Actuarial Valuation as at December 31, 2015

Report Prepared Under Sections 37 and 38 of the Public Service Pension Plan

Ontario Pension Board

November 2016

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Preparation of this Report

This report has been prepared for the Ontario Pension Board (the "Board") to fulfill the Board's obligations under Section 38 of the Public Service Pension Plan (the “PSPP") and can also serve as the report to the Minister under Section 37 of the Plan.

Under the requirements of subsection 38(1)(a), the Board shall identify:

> *"The additional cost to the Plan of the pension provided to members of the Ontario Provincial Police Force by subsection 15(4) over the cost of the pension or deferred pension that would be payable without that subsection."*

As of December 31, 2015, based on the actuarial assumptions and methods outlined in this report, we have calculated this additional cost to be $245,858,000, which represents (a) less (b) below:

(a) The present value of benefits for current members of the Ontario Provincial Police Force ("OPP Officers") reflecting the early retirement provisions under subsection 15(4) (the "OPP early retirement provision") and based on the retirement rates for OPP Officers under the OPP early retirement provision (including age 50 and 30 years of pension credit).

(b) The present value of benefits for OPP Officers excluding the OPP early retirement provision and based on the retirement rates for OPP Officers, with unreduced retirement rates starting at age 60 with 20 years of pension credit or age plus pension credit totaling 90.

Under the requirements of subsection 38(1)(b), the Board shall identify:

> *"The financial benefit to the Plan from the contributions of members of the Ontario Provincial Police Force under subsection 6(2), from the employer's contributions made to match contributions under that subsection, and from the return reasonably attributable to the investment of the contributions and of the proceeds received by the Fund from transfers under subsections 7(2) and (3) of this Act."*

As of December 31, 2015, we have calculated this amount to be $415,503,000, which represents

(a) plus (b) less (c) below:

(a) The accumulated value of contributions under subsection 6(2) (the “OPP additional contribution provision”), plus matching employer contributions, made to December 31, 2015 and the investment return thereon.

(b) The present value for OPP Officers of future regular contributions under subsection 6(1) and additional contributions under subsection 6(2), plus matching employer contributions, based on the retirement rates for OPP Officers under the OPP early retirement provision, less the present value for OPP Officers of future regular contributions under subsection 6(1) based on the retirement rates for OPP Officers, with unreduced rates starting at age 60 with 20 years of pension credit or age plus pension credit totaling 90.

(c) For members who are being paid pensions as of December 31, 2015, the cost of the OPP early retirement provision calculated in the year of retirement in accordance with the methods outlined in this report.

Under the requirements of subsection 38(2):

> *"The Board shall also indicate the sufficiency of the financial benefit referred to in clause (1)(b) to meet the additional costs referred to in clause 1(a) and whether those additional costs for pensions that are being paid at the end of the year for which the report is made have been met by the financial benefits that have been accrued to the Fund."*

On the basis of the above, as of December 31, 2015, the financial benefits referred to under subsection 38(1)(b) are sufficient to meet the additional costs referred to in subsection 38(1)(a), after reflecting the additional costs of the pensions that are being paid as of December 31, 2015. As of December 31, 2015, the notional excess is $169,645,000.

Section 38 isolates the additional benefits for OPP Officers under subsection 15(4) and the additional contributions under subsection 6(2). It does not require assessing the sufficiency of the "aggregate contributions" made by OPP Officers (i.e., regular contributions under subsection 6(1) plus the additional contributions under subsection 6(2)), plus the matching employer contributions, against the "aggregate benefits" provided to OPP Officers (i.e., including the benefits under subsection 15(4)). Based on the most recent Long-Term Funding Study prepared by the Board, the aggregate contributions for OPP Officers were determined to be sufficient to provide the aggregate benefits for OPP Officers on a go-forward basis.

For purposes of the calculations presented in this report, it is our opinion that:

- The data upon which the calculations are based are sufficient and reliable;
- The assumptions used are appropriate for purposes of the calculations; and
- The methods used are appropriate for the purposes of the calculations.

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

Andrew Hamilton
Fellow of the Canadian Institute of Actuaries

Jonathan Skan
Fellow of the Canadian Institute of Actuaries

Aon Hewitt
225 King Street West, Suite 1600
Toronto, Ontario M5V 3M2

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Methodology and Valuation Results

This section provides additional details of the calculation of amounts presented in the previous section of this report.

