS)	7	Non-Fixed Income	5.0%
Infrastructure (Listed)	17	Non-Fixed Income	5.0%
			100.0%
Fixed income ("L")			35%
Alternative Investment ("M")			0%
(a) Percentage of fixed income for PfAD ["L" + 50%* "M"]			35.00%
(b) Percentage of non-fixed income for PfAD [100%-(a)]			65.00%
(c) Asset mix component (see table below) [2]			5.00%

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

1 The fixed income investments satisfy the minimum credit rating requirements prescribed by the Regulation.
2 Based on linear interpolation.

Benchmark Discount Rate (BDR)

(d) V39056 rate at the valuation date	1.70%
(e) BDR [(d)+1.5%*(a)+5.0%*(b)+0.5%]	5.98%
(f) Best estimate discount rate	5.64%
(g) Plan duration	14.64

PfAD is Determined as Follows:

Fixed component (4% for open plan or 5% for closed plan)	4.00%
Asset mix component	5.00%
BDR component [Max [0, (g)*((f)-(e))]]	0.00%
Total	**9.00%**

Demographic Assumptions

Mortality

At the current valuation, the mortality assumption has been updated to the 2014 Canadian Pensioners' Public Sector Mortality Table. At the prior valuation the 2014 Canadian Pensioners' Combined Mortality Table was used. The update was based on a review of pensioner mortality experience over the past 8 years.

In 2017, the CIA released a research paper introducing a new Mortality Improvement Scale (MI-2017) and subsequently published an Education Note stating that both the MI-2017 and CPM-B Scales "constitute broad and relevant mortality improvement studies for the Canadian population." We have continued to use MI-2017 projection scale for the purposes of this valuation since this scale takes into account a broader thinking on mortality improvements.

Retirement

The retirement assumption has been updated from a single point retirement age of 64 used at the last valuation to a table of assumed retirement rates varying by age. The rates of retirement have been developed as our expectation of the best-estimate rates of retirement based on the Plan provisions and a review of retirement experience over the past 10 years.

Termination of Employment

The rates of termination of employment before retirement represent a best estimate of termination rates for a plan of this size and workforce characteristics of the Plan. Table A was developed by a previous actuary for the Plan. We have been using this table as our assumption since our first valuation in 2005. The resulting gains and losses have been relatively small. Therefore, we continue to find this table appropriate.

Option Elections on Termination

We have assumed all members will elect a deferred annuity on termination.

Disability

If an active Plan member becomes disabled, contributory service continues to accrue until unreduced pension commencement age, but employee contributions are waived. Since this benefit is substantially the same as the benefit that accrues to an active member, no disability assumption was used. Use of an actual disability assumption in this case would reduce liabilities slightly, so a nil disability incidence assumption represents a small element of conservatism. The disability assumption has very little impact on the valuation results.

Proportion of Members with Spouses and Spousal Age Differential

There is no percent married assumption or age difference assumption required since the Plan does not offer a subsidized joint and survivor pension at retirement, nor any specific preretirement death benefit for a spouse that is not offered to any other beneficiary.

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 unit credit 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 a surplus 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) net of any required employee contributions is expressed as a percentage of the expected value of participating payroll for that year. The employer 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 preretirement death benefits are included. For each member, the retirement, withdrawal and preretirement 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’s assets are adequate to provide the benefits. Conversely, favourable experience may generate surplus which may serve to reduce future contribution requirements.>>

Asset Valuation Method

The asset valuation method for this valuation is market value of assets. All other gains and losses have been fully recognized.

Appendix D: Solvency and Hypothetical Wind Up Assumptions and Methods

Valuation Assumptions

	January 1, 2020	January 1, 2018
Economic Assumptions		
Discount Rates—Solvency		
Transfer value basis	2.50% per year for 10 years; 2.60% per year thereafter	2.80% per year for 10 years; 3.30% per year thereafter
Annuity purchase basis	2.96% per year	3.03% per year
Duration used to determine annuity purchase basis	11.25	11.23
Blended rates used to determine solvency special payments	2.80%	3.00% per year
Discount Rates—Hypothetical Wind-Up		
Transfer value basis		
100% CPI Indexed	1.20% per year for 10 years; 1.20% per year thereafter	1.30% per year for 10 years; 1.50% per year thereafter
75% CPI Indexed	1.50% per year for 10 years; 1.60% per year thereafter	1.70% per year for 10 years; 1.90% per year thereafter
Annuity purchase basis		
100% CPI Indexed	-0.29% per year	-0.13% per year
75% CPI Indexed	0.52% per year	0.66% per year

Demographic Assumptions		
Mortality table	2014 Canadian Pensioners' Combined Mortality ("CPM2014") Table with mortality improvement Scale CPM-B[1]	Same
Termination rates	Immediate	Same
Retirement age	Age between 55 and 65 that produces highest value	

[1] No preretirement mortality was applied

	January 1, 2020	January 1, 2018
Other		
Wind up expenses	$500,000	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
Incremental Cost		
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

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:

	Percent of Liability Assumed to be Settled By Purchase of Annuities	Percent of Liability Assumed to be Settled By Lump-Sum Transfer
Active Members		
Not retirement eligible	0%	100%
Retirement eligible	100%	0%
Deferred Vested Members		
Not retirement eligible	100%	0%
Retirement eligible	100%	0%
Retired Members and Beneficiaries	100%	0%

Postulated Scenario

The postulated scenario is the assumption of immediate termination of employment for the active group at the valuation date. Therefore, no allowance for future salary increases or demographic experience are reflected.

Benefits Valued

	Solvency Valuation	**Hypothetical Wind Up Valuation**
Vesting	We have treated all accrued benefits as vested on Plan wind up.	We have treated all accrued benefits as vested on Plan wind up.
Consent Benefits	None.	None.
Grow-in Benefits	Active members with 55 age-plus-continuous service points as of the valuation date are assumed to grow into the enhanced early retirement reductions of the Plan.	Active members with 55 age-plus-continuous service points as of the valuation date are assumed to grow into the enhanced early retirement reductions of the Plan.
Exclusions	In accordance with the *Pension Benefits Act* (Ontario), the solvency liability excludes the value of future escalated adjustments (future indexation) for both the preretirement and postretirement period.	None.
Post-valuation Date Benefit Increases	Not applicable	Not applicable
Indexing	Excluded	Included

Justification for Valuation Assumptions

We have set the aforementioned assumptions based on guidance prepared by the CIA Committee on Pension Plan Financial Reporting ("PPFRC") in Educational Note – Assumptions for Hypothetical Wind-Up and Solvency Valuations with Effective Dates between December 31, 2019 and December 30, 2020 ("CIA Guidance - Tentative") released on January 23, 2020.

For benefit entitlements that are expected to be settled by lump-sum transfer, we based the assumptions on Section 3500 (Pension Commuted Values) of the CIA Standards of Practice, using rates corresponding to a valuation date of January 1, 2020.

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 as described in the educational note.

Non-Indexed Rates

Solvency lump-sum discount rate for 10 years ($i_{1\text{-}10}$)	= V122542[1] + 90 bps
	= 1.63% + 0.90%
	= 2.53% (rounded to 2.50%) per year
Solvency lump-sum discount rate thereafter (i_{10+})	= V122544[30]+ 0.5 x (V122544[1] – V122542[1]) + 90 bps
	= 1.67% + 0.5 x (1.67% – 1.63%) + 0.90%
	= 2.59% (rounded to 2.60%) per year
Solvency annuity purchase discount rate	= V39062 + Duration Adjustment
	= 1.76% + 1.20%
	= 2.96% per year

[1] CANSIM Series (annualized)

Indexed Rates

Theoretical Yield on 7-year RRGCB (r_7) = V122553[1] x (V122542[1] / V122544[1])
= 0.32% + (1.64%/1.68%)
= 0.31% per year

Fully indexed lump-sum discount rate for 10 years ($r_{1\text{-}10}$) = r_7 + 90 bps
= 0.31% + 0.90%
= 1.21% (rounded to 1.20%) per year

Fully indexed lump-sum discount rate thereafter (r_{10+}) = V122553[1] + 0.5 x (V122553[1] – r7) + 90 bps
= 0.32% + 0.5 x (0.32% – 0.31%) + 0.90%
= 1.22% (rounded to 1.20%) per year

Full indexed annuity purchase discount rate = V39057 – 70 bps
= 0.41% - 0.70%
= -0.29% per year

Implied 100% CPI for 10 years ($u_{1\text{-}10}$) = [(1 + $i_{1\text{-}10}$) / (1 + $r_{1\text{-}10}$)] - 1
= [(1 + 2.53%) / (1 + 1.21%)] - 1
= 1.30% per year

Implied 100% CPI for 10 years (u_{10+}) = [(1 + i_{10+}) / (1 + r_{10+})] - 1
= [(1 + 2.59%) / (1 + 1.22%)] - 1
= 1.35% per year

Partially indexed (75% CPI) lump-sum discount rate for 10 years = [(1 + $i_{1\text{-}10}$) / (1 + 0.75 x $u_{1\text{-}10}$)] - 1

= [(1 + 2.53%) / (1 + 0.75 x 1.30%)] - 1
= 1.54% (rounded to 1.50%) per year

Partially indexed (75% CPI) lump-sum discount rate thereafter = [(1 + i_{10+}) / (1 + 0.75 x u_{10+})] - 1

= (1 + 2.59%) / (1 + 0.75 x 1.35%) - 1
= 1.56% (rounded to 1.60%) per year

Partially indexed (75% CPI) annuity purchase discount rate =

0.25 x Solvency annuity purchase discount rate + 0.75 x Full indexed annuity purchase discount rate
= 0.25 x 2.96% + 0.75 x -0.29%
= 0.52% per year

Mortality Table

The derivation of the discount rate above is in conjunction with CPM2014 in accordance with the CIA Guidance.

