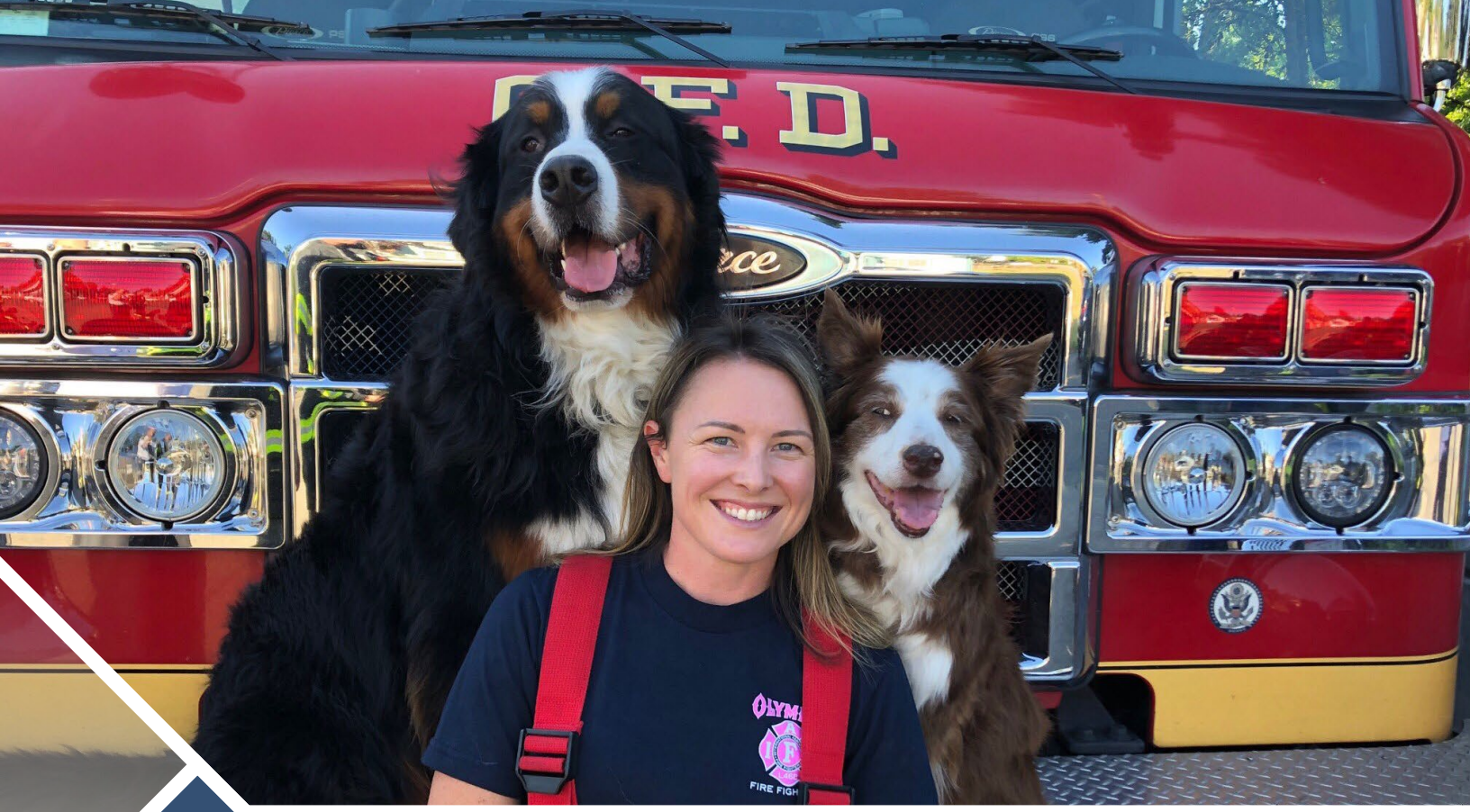

2018

ACTUARIAL VALUATION REPORT

Law Enforcement Officers' and Fire Fighters'
Plan 2 Retirement Board

Office of the State Actuary

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2018

ACTUARIAL VALUATION REPORT

Law Enforcement Officers' and Fire Fighters'
Plan 2 Retirement Board

Report Preparation

Office of the State Actuary

Matthew M. Smith, FCA, EA, MAAA
State Actuary
Sarah Baker
Kelly Burkhart
Mitch DeCamp
Kaitlyn Donahoe, MPA
Graham Dyer
Aaron Gutierrez, MPA, JD
Beth Halverson
Michael Harbour, ASA, MAAA
Luke Masselink, ASA, EA, MAAA
Darren Painter
Frank Serra
Kyle Stineman, ASA
Keri Wallis
Lisa Won, ASA, FCA, MAAA

LEOFF Plan 2 Retirement Board

Steve Nelsen, *Executive Director*
Jessica Burkhart
Karen Durant
Tammy Harman
Jessie Jackson
Tim Valencia
Jacob White

Additional Assistance

Department of Retirement Systems
Washington State Investment Board
Legislative Support Services

To obtain a copy of this report in alternative format or for TDD call 711.