1. Present Value of Benefits For Future Retirements Under The OPP Early Retirement Provision

This calculation has been prepared as of December 31, 2015 based on the data used for the December 31, 2015 actuarial valuation of the PSPP, and on the methods outlined in this section and the actuarial assumptions outlined in the actuarial assumptions section of this report. As of December 31, 2015, there were 6,068 OPP Officers included in the calculation.

The **Present Value of Benefits For Future Retirements Under The OPP Early Retirement Provision** is calculated as (a) less (b) below:

(a) **Present Value of Benefits With OPP Early Retirement Provision,** which is the present value of benefits for current OPP Officers reflecting:

- PSPP benefits including the OPP early retirement provision;
- Member contributions including the 2% contributions under the OPP additional contribution provision (for purposes of the 50% cost sharing rule);
- Termination rates and promotional scale applicable to OPP Officers; and
- Retirement rates for OPP Officers under the OPP early retirement provision.

(b) **Present Value of Benefits Without OPP Early Retirement Provision,** which is the present value of benefits for current OPP Officers reflecting:

- Regular benefits under the PSPP excluding the OPP early retirement provision;
- Regular member contributions under the PSPP excluding the 2% contributions under the OPP additional contribution provision (for purposes of the 50% cost sharing rule);
- Termination rates and promotional scale applicable to OPP Officers; and
- Retirement rates for OPP Officers, with unreduced rates starting at age 60 with 20 years of pension credit or age plus pension credit totaling 90.

The calculation as of December 31, 2015 of the Present Value of Benefits For Future Retirements Under The OPP Early Retirement Provision is as follows:

		($000's)
(a) Present Value of Benefits With OPP Early Retirement Provision; less	$	3,746,078
(b) Present Value of Benefits Without OPP Early Retirement Provision		3,500,220
	$	**245,858**

2. Present Value of Future Additional Contributions From OPP Officers and Matching Employer Contributions

This calculation has been prepared as of December 31, 2015 based on the data used for the December 31, 2015 actuarial valuation of the PSPP, and on the methods outlined in this section and the actuarial assumptions outlined in the actuarial assumptions section of this report. As of December 31, 2015, there were 6,068 OPP Officers included in the calculation.

The **Present Value of Future Contributions Under The OPP Additional Contribution Provision** is calculated as (a) less (b) below:

(a) **Present Value of Future Contributions With The OPP Additional Contribution Provision**, which is the present value of future contributions for OPP Officers reflecting:

- Member contributions including the 2% contributions under the OPP additional contribution provision plus matching employer contributions;
- Termination rates and promotional scale applicable to OPP Officers; and
- Retirement rates for OPP Officers under the OPP early retirement provision.

(b) **Present Value of Future Contributions Without OPP Additional Contribution Provision,** which is the present value of future contributions for OPP Officers reflecting:

- Regular member contributions under the PSPP excluding the additional 2% contributions under the OPP additional contribution provision;
- Termination rates and promotional scale applicable to OPP Officers; and
- Retirement rates for OPP Officers, with unreduced rates starting at age 60 with 20 years of pension credit or age plus pension credit totaling 90.

The calculation as of December 31, 2015 of the Present Value of Future Contributions Under the OPP Additional Contribution Provision is as follows:

		($000's)
(a) Present Value of Future Contributions With OPP Additional Contribution Provision; less	$	1,272,655
(b) Present Value of Future Contributions Without OPP Additional Contribution Provision		1,158,496
	$	**114,159**

3. Crystallization of Benefits

The crystallized benefit is calculated as (a) less (b) below:

(a) The present value of benefits as of the early retirement date of the immediate pension under the OPP early retirement provision.

(b) The present value of benefits as of the early retirement date that would be held for the OPP Officer had he/she remained in employment and retired under the regular PSPP provisions (i.e., without the OPP early retirement provision). This present value is calculated as (i) less (ii) below:

  (i) The Present Value of Benefits Without OPP Early Retirement Provision
  (as calculated in 1. above, based on assumptions in effect for the December 31, 2014 report).

  (ii) The Present Value of Future Contributions Without Additional OPP Contribution Provision
  (as calculated in 2. above, based on assumptions in effect for the December 31, 2014 report).