Preretirement Mortality

We have made no allowance for preretirement 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.

Assumptions Not Needed

The following are not relevant to the solvency or hypothetical wind up valuation:

- Increases in pensionable earnings;
- Termination of employment rates;
- Increases in YMPE; and
- Increases in *Income Tax Act* maximum pension limit.

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 calculated this as a flat $500,000. We have not made an allowance for expenses related to surplus or deficit resolution. We have assumed that the University will still be solvent on the wind up of the Plan.

Calculation of Special Solvency Payments

To calculate the special payments necessary to liquidate the Solvency deficiency we used a weighted average of the solvency discount rates based on the relative proportions of benefit entitlements that are expected to be settled by purchase of annuities and lump-sum transfer.

Unisex Assumption

The liabilities are valued on a sex-distinct basis. The determination of the unisex percentage used in the payment of commuted values to non-Quebec members eligible for portability is based on the proportion of non-Quebec active and deferred vested liabilities for males and females. As such, the determination of commuted value liabilities on a sex-distinct basis in the solvency/hypothetical wind-up valuation is appropriate.

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.

Incremental Cost

The incremental cost represents the present value, at the calculation date (time 0), of the expected aggregate change in the 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 CIA 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 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 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, 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 assumptions used to calculate the projected liability at time t are consistent with the assumptions for the 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 are considered in calculating the incremental cost.

Appendix E: Summary of Plan Provisions

This funding valuation was based on Plan design information provided by the University as of January 1, 2020. The following is a summary of the main provisions of the Plan.

Plan Provisions

Effective Date	January 1, 2011 (last restatement of the Plan document and as subsequently amended).
Jurisdiction of Registration	Ontario
Eligibility for Membership	Faculty and Staff Employees are eligible to join the Plan on the first day of any month coincident with or next following the date of employment with the University. An eligible Employee must join the Plan no later than the first day of the calendar year coincident with or next following attainment of age 35, or their appointment (if already age 35). Faculty Employees employed as lecturers may elect not to join the Plan. However, a lecturer who has attained age 35 must join the Plan on the first day of the month coincident with or next following the earlier of promotion to a higher rank or completion of five years of service with the University. Any Employee who has either earned at least 35% of the Year's Maximum Pensionable Earnings (YMPE) under the Canada Pension Plan or worked at least 700 hours in each of the two immediately preceding calendar years, shall be eligible to join the Plan on the first day of any month coincident with or next following the date on which such conditions are satisfied.
Normal Retirement	
Eligibility	First day of the month coincident with or next following attainment of age 65.
Benefit	Effective May 1, 1998 on retirement, a member receives an annual pension equal to the sum of the following: 1.4% of Final Average Earnings up to the Average Year's Maximum Pensionable Earnings, plus, 2.0% of Final Average Earnings in excess of the Average Year's Maximum Pensionable Earnings for each year and completed month of Credited Service under the Plan.

The Final Average Earnings is determined based on 36 consecutive months of earnings for retirements on or before January 1, 2014. The averaging period is increased by one month for each month in 2014 and 2015 so that the averaging period is 60 consecutive months for all retirements after December 31, 2015. The Average Year's Maximum Pensionable Earnings is determined over a five-year period.

On retirement prior to May 1, 1998, a member received an annual pension equal to the sum of the following:

1.3% of Final Three-Year Average Earnings up to the Average Year's Maximum Pensionable Earnings, plus,

2.0% of Final Three-Year Average Earnings in excess of the Average Year's Maximum Pensionable Earnings.

for each year and completed month of Credited Service under the Plan.

The Average Year's Maximum Pensionable Earnings was determined over a three-year period.

Maximum Pension

The annual benefit payable in the Normal Form under the Plan for a member determined at the time of pension commencement cannot exceed the lesser of:

- the lesser of (a) and (b):
  (a) the defined benefit limit for the year as defined in the *Income Tax Act*; and
  (b) $3,200.00 prior to January 1, 2021 or $3,400.00 effective January 1, 2021, increased thereafter each calendar year commencing January 1, 2022 by one-third (1/3) of the percentage increase in the Average Industrial Wage, calculated on an annual basis.

times the Member's Credited Service; and

- 2.0% of the Member's highest indexed compensation times Credited Service.

For service prior to January 1, 1992, a member's Credited Service shall not exceed 35 years.

Regulation 8504(6) imposes a lower maximum benefit limit in respect of any pre-1990 service that is granted after June 8, 1990 (e.g., buy-back or granting of years of pre-1990 service that was not previously counted as Credited Service).

Early Retirement

Eligibility	Within ten years of normal retirement date and retire from active service.
Benefit	For Members who retired on an early retirement date prior to May 1, 2000, the pension payable on early retirement is reduced by ⅓ of 1% for each of the first 60 complete months by which early retirement precedes the normal retirement date plus ½ of 1% for each additional complete month. For Members who retire on an early retirement date on or after May 1, 2000, the pension payable on early retirement is reduced by 1/2 of 1% for each complete month by which early retirement date precedes the first day of the month coincident with or next following age 62. In any event, the reduced pension cannot be less than the actuarial equivalent of the Member's accrued pension.

Postponed Retirement

Eligibility	Any age after normal retirement date; pension commencement under the Plan may not be postponed beyond the end of the calendar year in which the Member attains age 71.
Benefit	The Member continues to make required contributions, his or her service continues to accrue and the Member will receive a pension on his or her postponed retirement date based on Credited Service, Final Average Earnings and Average Year's Maximum Pensionable Earnings at that date, subject to the paragraphs below. A Member who is a Faculty Employee employed by the University since prior to January 1, 1969 is permitted, if he or she elects on or before normal retirement date to postpone retirement by no more than three years following the first of the month coincident with or next following the end of the contract year during which he or she attains age 65, to elect on or before normal retirement date to cease making any further contributions to the Plan. Such Member shall receive a pension equal to the actuarial equivalent of the pension they would have received at normal retirement date. A Member who is a non-union Staff Employee employed by the University since prior to January 1, 1969 is permitted, if he or she elects on or before normal retirement date to postpone retirement by no more than three years following the first of the month coincident with or next following the normal retirement date, to elect on or before normal retirement date to cease making any further contributions to the Plan. Such Member shall receive a pension equal to the actuarial equivalent of the pension they would have received at normal retirement date.

Termination Benefits	
Eligibility	Immediate (prior to early retirement date)
Benefit	A Member whose service terminates is entitled to a locked-in fully vested deferred pension commencing at his normal retirement date. The early retirement reduction applicable if the former Member commences receipt of the pension prior to normal retirement date, on or after early retirement date, is equal to 1/3 of 1% for each of the first 60 complete months by which early retirement precedes the normal retirement date plus ½ of 1% for each additional complete month. A Member who terminates employment and is entitled to a locked-in vested deferred pension may request that an amount equal to the commuted value of the deferred pension entitlement be transferred to another registered pension plan, to a prescribed locked-in retirement savings arrangement or to an insurance company for the purchase of a life annuity that will not commence benefit payments prior to the Member's early retirement date. Different provisions applied for those members who terminated employment prior to July 1, 2012
Death Benefits	
Eligibility	Immediate
Benefit	On the death of a Member while in the service of the University, a refund of the commuted value of the accrued pension, subject to the 50% minimum employer cost rule plus any additional voluntary contributions, are paid to the Member's spouse, or if no spouse, the Member's designated beneficiary or estate. Different pensions applied prior to July 1, 2012.
Disability	
Eligibility	Immediate (prior to age 65)
Benefit	Members who are in receipt of income disability benefits under the long-term disability insurance plan of the University cease to contribute while disabled but continue to accrue Credited Service for pension purposes. Accrued pensions for LTD Members are based on pensionable earnings, to date of disability, increased each year by a percentage which is determined annually by the Committee.
Normal Form of Payment	The normal form of pension payable to a Member is a life annuity with a ten-year guarantee period. For Members who terminated prior to May 1, 1998 and are entitled to a deferred pension under the Plan, the normal form is a life annuity with a five-year guarantee period.