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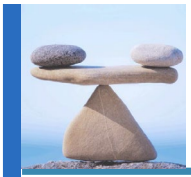
Office of the State Actuary
P.O. Box 40914
Olympia, WA 98504-0914

Physical Address
2100 Evergreen Park Dr. SW, Suite 150

Reception: 360.786.6140
TDD: 711

state.actuary@leg.wa.gov
leg.wa.gov/osa/



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Letter of Introduction
Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2 Actuarial Valuation Report
As of June 30, 2018

November 2019

As required under Chapter 41.45 of the Revised Code of Washington (RCW), this report documents the results of an actuarial valuation of the Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2 (LEOFF 2).

The primary purpose of this valuation is to determine contribution requirements for LEOFF 2 based on a June 30, 2018, measurement date and under the funding policy established by the LEOFF 2 Retirement Board (the Board). These contribution requirements are purely informational since, according to state law, this "off-cycle" valuation is not used to determine contribution rates. This valuation also provides information on the funding progress and developments in the plan over the past year.

This report is organized into four sections.

- Summary of Key Results.
- Actuarial Exhibits.
- Participant Data.
- Appendices.

The **Summary of Key Results** section provides a high-level summary of the valuation results for LEOFF 2. The **Actuarial Exhibits** and **Participant Data** sections of the report provide detailed actuarial asset and liability information and participant data. The **Appendices** provide access to a summary of the principal actuarial assumptions and methods, a summary of the major plan provisions, and additional information used to prepare this valuation.

The Board has received the 2018 Recognition Award for Funding from the Public Pension Coordinating Council (PPCC). The PPCC is a coalition of three national retirement associations, which establish Public Pension Standards that reflect minimum expectations for public retirement system management, administration, and funding.

We encourage you to submit any questions you might have concerning this report to our mailing address or our e-mail address at state.actuary@leg.wa.gov. We also invite you to visit our website (leg.wa.gov/osa), for further information regarding the actuarial funding of the Washington State retirement systems.

Sincerely,

Luke Masselink, ASA, EA, MAAA
Senior Actuary

Frank Serra
Actuarial Analyst

PO Box 40914 | Olympia, Washington 98504-0914 | state.actuary@leg.wa.gov | leg.wa.gov/osa
Phone: 360.786.6140 | Fax: 360.586.8135 | TDD: 711

I. SUMMARY OF KEY RESULTS

Intended Use

The purpose of this report is to develop contribution rates required to fund LEOFF Plan 2 based on a June 30, 2018, measurement date, and the funding policy described in this section. This report provides information on the contribution rates, funding progress, and developments in the plan over the past year. This report also discloses the data, assumptions, and methods we—the Office of the State Actuary (OSA)—used to develop the contribution rates. This is an "off-cycle" valuation, which means that the contribution rates developed in this valuation represent an update on the statutory contribution rates from the prior year's valuation. This report is not intended to satisfy the accounting requirements under the Governmental Accounting Standards Board (GASB) rules.

Similarly, this actuarial valuation is not intended to report on the overall health or financial condition of LEOFF Plan 2. We issue a Report on Financial Condition (RFC) every two years, which assesses the health of all state retirement systems and focuses on funding level, adequacy and affordability of contributions, and risk.

Commentary On Risk

In the course of developing our actuarial valuation we make hundreds of assumptions, such as the level of returns on future investments, the rate of mortality for retirees, and the number of members contributing to the pension system annually. In some cases, small changes in these assumptions or unexpected plan experience can lead to significant changes in measurements, such as the calculation of a plan's contribution rates or the projection of a plan's funded status. This can affect plan risk, and these sensitivities can evolve as the plans grow and mature over time. The Legislature's response to these changes and their action governing the state's pension system also affects plan risk. To help readers better understand some of these risks and their potential impacts at a system-wide level, we have developed a Commentary on Risk webpage which can be found on our website.