The crystallized benefits have been calculated under the above methodology for retirements in 2011 through 2015 inclusive. The crystallized benefits for the last five years are shown below:

Calendar Year	Number of Retirements Under OPP Early Retirement Provision	Crystallized Benefit ($000's)
2011	109	$ 20,237
2012	138	$ 25,368
2013	79	$ 12,273
2014	126	$ 23,909
2015	184	$ 39,747

4. Assets Notionally Allocated to OPP Early Retirement Provision

Based on the December 31, 2014 Report Prepared under Sections 37 and 38 of the Public Service Pension Plan, the assets notionally allocated in respect of the OPP early retirement provision were $300,394 as of December 31, 2014. The reconciliation of assets notionally allocated as of December 31, 2015 is shown below:

	($000's)
Notional Assets, January 1, 2015[1]	$ 299,386
Additional Member and Employer Contributions for 2015	23,812
Crystallized Benefits in 2015	(39,747)
Interest	17,893
Notional Assets, December 31, 2015	$ 301,344

Interest above has been calculated based on the rate of return for 2015 of 6.14%, as provided by the Board.

The assets notionally allocated in respect of the OPP early retirement provision combined with the present value of future contributions under the OPP additional contribution provision total $415,503,000.

[1] Assets as of December 31, 2014 were adjusted based on revised historical contributions provided by the Board.

Demographic Information

Member Characteristics

The actuarial valuation was based on member data supplied by the Board as of December 31, 2015. This section presents the characteristics of active members as of
December 31, 2015 who are OPP Officers, and for comparison purposes, as of December 31, 2014.

Active Members—OPP Officers	December 31, 2014	December 31, 2015
Number	6,092	6,068
Average Age (Years)	43.0	43.0
Average Years of Pension Credit	16.4	16.3
Average Pensionable Earnings[1]	$ 98,434	$ 97,893

[1] In calendar year preceding the valuation date

Distribution of Active Members by Age and Service (OPP Officers)

Age Group		Under 5	5–9	10–14	15–19	20–24	25–29	30–34	35+	Total
		Completed Years and Months of Pension Credit								
<25	Number	54								54
	Average Earnings	$57,918								$57,918
25–29	Number	328	136							464
	Average Earnings	$70,382	$90,584							$76,303
30–34	Number	177	469	106						752
	Average Earnings	$75,467	$92,626	$94,211						$88,811
35–39	Number	61	232	355	143	1				792
	Average Earnings	$78,481	$93,169	$95,017	$98,391	$100,590				$93,818
40–44	Number	38	177	288	525	197	2			1,227
	Average Earnings	$84,851	$92,998	$95,282	$99,355	$104,642	$98,777			$97,881
45–49	Number	12	74	124	270	498	355	2		1,335
	Average Earnings	$90,697	$93,465	$95,342	$100,596	$105,332	$108,511	$113,277		$103,514
50–54	Number		21	50	82	146	631	142	2	1,074
	Average Earnings		$93,599	$95,930	$101,713	$103,787	$109,587	$116,466	$98,777	$108,138
55–59	Number		8	19	27	49	121	82	11	317
	Average Earnings		$101,597	$97,766	$101,548	$106,974	$106,197	$116,973	$124,796	$108,733
60+	Number		2	12	7	7	10	5	10	53
	Average Earnings		$128,673	$98,324	$99,036	$95,904	$106,651	$104,309	$109,970	$103,577
Total	Number	670	1,119	954	1,054	898	1,119	231	23	6,068
	Average Earnings	$72,643	$92,752	$95,194	$99,780	$104,940	$108,833	$116,355	$116,088	$97,893

Plan Provisions

Eligibility for Membership	Civil servants, employees of designated agencies, boards, commissions and foundations, and employees of the Office of the Auditor General.
Member Contributions	
Members Other Than OPP Officers and Civilians	6.40% of salary up to the YMPE plus 9.50% of salary in excess of the YMPE
OPP Civilians	6.775% of salary up to the YMPE plus 9.875% of salary in excess of the YMPE
OPP Officers	7.20% of salary up to the YMPE plus 10.30% of salary in excess of the YMPE plus 2.00% on all salary
Unreduced Retirement	
Eligibility	Age 65; or Age 60 with 20 or more years of Pension Credit; or Age plus years of Pension Credit totaling 90 or more; or Age 60 with Pension Credit prior to January 1, 1966. Age 50 with 30 or more years of Pension Credit (for OPP Officers only).
Benefit	**Basic Pension:** 2.0% of Average Annual Salary times Pension Credit. **CPP Integration at Age 65:** Basic Pension reduced by: 0.7% of Average Annual Salary up to Average YMPE times Pension Credit after December 31, 1965 (maximum 35 years).