Cost-of-Living Adjustments

The pension of each Member receiving pension payments on May 1 of any year shall be adjusted by the Postretirement Cost-of-Living Factor for each year, provided that the Member has received at least one regular pension payment prior to May 1.

For any pension benefits accrued prior to January 1, 2014, this factor is obtained by dividing the average Consumer Price Index for the preceding calendar year by the average index for the next preceding calendar year. In the first year of retirement, the increase will be provided on a pro rata basis subject to the *Income Tax Act* rules. However, if this factor exceeds 105% and if the financial position of the Plan is not sufficient to provide for this increase, the factor may be reduced, within certain limits, to maintain the solvency of the Plan.

For any pension benefits accrued on and after January 1, 2014 this factor is obtained by dividing the average Consumer Price Index from the preceding calendar year by the average index for next preceding calendar year, and then multiplying the result by 0.75. However, if this factor exceeds 103.75% and if the financial position of the plan is not sufficient to period for this increase, the factor may be reduced, within certain limits, to maintain the solvency of the Plan.

In 2009, the date of the annual adjustment changed from July 1 to May 1, with the first such adjustment as of May 1, 2009 prorated to reflect the ten-month period since the prior adjustment.

All terminated Members who are entitled to a terminated vested pension except for those who terminated between July 1, 1977 and December 31, 1986 shall have their terminated vested pensions adjusted on May 1 (July 1 prior to 2009) of each year by a cost-of-living factor to be determined annually by the Committee, subject to the *Income Tax Act* Rules. Notwithstanding the foregoing, if a Member terminates employment on or after January 1, 2008 and is not within ten years of his or her Normal Retirement Date, or has not completed 20 years or more of continuous employment, the Cost of Living Factor shall only apply to the terminated vested member's pension earned in respect of Credited Service prior to January 1, 2008.

Increases in the Consumer Price Index and the corresponding postretirement cost-of-living factors for 2017 and the previous years are shown below[1]:

[1] Cost of living factors only shown for pre-2014 accrued benefits

Year	Increase in Prior Year Consumer Price Index (%)	Postretirement Cost-of-Living Factor (%)
1968	-	2.50
1969	-	3.00
1970	4.50	4.50
1971	3.30	2.00
1972	2.90	2.30
1973	4.80	4.80
1974	7.70	6.40
1975	10.90	10.90
1976	10.80	10.80
1977	7.50	7.50
1978	7.99	5.00
1979	8.91	8.91
1980	9.15	9.15
1981	10.16	10.16
1982	12.49	10.00
1983	10.76	10.76
1984	5.83	5.83
1985	4.35	4.35
1986	3.96	3.96
1987	4.17	4.17
1988	4.37	4.37
1989	4.04	4.04
1990	4.97	4.97
1991	4.76	4.76
1992	5.64	5.64
1993	1.49	1.49
1994	1.84	1.84
1995	0.19	0.19
1996	2.17	2.17
1997	1.56	1.56
1998	1.63	1.63
1999	0.97	0.97
2000	1.74	1.74
2001	2.68	2.68
2002	2.56	2.56
2003	2.23	2.23
2004	2.77	2.77
2005	1.88	1.88
2006	2.17	2.17
2007	2.04	2.04
2008	2.20	2.20
2009[1]	1.94	1.94
2010	0.29	0.29
2011	1.78	1.78
2012	2.91	2.91
2013	1.52	1.52
2014	0.94	0.94
2015[2]	1.91	1.91
2016	1.13	1.13
2017	1.43	1.43
2018	1.60	1.60
2019	2.27	2.27
2020	1.95	1.95

[1] Effective May 1, 2009 the indexation date was changed from July 1 to May 1. Therefore, the indexation adjustment made in 2009 is prorated for ten months since the prior adjustment

[2] Pensions earned up to December 31, 2013 are indexed annually at 100% of the postretirement cost-of-living factor; pensions earned on and after January 1, 2014 are indexed at 75% of the postretirement cost-of-living factor

Member Contributions

Effective May 1, 2020, Members are required to contribute to the Plan in accordance with the following table:

	Contribution Rate on Earnings	
Effective Date	**Not in Excess of Year's Maximum Pensionable Earnings**	**In Excess of Year's Maximum Pensionable Earnings**
May 1, 2020	6.95%	9.95%
May 1, 2021	7.40%	10.60%
May 1, 2022	7.80%	11.20%

Effective January 1, 2013, members are required to contribute 6.25% of annual earnings up to the YMPE, 8.95% of annual earnings that exceed the YMPE but are less than two times the YMPE, and 9.95% of annual earnings in excess of two times the YMPE, subject to the amount permitted under the *Income Tax Act* for the year.

Effective May 1, 2009, Members were required to contribute 5.80% of annual Earnings up to the YMPE, 8.30% of annual Earnings that exceed the YMPE but are less than two times the YMPE, and 9.65% of annual Earnings in excess of two times the YMPE, subject to the amount permitted under the *Income Tax Act* for the year.

Effective July 1, 2008, Members were required to contribute 5.05% of annual Earnings up to the YMPE, 7.85% of annual Earnings that exceed the YMPE but are less than two times the YMPE, and 9.20% of annual Earnings in excess of two times the YMPE, subject to the maximum amount permitted under the *Income Tax Act* for the year.

Effective July 1, 2007, Members were required to contribute 4.80% of annual Earnings up to the YMPE, 7.175% of annual Earnings that exceeds the YMPE but are less than two times the YMPE, and 7.85% of annual Earnings in excess of two times the YMPE, subject to the maximum amount permitted under the *Income Tax Act* for the year.

For the period January 1, 2003 to June 30, 2007, Members were required to contribute 4.55% of annual Earnings up to the YMPE and 6.50% of the excess of Earnings above the YMPE, subject to the maximum amount permitted under the *Income Tax Act* for the year.

Prior to May 1, 1998, Members were required to contribute 4.875% of annual Earnings up to the YMPE and 6.50% of the excess of annual Earnings above the YMPE, subject to the maximum amount permitted under the *Income Tax Act* for the year. Between May 1, 1998 and January 1, 2003, there were temporary reductions in these member contribution rates.

Prior to January 1, 2012, these contributions were credited with interest each year at the four-year arithmetical average rate of return on the pension fund, excluding real return bonds, calculated at December 31st of the prior year. Effective January 1, 2012, the interest credit is the CANSIM rate.

Member Flexible Pension Plan Contributions

Prior to January 1, 2014, members are permitted to make additional flexible Pension Plan contributions on December 31st of each year up to the maximum deductible contribution permitted by the *Income Tax Act*.

On retirement or termination of membership, a Member's flexible Pension Plan contribution balance may be used to purchase additional ancillary benefits under the Pension Plan, up to the maximum ancillary benefits permitted by the *Income Tax Act*.

Flexible contributions that cannot be used to purchase ancillary benefits will be forfeited by the Member.

Transfers to the Pension Fund

A new Member may transfer the value of his or her benefits earned under the registered pension plan of a previous employer into the pension fund. The terms and conditions of such transfer and the benefits that will be payable are determined in accordance with Article 12 of the Plan, as amended from time to time.

Definitions

Pensionable earnings	**Staff Employees** Base salary, excluding overtime pay, reimbursement for expenses, special payments, shift premiums, week-end provisions, special allowances and other like payments. **Faculty Employees** Base salary, excluding reimbursement for expenses, administrative stipends, faculty research fellowships, seasonal stipends, summer teaching stipends, special payments, special allowances and other like payments.
Credited service	Member's years and completed months of continuous employment with the University while a member in the Plan. For service of a member employed on a part-time basis, the period of service is multiplied by the proportion the member's reduced work load bears to a regular full-time work load.

A copy of a letter from the University certifying the accuracy and completeness of the Plan provisions summarized in this report is included in Appendix G of this report.

Appendix F: Administrator Certification

With respect to the University of Waterloo Pension Plan, forming part of the actuarial report as at January 1, 2020, I hereby certify that, to the best of my knowledge and belief:

- The asset data provided or made available to the actuary is complete and accurate;
- 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 Plan provisions provided or made available to the actuary are complete and accurate;
- The actuary has been notified of all relevant events subsequent to the valuation measurement date; and
- The terms of engagement contained in Section 1 of this report are accurate and reflect the plan administrator's direction.