Contribution Rates

We determine the member, employer, and state contribution rates as a percentage of salary based on the long-term funding policy adopted by the Board. The following summary table shows contribution rates based on the 2018 valuation, along with rates from the previous valuation. Throughout this report, we reconcile how plan experience compared to our assumptions over the valuation year. In doing so, we compare the contribution rates calculated under this valuation against those rates calculated under the 2017 valuation. Please note, however, that the 2018 contribution rates calculated in this valuation will not be collected, as 2018 is not a rate-setting year under the current contribution rate-setting cycle. The **Actuarial Exhibits** section of this report shows how we developed the contribution rates for 2018.

Calculated Contribution Rates		
	2018	2017
Member	8.67%	8.59%
Employer*	5.20%	5.15%
State	3.47%	3.44%

**Excludes administrative expense rate.*

Projected Contribution Rates

In addition to calculating contribution rates in this report, we also estimate contribution rates for future biennia based upon projected assets and liabilities. These projected rates can be found on our website. Please note that these projected rates are subject to change based on modifications to plan provisions, assumptions, and the actual experience of the plan.

Contribution Rate-Setting Cycle

Under current Washington State law, in July of even-numbered years, the Board reviews the basic contribution rates calculated by the Board-retained actuary. These rates are based on an actuarial valuation performed on asset, participant, and plan information compiled in odd-numbered years. In calculating basic contribution rates, the Board-retained actuary applies the statutory funding policies described in this section. The Board then adopts contribution rates for LEOFF 2 as provided under RCW 41.26.720(1)(a). The adopted rates remain in place for the ensuing biennium, subject to revision by the Legislature.

RCW 41.45.070 requires that a temporary and supplemental contribution rate increase be charged to fund the cost of benefit enhancements enacted, following the adoption of the basic rates. Supplemental contribution rates, if enacted, are included in the basic rates at the beginning of the next contribution rate-setting cycle.

Funding Policy

Washington State relies on systematic actuarial funding to finance the on-going cost of the state retirement systems. Under this financing approach, we reduce the cost of future pension payments by the expected long-term return on invested contributions. The LEOFF 2 funding policy splits the required contribution rate by 50 percent for members, 30 percent for employers, and 20 percent for the state.

The state's funding policy is found in RCW 41.45 — Actuarial Funding of State Retirement Systems. It includes the following goals:

- Provide a dependable and systematic process for funding the benefits to members and retirees of the Washington State Retirement Systems.
- Fully amortize the total cost of LEOFF 1 no later than June 30, 2024.
- Continue to fully fund LEOFF 2 as provided by law.
- Establish long-term employer contribution rates that will remain a relatively predictable proportion of future state budgets.
- Fund, to the extent feasible, all benefits over the working lives of those members so that the taxpayers who receive the benefit of those members' service pay the cost of those benefits.

In July 2018, the Board adopted a new long-term funding policy which raises the LEOFF 2 minimum contribution rates from 90 percent to 100 percent of the normal cost rate calculated under the Entry Age Normal (EAN) actuarial cost method. This change aligned the Board's long-term funding policy with their short-term funding policy.

If all actuarial assumptions are realized and all future contributions required under this funding policy are made, we expect the funding policy to accumulate sufficient assets to provide for all future benefits for current members when due.

The Washington State Investment Board (WSIB) directs the investment of retirement system contributions. RCW 43.33A.110 requires WSIB to maximize investment returns at a prudent level of risk.

Comments On 2018 Results

Many factors can influence how actuarial valuation results change from one measurement date to the next. Those factors include changes in the covered population, changes in plan provisions, assumptions and methods, and experience that varies from our expectations.

For this valuation, we observed no significant changes in the population, and we made no significant changes to our actuarial methods or assumptions. However, there were two LEOFF 2 policy changes: the expansion of the statutory list of presumptive occupational diseases (HB 1913, C 133 L 19) and the transfer of $300 million from the LEOFF Plan 2 trust fund to the plan's Benefit Improvement Account (BIA), effective July 1, 2019 (HB 2144, C 366 L 19). See the **Summary of Plan Provisions** section of this report for more details on these bills.

In terms of annual plan experience, the actual rate of investment return on the Market Value of Assets (MVA) was 9.56 percent, which was above the assumed rate. The rate of investment return on the Actuarial Value of Assets (AVA) was 10.02 percent, which was also higher than expected for the valuation year.

Detailed gain and loss information by system can be found in the **Actuarial Exhibits** section of this report. Please see the **Actuarial Certification Letter** for additional comments on the valuation results.