Reduced Early Retirement

Eligibility	Age 55.
Benefit	Basic Pension and CPP Integration reduced by 5/12 of 1% for each month that the pension start date precedes age 65.

Disability

Eligibility	Entitlement to benefits from the long-term income protection plan or other similar plan.
Benefit	Employer makes contribution on behalf of member and member continues to earn Pension Credit. Pension benefit is based on member's salary at date of disability, adjusted annually for inflation.

Termination Benefits

Eligibility	Immediate
Benefit	Deferred pension for all years of Pension Credit, payable at age 65. In lieu of the deferred pension, a member may request that an amount equal to the commuted value of the deferred pension be transferred to a locked-in retirement account, to another registered pension plan or to an insurance company for the purchase of a life annuity that will not commence benefit payments prior to the member's earliest retirement date under the Plan. A member may elect to commence the deferred pension as early as age 55. The Basic Pension and CPP Integration will be reduced by 5/12 of 1% for each month that the pension start date precedes age 65.

Death Benefits Before Pension Commencement

Eligibility	(a) Less than 10 or more years of continuous Plan membership or Pension Credit (b) 10 or more years of continuous Plan membership or Pension Credit.
Benefit	(a) **For Benefits Earned and Contributions Made After December 31, 1986:** Commuted value of pension or deferred pension (for former members) earned in respect of Pension Credit on and after January 1, 1987, payable to the member's surviving spouse, or if none, to the member's beneficiary, or if none, to the member's estate. **For Benefits Earned and Contributions Made Prior to January 1, 1987:** Two times the member's contributions with interest to the member's surviving spouse or if there is no surviving spouse to eligible children. If no surviving spouse or eligible children, refund of member's contributions with interest paid to the member's estate. (b) **For Benefits Earned and Contributions Made After December 31, 1986:** Commuted value of pension or deferred pension (for former members) earned in respect of Pension Credit on and after January 1, 1987, payable to the member's surviving spouse, or if none, to the member's beneficiary, or if none, to the member's estate. **For Benefits Earned and Contributions Made Prior to January 1, 1987:** If a member is survived by a spouse or dependent children, 50% of the pension benefit earned in respect of Pension Credit up to January 1, 1987 is payable to the spouse or dependent children. For purposes of this calculation, the pension benefit is determined as if the member had attained age 65 at date of death.

Death Benefits After Pension Commencement

Eligibility	Member's death while in receipt of a pension with an eligible spouse at date of pension commencement or dependent children.
Benefit	Survivor pension equal to 60% of the Member's pension benefit (for death prior to age 65, determined as if the member was age 65 at date of death); pension benefit to member actuarially reduced to provide for difference between 50% and 60% survivor pension. Member and spouse may waive 60% survivor pension for 50% survivor pension. Member may elect (at least two years prior to pension commencement) an actuarially reduced pension to provide for a 65%, 70% or 75% survivor pension.
***Income Tax Act* Maximum Pension**	Maximum pension provisions of the *Income Tax Act* apply to pension benefits in respect of Pension Credit earned from January 1, 1992 onward.
Inflation Adjustments	Pension benefits for members (or their survivors) in receipt of a pension, or pension benefits in the deferral period for former members, are adjusted each January 1st by increases in the Consumer Price Index (CPI). The adjustment applies to the Basic Pension and the CPP Integration. For members who started their pension or defer their pension during the year, the adjustment is prorated for partial months. For a given January 1st, the increase in CPI is determined by the ratio of (i) to (ii) below: (i) Average of the CPI for the 12-month period ending on the preceding September 30th. (ii) Average of the CPI for the 12-month period preceding the period in (i). The increase for any given January 1st is limited to 8%. Any increase in excess of 8% will be carried forward and applied in subsequent years when the increase is less than 8%.
50% Rule	At time of determination of a pension or deferred pension, if member contributions made after December 31, 1986, with interest, exceed 50% of the commuted value of the pension benefit earned in respect of Pension Credit after December 31, 1986, the excess will be refunded to the member or the member's beneficiary or estate, as applicable.