Name (print) of Authorized Signatory	Title
Signature	Date

About Aon

Aon plc (NYSE:AON) is a leading global professional services firm providing a broad range of risk, retirement and health solutions. Our 50,000 colleagues in 120 countries empower results for clients by using proprietary data and analytics to deliver insights that reduce volatility and improve performance.

Pension Risk Management Dashboard

University of Waterloo
As of March 31, 2020

Empower Results®

About This Material

This dashboard was prepared for the University of Waterloo to track changes in funded status of the Pension Plan over successive reporting periods, as well as quantify the amount of risk to which the Pension Plan is exposed. The report presents the funded status and performs the analysis on three bases:

Risk-Free Benchmark Basis – This liability is calculated using best estimate assumptions for retirement, termination and other demographic experience, and a discount rate and inflation assumption determined with reference to the risk-free environment. For this report, the liability has been determined at the real return bond yield plus a 40 basis point credit spread to reflect additional yield that can be achieved with relatively little additional risk. This liability differs from the solvency calculation in that the demographic assumptions are best estimate and statutory “grow-in” provisions are not included.

Going Concern Basis – This liability is calculated using the going concern assumptions at the most recent valuation. The analysis is performed using the market value of assets with Provision of Adverse Deviation as prescribed by the *Pension Benefits Act* (Ontario).

Solvency Basis – This liability is calculated using assumptions determined in accordance with the Canadian Institute of Actuaries Annuity Purchase guidance and Commuted Value standards in effect at each measurement date shown in this report. A summary of these assumptions is included on page 12.

This dashboard also contains a reconciliation that compares the going concern liability with the liability calculated using the risk-free benchmark. The difference between the two liabilities represents the amount of return expected to be provided by taking on risk in the investment portfolio. Over successive quarters the tool helps quantify how that risk changes as the underlying interest rates change.

On both bases the following information is shown:

- Current Funded Status and Historical Asset Liability Performance
  - How well funded is the plan?
  - What has been the return on plan assets and liabilities?
- Detailed Asset and Liability Performance Attribution
  - What factors drove the performance of assets and liabilities over the prior period?
  - What is the relative impact of these factors on the assets and liabilities in isolation and in combination?

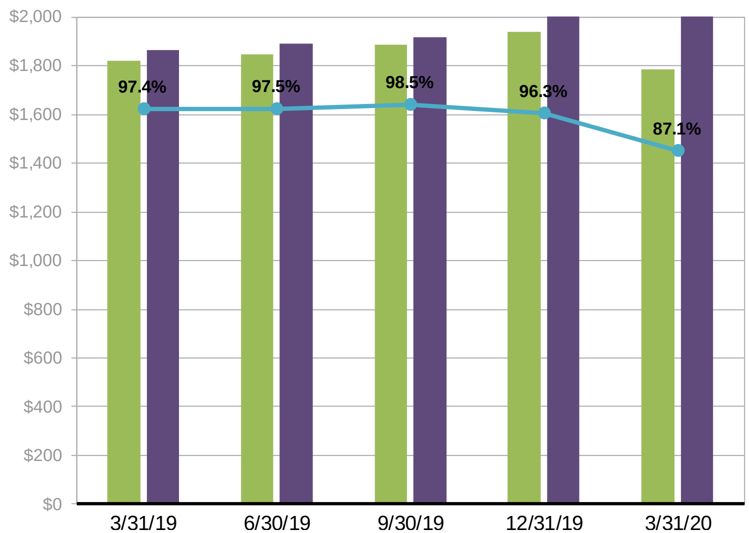
For the Risk-Free Benchmark Basis, the following information is also shown:

- Scenario Testing
  - What risk exposures does the plan face?
  - What would be the impact of a downside event for each risk factor?

Executive Summary – Going Concern

Funded Status

Values in $1,000,000 (CAD)



Highlights for the Quarter-Ending 3/31/20

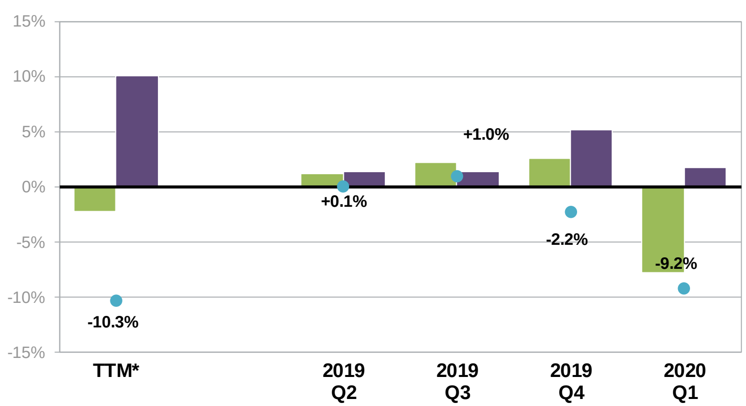
The plans' funded ratio decreased to 87.1% at 3/31/20. This result was primarily due to the combined effects of:

- Asset performance much lower than expected, and
- Increase in PfAD due to lower Benchmark Discount Rate ("BDR").

	3/31/19	6/30/19	9/30/19	12/31/19	3/31/20
Market Value of Assets	$ 1,819.1	$ 1,845.5	$ 1,889.0	$ 1,940.8	$ 1,785.8
Going Concern Liability	1,866.8	1,892.6	1,917.1	2,014.5[1]	2,050.1[2]
Surplus/(Deficit)	$ (47.7)	$ (47.1)	$ (28.1)	$ (73.7)	$ (264.3)
Periodic Contributions	22.3	$ 23.6	$ 24.2	$ 24.5	$ 16.2
Effective Interest Rate	5.70%	5.70%	5.70%	5.60%	5.60%
Funded Ratio (Market):	97.4%	97.5%	98.5%	96.3%	87.1%
Asset Duration:	2.0	2.0	2.0	1.9	1.9
Going Concern Liability Duration:	13.9	13.9	13.9	14.5	14.5

[1]After application of the Provision for Adverse Deviation ("PfAD") at 9.00%
[2]After application of the Provision for Adverse Deviation ("PfAD") at 9.55%

Asset-Liability Return



Asset Liability Return for Quarter-Ending 3/31/20

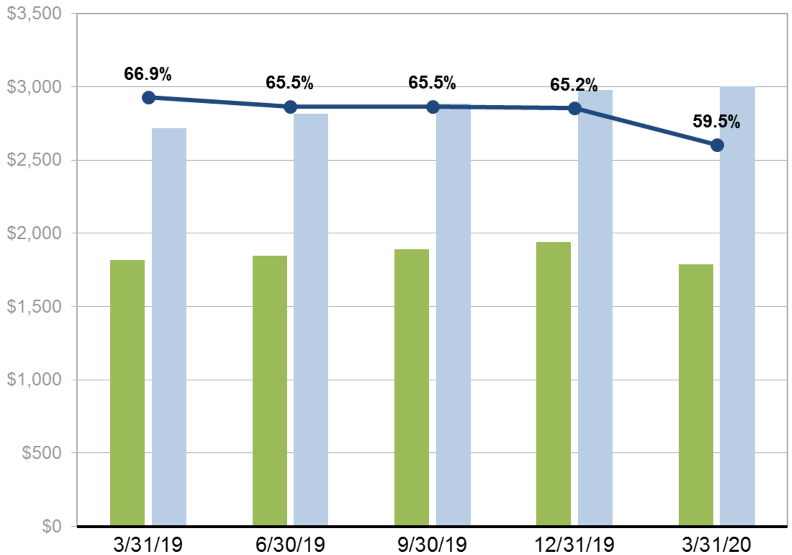
Assets returned -7.7% during the quarter while liabilities returned 1.8%, resulting in a funded status decrease of 9.2%.

Periodic Return/Change	Cumulative	6/30/19	9/30/19	12/31/19	3/31/20
Market Value of Assets Return	-2.2%	1.2%	2.2%	2.6%	-7.7%
Going Concern Return	10.1%	1.4%	1.4%	5.2%	1.8%
Funded Ratio Change[2]	-10.3%	0.1%	1.0%	-2.2%	-9.2%

Executive Summary – Risk-Free Benchmark

Funded Status

Values in $1,000,000 (CAD)



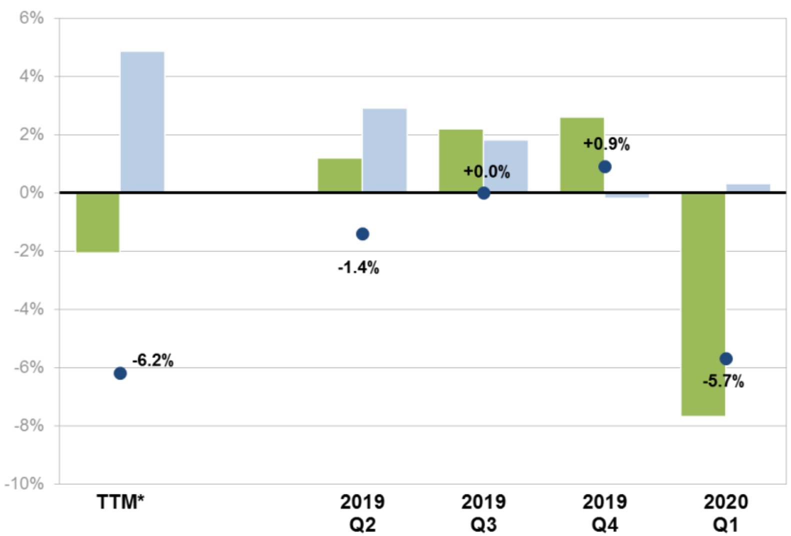
Highlights for the Quarter-Ending 3/31/20

The plans' funded ratio decreased to 59.5% at 3/31/20. This result was primarily due to the combined effects of:

- Asset performance much lower than expected, offset by
- A slight increase in risk-free rate.

		3/31/19		6/30/19		9/30/19		12/31/19		3/31/20
Market Value of Assets	$	1,819.1	$	1,845.5	$	1,889.0	$	1,940.8	$	1,785.8
Risk-Free Liability		2,718.4		2,816.0		2,884.0		2,975.1		3,003.5
Surplus/(Deficit)	$	(899.3)	$	(970.5)	$	(995.0)	$	(1,034.3)	$	(1,217.7)
Periodic Contributions		22.3	$	23.6	$	24.2	$	24.5	$	16.2
Discount Rate		0.86%		0.74%		0.68%		0.81%		0.83%
Funded Ratio:										
Assets/Risk-Free Liability		66.9%		65.5%		65.5%		65.2%		59.5%
Asset Duration:		2.0		2.0		2.0		1.9		1.9
Risk-Free Liability Duration:		18.9		18.9		18.9		18.7		18.7

Asset-Liability Return



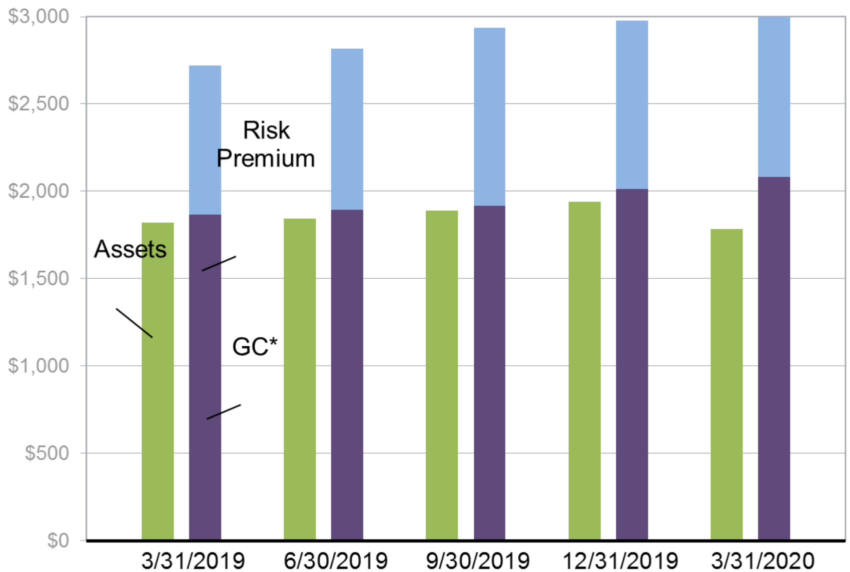
Asset Liability Return for Quarter-Ending 3/31/20

Assets returned -7.7% during the quarter while liabilities returned 0.3%, resulting in a funded status decrease of 5.7%.

Periodic Return/Change	Cumulative	6/30/19	9/30/19	12/31/19	3/31/20
Market Value of Assets Return	-2.1%	1.2%	2.2%	2.6%	-7.7%
Risk-Free Liability: Return	4.9%	2.9%	1.8%	-0.2%	0.3%
Funded Ratio Change	-6.2%	-1.4%	0.0%	0.9%	-5.7%

Reconciliation of Risk-Free Benchmark and Going Concern Funded Status

Values in $1,000,000 (CAD)



*Going Concern

	3/31/19	6/30/19	9/30/19	12/31/19	3/31/20
Market Value of Assets	$ 1,819.1	$ 1,845.5	$ 1,889.0	$ 1,940.8	$ 1,785.8
Going Concern Liability	$ 1,866.8	$ 1,892.6	$ 1,917.1	$ 2,014.5	$ 2,050.1
Risk Premium	851.6	923.4	966.9	960.6	953.4
Risk-Free Liability	$ 2,718.4	$ 2,816.0	$ 2,884.0	$ 2,975.1	$ 3,003.5

The difference between the Risk-Free Liability and the Going Concern Liability is a measure of the amount of risk premium on which the Pension Plan funding is based.

Hypothetical Wind Up (HWU) and Transfer Ratio

Values in $1,000,000 (CAD)

	1/1/2018 (Last Filed)	1/1/2020	4/1/2020
HWU Assets *	$ 1,675.4	$ 1,940.3	$ 1,785.3
HWU Liability	2,700.2	2,909.7	2,963.1
Surplus/(Deficit)	$ (1,024.8)	$ (969.4)	$ (1,177.8)
Transfer Ratio:			
Market Value of Assets/HWU Liability	62.1%	66.7%	60.3%

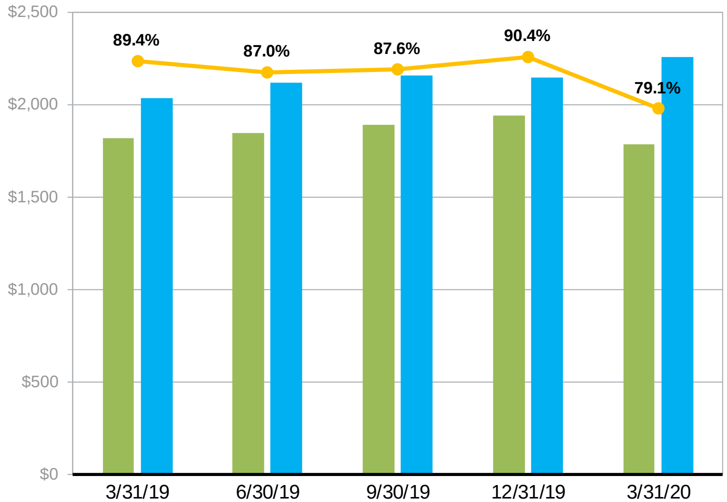
* Net of estimated wind up expenses

- Restrictions on commuted values may come into effect if the administrator of the pension plan knows or ought to know that since the valuation date of the last filed report, events have taken place that may result in the reduction of the transfer ratio by 10% or more of the most recently determined transfer ratio. In such case, the administrator shall not transfer any part of the commuted value without prior approval of the Superintendent.
- If the transfer ratio (the hypothetical wind up assets divided by the hypothetical wind-up liabilities including indexation) drops by 10% or more since the last filed valuation, the administrator must stop paying commuted values and seek approval from the regulators to restart paying commuted values. The application is made in a prescribed format. This is generally referred to as a “Regulation 19 Filing”.
- During Q1 2020, despite asset performances being much lower than expected, the financial position of the Pension Plan as measured on a wind-up basis did not drop by more than 10% since January 1, 2018 (the last filed valuation). Therefore, no Regulation 19 Filing is required as of April 1, 2020.
- The Regulation 19 filing requirements will need to be revisited and monitored throughout 2020 on a quarterly basis. The 10% reduction test will be measured from the Transfer Ratio in the January 1, 2020 valuation report once that report is filed with the regulators.

Executive Summary - Solvency

Funded Status

Values in $1,000,000 (CAD)



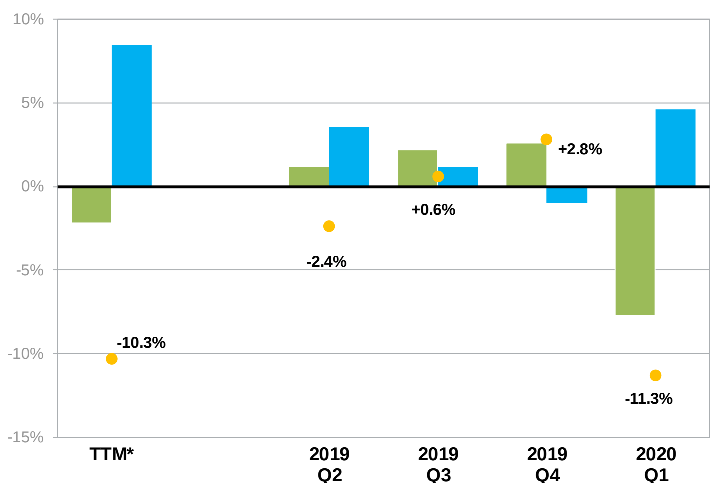
Highlights for the Quarter-Ending 3/31/20

The plans' funded ratio decreased to 79.1% at 3/31/20. This result was primarily due to the combined effects of:

- Asset performance much lower than expected, and
- A decrease in effective interest rate.