Average Annual Salary	
Members Other Than OPP Officers and Civilians	Average of annual salary rates over the 60 consecutive months of Plan membership that produces the highest amount (or period of Plan membership if less than 60 months).
OPP Civilians	Average of annual salary rates over the 48 consecutive months of Plan membership that produces the highest amount (or period of Plan membership if less than 48 months each calendar month).
OPP Officers	Average of annual salary rates over the 36 consecutive months of Plan membership that produces the highest amount (or period of Plan membership if less than 36 months each calendar month).
Average YMPE	Average of the Year's Maximum Pensionable Earnings (YMPE) under the Canada Pension Plan in the year Plan membership ceases and the two preceding years.
Interest	Minimum rate prescribed by the *Pension Benefits Act* (Ontario) and its Regulations.
Pension Credit	Years and months for which contributions have been made by the member (or on behalf of the member). For less than full-time employment, prorated to reflect the proportion that the work period of the member bears to the full-time work period for the same or comparable position. Also includes any credit transferred into the Plan or purchased in the Plan.

Actuarial Assumptions

The actuarial assumptions used for the December 31, 2015 actuarial valuation of the PSPP which are applicable to the preparation of calculations in this report are shown below:

Economic Assumptions

Increase in Consumer Price Index	2.10% per year.
Increase in Year's Maximum Pensionable Earnings	2.60% per year until 2018[1]; 3.10% per year thereafter.
Increase in Maximum Pension Under *Income Tax Act*	2.60% per year until 2018[1]; 3.10% per year thereafter.
Increase in Salaries	Active Members: 2016: 1.50% per year; 2017: 1.50% per year; 2018: 2.00% per year; 2019: 2.50% per year; 2020: 3.10% per year thereafter Members on Long-Term Income Protection (LTIP): 2.10% per year.
Interest Rate on Member Contributions	3.50% per year.
Investment Return[2]	
Nominal Rate	5.95% per year.
Real Rate	3.85% per year.
Commuted Value Interest Rate[3]	2.50% per year.

Promotional Scale for Increase in Salaries

OPP Officers	
Completed Service (yrs)	**Promotional Increase**
1	4.00%
2	3.60%
3	3.20%
4	2.90%
5	2.60%
6	2.30%
7	2.00%
8	1.80%
9	1.60%
10	1.40%
11	1.20%
12 – 15	1.00%
16 – 20	0.50%
21+	0.00%

[1] Actual increase used for 2016
[2] Net of investment/custodial and operating expenses
[3] Net interest rate

Demographic Assumptions

Retirement Rates

OPP Officers

Age	Rates: Eligible for Unreduced Pension*	Rates: Eligible for Reduced Pension[1]
First Unreduced Age	60%	N/A
51	25%	N/A
52	25%	N/A
53	25%	N/A
54	25%	N/A
55	25%	4%
56	25%	4%
57	25%	4%
58	25%	4%
59	25%	7%
60	25%	7%
61	20%	7%
62	20%	7%
63	20%	7%
64	45%	15%
65	100%	100%

* Age 60 or over with 20 or more years of pension credit or age plus pension credit totaling 90 of more. Age 50 or over with 30 or more years of pension credit, when applicable for the calculation

Termination Rates

OPP Officers

Completed Service (yrs)	Annual Rate
<1	6%
1 – 3	3%
4 – 5	2%
6 – 10	2%
11 – 12	2%
13 – 14	1%
15 – 20	1%
21+	1%

It is assumed that 50% of terminating members elect commuted values.

[1] No retirement assumed within one year of first unreduced retirement age

Mortality Rates	CPM 2014 Private Sector Mortality Table, with rates adjusted as follows to reflect actual plan experience:

	% of Rates	
Age	**Male**	**Female**
Less than age 70	80%	115%
Age 70 to 79	105%	115%
Age 80 to 84	110%	115%
Age 85 to 89	110%	105%
Age 90 or higher	100%	105%

Allowance for future mortality improvement projected from 2014 using the CPM Improvement Scale B.

Percentage With a Spouse	
Non-retired Members	87% of males and 52% of females are assumed to have a spouse at retirement or death; female spouses assumed to be 3 years younger than member and male spouses assumed to be same age as member.
Retired Members	Actual marital status and spouse's birth date.