	3/31/19	6/30/19	9/30/19	12/31/19	3/31/2020
Market Value of Assets	$ 1,819.1	$ 1,845.5	$ 1,889.0	$ 1,940.8	$ 1,785.8
Solvency Liability	2,035.6	2,120.6	2,157.5	2,146.0	2,257.7
Surplus/(Deficit)	$ (216.5)	$ (275.1)	$ (268.5)	$ (205.2)	$ (471.9)
Periodic Contributions	22.3	$ 23.6	$ 24.2	$ 24.5	$ 16.2
Effective Interest Rate	2.90%	2.71%	2.72%	2.86%	2.64%
Funded Ratio: Assets/Solvency Liability	89.4%	87.0%	87.6%	90.4%	79.1%
Assets Duration:	2.0	2.0	2.0	1.9	1.9
Solvency Liability Duration:	14.1	14.1	14.1	14.5	14.5

Asset-Liability Return



Asset Liability Return for Quarter-Ending 3/31/20

Assets returned -7.7% during the quarter while liabilities returned 4.6%, resulting in a funded status decrease of 11.3%.

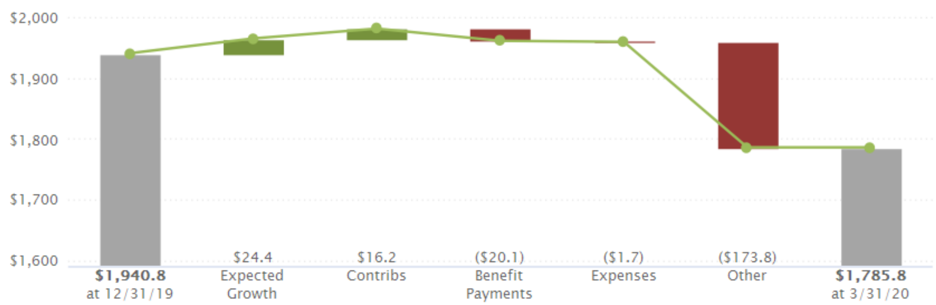
Periodic Return/Change	Cumulative	6/30/19	9/30/19	12/31/19	3/31/20
Market Value of Assets Return	-2.2%	1.2%	2.2%	2.6%	-7.7%
Funding Target: Return	8.5%	3.6%	1.2%	-1.0%	4.6%
Funded Ratio Change	-10.3%	-2.4%	0.6%	2.8%	-11.3%

Appendix

Asset-Liability Performance Attribution – Going Concern

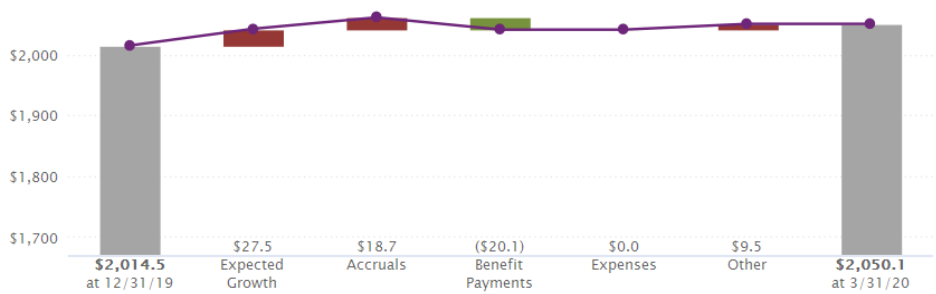
Values in $1,000,000 (CAD)

Assets



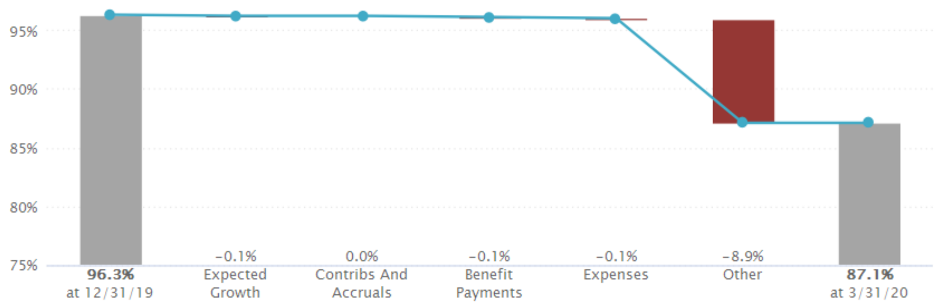
- Assets returned -7.7% during this quarter, as opposed to an expected growth assumption of about 1.3% per quarter.
- The fixed income assets gained value due to a decrease in the underlying risk-free rates, partially offset by widening credit spreads.
- $16.2 million in contributions during the quarter and the trust paid $20.1 million in benefits to the participants.
- “Other” includes the impact of active management, differences between benchmark and actual investment allocations, and plans' return-seeking assets (Alternatives and International Equities) performing much lower than expected during the quarter.

Liabilities



- Liabilities as of 3/31/20 are based on 5.60%.
- Liabilities were expected to grow by $27.5 million due to interest cost during the quarter.
- New benefit accruals increased the liability by $18.7 million during the quarter.
- Plan liabilities decreased by $20.1 million during the quarter as benefits were paid.
- “Other” includes the impact of a change in Provision for Adverse Deviation (“PfAD”) from 9.00% to 9.55% ($9 million).

Funded Ratio

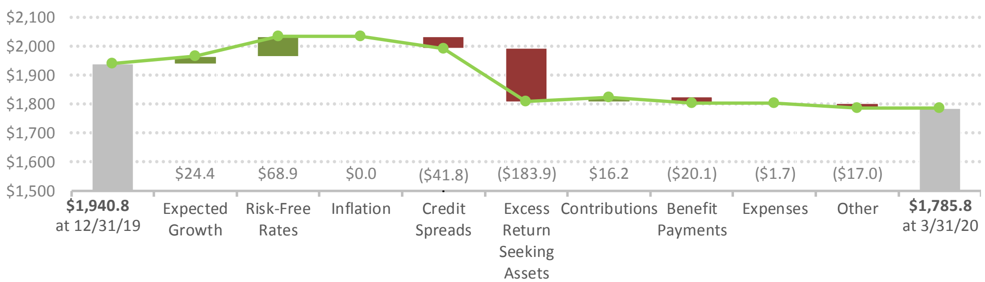


- Assets returned -7.7% during the quarter while liabilities returned 1.8%, resulting in a funded status decrease of 9.2%.

Asset-Liability Performance Attribution – Risk-Free Benchmark

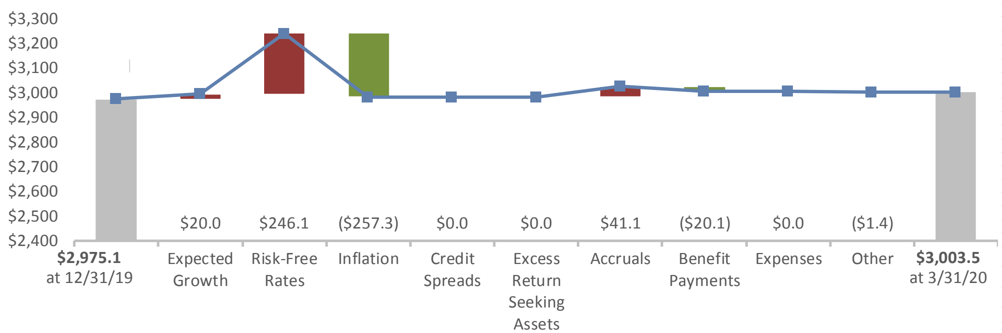
Values in $1,000,000 (CAD)

Assets



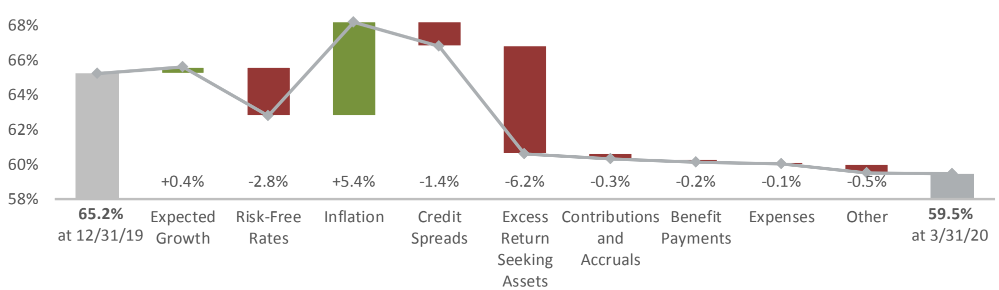
- Assets returned -7.7% during this quarter.
- The fixed income assets gained value due to a decrease in the underlying risk-free rates, partially offset by widening credit spreads.
- The plans' return-seeking assets (Alternatives and International Equities) performed much lower than expected during the quarter.
- $16.2 million in contributions were made during the quarter and the trust paid $20.1 million in benefits to the participants.
- "Other" includes the impact of active management, and differences between benchmark and actual investment allocations.

Liabilities



- Liabilities were expected to grow by $20.0 million due to interest cost during the quarter.
- Risk-free rates decreased resulting in an increase in liabilities of $246.1 million.
- New benefit accruals increased the liability by $41.1 million during the quarter
- Expected inflation rates decreased resulting in a decrease in liabilities of $257.3 million.
- Plan liabilities decreased by $20.1 million during the quarter as benefits were paid.

Funded Ratio

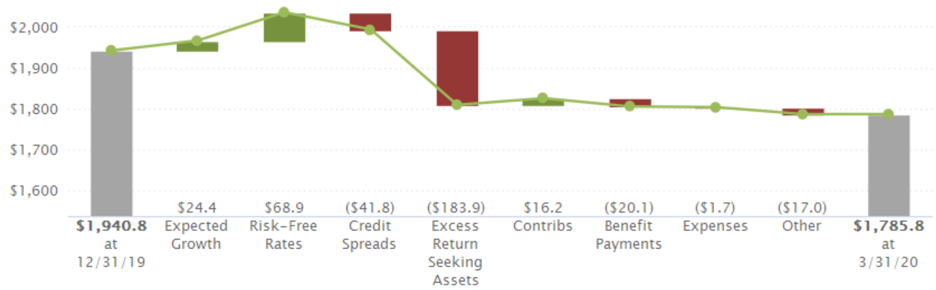


- The difference in exposure to risk-free rates between assets and liabilities combined with changes in risk-free rates resulted in a decrease in funded status of 2.8%.
- Changes in credit spreads resulted in a decrease in funded status of 1.4%.
- Decrease in inflation expectation resulted in an increase in funded status of 5.4%.
- Return-seeking assets did not perform as well as expected during the quarter, resulting in a decrease in funded status of 6.2%.

Asset-Liability Performance Attribution – Solvency

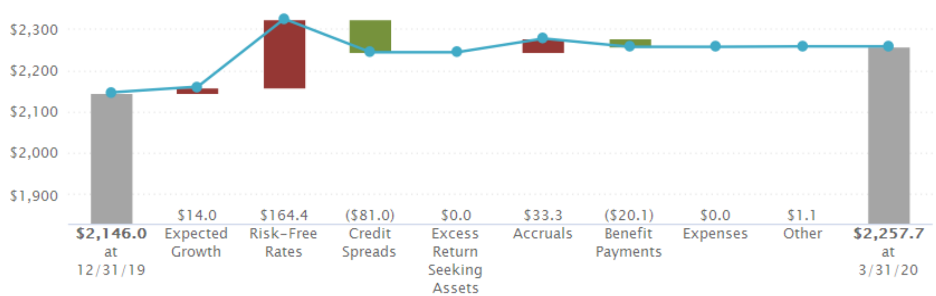
Values in $1,000,000 (CAD)

Assets



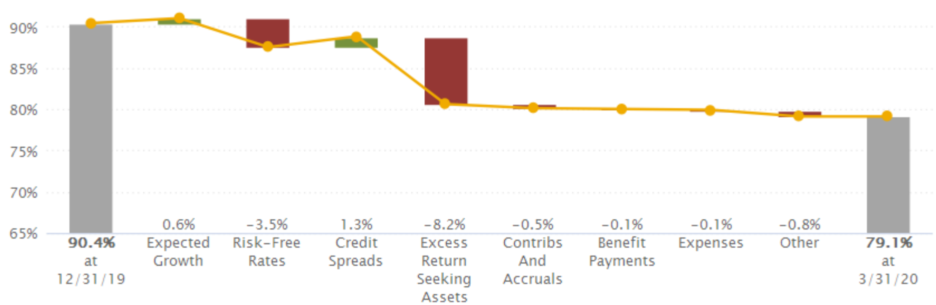
- Assets returned -7.7% during this quarter, as opposed to an expected growth assumption of about 1.3% per quarter.
- The fixed income assets gained value due to a decrease in the underlying risk-free rates, partially offset by widening credit spreads.
- The plans' return-seeking assets (Alternatives and International Equities) performed much lower than expected during the quarter.
- $16.2 million in contributions during the quarter and the trust paid $20.1 million in benefits to the participants.
- “Other” includes the impact of active management, and differences between benchmark and actual investment allocations.

Liabilities



- Liabilities were expected to grow by $14.0 million due to interest cost during the quarter.
- Risk-free rates decreased, and credit spreads widened, resulting in a net increase of $83.4 million ($164.4 million - $81.0 million).
- New benefit accruals increased the liability by $33.3 million during the quarter.
- Plan liabilities decreased by $20.1 million during the quarter as benefits were paid.

Funded Ratio



- The difference in exposure to risk-free rates between assets and liabilities combined with changes in risk-free rates resulted in a decrease in funded status of 3.5%.
- The difference in exposure to credit spreads between assets and liabilities combined with changes in credit spreads resulted in an increase in funded status of 1.3%.
- Return-seeking assets did not perform as well as expected during the quarter, deducting 8.2% from the plans' funded status during the period.

Plan Provisions & Membership Data

Same as in the Actuarial Valuation Results as of January 1, 2020 presentation to the Pension and Benefits Committee Meeting dated March 20, 2020.

Actuarial Methods & Assumptions

Our analysis of the estimated financial position of the Pension Plan is based on the following:

	3/31/19	6/30/19	9/30/19	12/31/19	3/31/20
Going Concern					
Discount Rate	5.70%	5.70%	5.70%	5.60%	5.60%
Inflation	2.00%	2.00%	2.00%	2.00%	2.00%
PfAD	8.50%	8.50%	8.50%	9.00%	9.55%
Mortality	CPM2014	CPM2014	CPM2014	CPM2014Public	CPM2014Public
Risk-Free Benchmark					
Discount Rate	0.86%	0.74%	0.68%	0.81%	0.83%
Solvency					
Annuity Purchase Interest Rate	2.93%	2.76%	2.81%	2.96%	2.78%
Effective Date of Annuity Purchase Guidance Used	3/31/19	6/30/19	9/30/19	12/31/19	3/31/20
Lump Sum Value Interest Rate (Years 1-10)[1]	2.40%	2.30%	2.30%	2.50%	1.70%
Lump Sum Value Interest Rate (Years 10+)[1]	2.90%	2.80%	2.60%	2.60%	2.50%
Mortality[2]	CPM2014	CPM2014	CPM2014	CPM2014	CPM2014
Underlying Canadian Reference Data					
CANSIM v39054 (7 Year)	1.55%	1.41%	1.38%	1.68%	0.64%
CANSIM v39056 (30 Year Long Term)	1.90%	1.68%	1.53%	1.76%	1.32%
CANSIM v39057 (30 Year Real Return)	0.46%	0.34%	0.28%	0.41%	0.43%
CANSIM v39062 (Over 10 Years)	1.83%	1.66%	1.51%	1.76%	1.18%

[1] Lump Sum Value Interest Rates are based on rates in effective on the first day of the month following quarter end (i.e. January 1st, April 1st, July 1st and October 1st).
[2] With improvement scale MI-2017 for Going Concern and Risk Free and CPM-B for Solvency.

All other assumptions and methods are the same as those shown in the Actuarial Valuation Results as of January 1, 2020 presentation to the Pension and Benefits Committee Meeting dated March 20, 2020. For the Risk-Free Benchmark basis, all other assumptions and methods are the same as those used for the Going Concern basis.

Actuarial Attestation

This document is intended to provide to the University of Waterloo a summary of the performance of the Pension Plan as of March 31, 2020.

This analysis is intended to assist University of Waterloo with a review of the associated issues and options, and its use may not be appropriate for other purposes. This analysis has been prepared solely for the benefit of University of Waterloo. Any further dissemination of this report is not allowed without the written consent of Aon.

In conducting the analysis, we have relied on plan design, demographic and financial information provided by other parties, including the plan sponsor. While we cannot verify the accuracy of all the information, the supplied information was reviewed for consistency and reasonableness. As a result of this review, we have no reason to doubt the substantial accuracy or completeness of the information and believe that it has produced appropriate results.

Experience different than anticipated could have a material impact on the ultimate costs of the benefits. In addition, changes in plan provisions or applicable laws could have a substantial impact on cost. Actual experience may differ from our modeling assumptions.

May 2020

Asset Allocation and Benchmarking

Asset Class	12/31/19
Alternatives	
■ MSCI USA REIT Index	3.4%
■ MSCI USA Infrastructure Index	5.6%
Fixed Income	
■ FTSE TMX Universe Bond Index	46.1%
Equities	
■ MSCI World Index	39.0%
■ S&P TSX	5.9%
Total	100.0%

Glossary of Terms

- **Funded Status and Asset-Liability Return**
  - **Liability Return** reflects the growth in liability due solely to interest rate movements and excludes the impact of Accruals and Benefit Payments.
- **Asset Liability Performance Attribution**
  - **Expected Growth** reflects assets growing at the expected annual return and liabilities increasing at the interest rate[1].
  - **Risk-Free Rates** splits out the expected movement in assets and liabilities based on movements in federal bond yields.
  - **Inflation** splits out the expected movement in assets and liabilities based on movements in implied inflation, determined based on real and nominal federal bond yields.
  - **Credit Spreads** splits out the expected movements in corporate and provincial bond yields in excess of federal bond yields.
  - **Excess Return-Seeking Assets** defines the movement in the Return-Seeking assets based on benchmark returns in excess of expectations. The expectations are defined by the long-term capital market assumptions of the plan and are reflected in "expected growth".
  - **Benefit Payments** displays the expected decrease in assets and liabilities due to benefit payments during the period.
  - **Contributions/Accruals** displays the expected increase in assets and liabilities due to employer contributions and new benefit accruals, respectively.
  - **Other** includes fixed income returns due to coupons and other active management effects, from the asset perspective. From a liability perspective, this bucket includes all liability changes not explained by financial movements during the period.

[1] On the Risk Free basis, the expected growth of liabilities is based on the net interest rate, and the expected growth due to inflation is included in the benefit accrual.

UNIVERSITY OF WATERLOO
2020/21 Operating Income Budget (in thousands) - PROVISIONAL

Board of Governors
April 7, 2020

	2019/20 Base Budget	Increase / (Decrease) $	Increase / (Decrease) %	2020/21 Base Budget	Notes
INCOME					
Operating Grant					
Enrolment	224,740	(36,894)	-16.4%	187,846	
Student Success and Differentiation	20,576	(20,576)	-100.0%	0	
SMA3 Performance Outcomes	0	62,615	100.0%	62,615	
Special Purpose	5,068	31	0.6%	5,099	
International Student Recovery	(5,803)	(102)	1.8%	(5,905)	
Graduate Expansion	4,024	(4,024)	-100.0%	0	
Transfers to AFIW	(13,978)	340	-2.4%	(13,638)	
	234,627	1,390	0.6%	236,017	Note 1
Tuition					
Domestic - Undergraduate	231,240	(4,928)	-2.1%	226,312	Note 2
Domestic - Graduate	28,350	152	0.5%	28,502	
International - Undergraduate	205,491	22,045	10.7%	227,536	Note 3
International - Graduate	44,948	4,421	9.8%	49,369	Note 4
Transfers to AFIW	(19,435)	13	-0.1%	(19,422)	
	490,594	21,703	4.4%	512,297	
Other Revenue					
Co-op Recovery	22,508	526	2.3%	23,034	
Student Services Fee	12,887	1,477	11.5%	14,364	Note 5
Research Overhead	8,460	668	7.9%	9,128	
Interest	9,600	1,500	15.6%	11,100	Note 6
Services to AFIW	3,907	(20)	-0.5%	3,887	
Miscellaneous Income	9,773	-	0.0%	9,773	
	67,135	4,151	6.2%	71,286	
Total Income	792,356	27,244	3.4%	819,600	

Note 1 - Consistent with the transition to the next Strategic Mandate Agreement (SMA3, 2020/21-2024/25), effective April 1, 2020, the Enrolment, Student Success and Differentiation and SMA3 Performance Outcomes grants have been updated. These grants reflect the roll in of funding associated with SMA2 Graduate Expansion growth (up to negotiated targets), and a planned redistribution to designate a share of total grant funding as subject to performance outcomes, shown above as SMA3 Performance Outcomes.

Note 2 - The decrease in Domestic Undergraduate tuition revenue is primarily driven by the 10% tuition rate reduction in 2019/20, and subsequent tuition freeze for 2020/21, as required by the Ministry of Colleges and Universities (MCU) tuition framework effective 2019-2020 to 2020-2021.

Note 3 – The increase in International Undergraduate tuition revenue is consistent with tuition rate increases approved by the Board of Governors in its February 2020 meeting.

Note 4 - The increase in International Graduate tuition revenue is driven by international tuition rate increases approved by Board in its February 2020 meeting as well as a slight projected increase in overall international graduate volume.

Note 5 - The increase in the student services fee revenue relates mainly to past decision by students through the Student Services Advisory Committee to provide funding for designated student services.

Note 6 - The investment income earned on operational funds is based on current and forecasted cash management and investment plans.

UNIVERSITY OF WATERLOO

2020/21 Operating Expense Budget (in thousands) - PROVISIONAL

Board of Governors
April 7, 2020

	2019/20 Base Budget	Increase / (Decrease) $	Increase / (Decrease) %	2020/21 Base Budget	2020/21 Base Budget as of Income	Notes
EXPENSES						
Salary and Wages						
Current salaries and wages	454,798	15,937	3.5%	470,735	57.4	Note 1
Benefits						
Current benefits	102,822	5,525	5.4%	108,347	13.2	
Faculty professional expense reimbursement plan	2,688	54	2.0%	2,742	0.3	
Parental leave supplement	2,000		0.0%	2,000	0.2	
Total benefits	107,510	5,579	5.2%	113,089	13.8	Note 2
Total salaries and benefits	562,308	21,516	3.8%	583,824	71.2	
Student Support						
Graduate student support	8,831	-	0.0%	8,831	1.1	
Graduate incentive fund	450	-	0.0%	450	0.1	
Support for international graduate students	9,943	(181)	-1.8%	9,762	1.2	
Senate matching scholarships	160	-	0.0%	160	0.0	
Tuition set aside	23,846	(226)	-0.9%	23,620	2.9	Note 3
Undergraduate scholarships/bursaries	11,580	-	0.0%	11,580	1.4	
Total student support	54,810	(407)	-0.7%	54,403	6.6	
Other						
Accessibility fund for students with disabilities	1,051	-	0.0%	1,051	0.1	
Insurance	2,000	-	0.0%	2,000	0.2	
Library acquisitions	8,519	-	0.0%	8,519	1.0	
Municipal taxes	2,800	-	0.0%	2,800	0.3	
University Fund	35,975	4,000	11.1%	39,975	4.9	Note 4
Utilities	22,825	100	0.4%	22,925	2.8	
Total other	73,170	4,100	5.6%	77,270	9.4	
Supplies and expenses	118,207	2,201	1.9%	120,408	14.7	Note 5
Gross expenses	808,495	27,410	3.4%	835,905	102.0	
Cost recoveries	(12,720)	-	0.0%	(12,720)	(1.6)	Note 6
Estimated net expenses	795,775	27,410	3.4%	823,185	100.4	
Estimated income	792,356			819,600		
Budget surplus (deficit)	(3,419)			(3,585)		
One-time contribution from Faculties	3,656			-		Note 7
Surplus (Unfunded deficit)	237			(3,585)		

Note 1 - This reflects committed May 1, 2020 salary increases based on existing salary agreements with the University's employee groups. 2020/21 is the third year of a three year salary agreement with each of the employee groups.

Note 2 - This reflects increases in benefits costs related to a number of factors including changes as a result of salary increases and rate/premium increases.

Note 3 - The Tuition Set Aside amount is calculated based on a formula mandated by the Ministry of Training, Colleges and Universities. It is to be used on needs based student support programs.

Note 4 - The University Fund is used strategically for funding the University's strategic priorities and managing risk.

Note 5 - Supplies and expenses reflects the budget for a variety of non-salary operating expenses of the faculties and academic support units such as supplies, enterprise software, maintenance, professional services, etc.

Note 6 - Chargeouts and cost recoveries primarily include recoveries from Ancillary Enterprises (Housing, Food Services, Print & Retail Solutions, Watcard and Parking) for space charges and administrative support.

Note 7 - Faculties made a contribution in 2019/20 to balance the budget in that year, mainly achieved by redistributing resources available from recent underspending against available budgets.