Actuarial Liabilities

The following table summarizes key measures of actuarial liability along with the liabilities from last year's valuation. The Future Value of Fully Projected Benefits represents the total expected value of all future benefit payments for all members as of the valuation date. The Present Value of Fully Projected Benefits (PVFPB) represents today's value of the Future Value of Fully Projected Benefits when we discount future benefit payments with the valuation interest rate. In other words, if we invest the PVFPB as a lump sum amount at the valuation date and earn the currently assumed valuation interest rate each year, we expect there would be enough money to pay all future benefit payments for current members.

Actuarial Liabilities		
(Dollars in Millions)	2018	2017
Future Value of Fully Projected Benefits	$108,950	$100,995
Present Value of Fully Projected Benefits	$14,846	$13,689
Present Value of Accrued Benefits*	$11,066	$10,160
Valuation Interest Rate	7.40%	7.40%

**Calculated using EAN cost method.*

The Present Value of Accrued Benefits identifies the portion of the present value of future benefits that has been accrued as of the valuation date based on the EAN actuarial cost method.

See the **Actuarial Exhibits** section of this report for a summary of actuarial liabilities. For projected benefit payments by year, please visit the Interactive Reports page on our website. Also, see the Glossary on our website for brief explanations of the actuarial terms.

Assets

The following table shows the MVA and AVA along with approximate rates of investment return. To limit the volatility in contribution rates and funded status due to short-term market fluctuations, we smooth (or defer recognition of) the difference between actual and expected annual investment returns over a period not to exceed eight years. The number of years over which we smooth is dependent on the magnitude of the gain or loss. The AVA equals the MVA less the Total Deferred Investment Gains and (Losses) at the valuation date. The AVA can never be less than 70 percent or greater than 130 percent of the MVA. See the **Actuarial Exhibits** section of this report for additional information on the plan's assets and for the development of the AVA.

Assets		
(Dollars in Millions)	2018	2017
Market Value of Assets (MVA)	$12,706	$11,758
Actuarial Value of Assets (AVA)	11,972	11,037
Contributions[1]	349	316
Disbursements	549	229
Investment Return	1,125	1,446
Other[2]	$24	$30
MVA Return[3]	9.56%	14.14%
AVA Return[4]	10.02%	8.92%

[1] *Employee and Employer.*
[2] *Includes transfers, restorations, payables, etc.*
[3] *Dollar-weighted rate of return on the MVA, net of expenses. May not match the time-weighted return on the Commingled Trust Fund.*
[4] *The AVA is used in determining contribution rates.*

The assets displayed below and throughout this report exclude the $20.2 million held in the LEOFF 2 BIA and have been further reduced by $300 million payable to the BIA effective July 1, 2019 (C 366 L 19). This reduction, which is listed as a 2018 "Disbursement" in the table above, is $279.3 million as of this June 30, 2018, valuation date, after discounting by LEOFF 2's interest rate of 7.40 percent.

Funded Status

Funded status is one of many measures that helps explain the health of a pension plan. A history of funded status measured consistently over a defined period helps readers evaluate a plan's funding progress over time. The funded status represents the portion of the actuarial accrued liability covered by today's actuarial assets. A plan with a 100 percent funded status has one dollar in actuarial assets for each dollar of accrued liability at the valuation date. A plan with a funded status of at least 100 percent is generally considered to be on target with its financing plan. However, a plan more/less than 100 percent funded is not automatically considered over-funded/at-risk. The following table displays the funded status for LEOFF 2.

Funded Status		
(Dollars in Millions)	2018	2017
a. Entry Age Normal Accrued Liability	$11,066	$10,160
b. Market Value of Assets	12,706	11,758
c. Deferred Gains/(Losses)	734	720
d. Actuarial Value of Assets (b - c)	11,972	11,037
Unfunded Liability - Entry Age Normal (a - d)	($906)	($878)
Entry Age Normal Funded Ratio (d / a)	**108%**	**109%**

Note: Totals may not agree due to rounding.

Participant Data

The following table summarizes the participant data used in the actuarial valuation for the plan year ending June 30, 2018, along with information from last year's valuation. See the **Participant Data** section of this report for additional information.

Participant Data		
	2018	2017
Active Members		
Number	18,130	17,694
Total Salaries (in Millions)	$1,982	$1,879
Average Annual Salary	$109,319	$106,169
Average Attained Age	43.1	43.2
Average Service	13.9	14.2
Retirees and Beneficiaries		
Number	5,436	4,851
Average Annual Benefit	$48,843	$46,727
Terminated Members		
Number Vested	934	863
Number Non-Vested*	2,055	1,917

**Members who terminated without a vested lifetime benefit but are eligible for a refund of their employee contributions with interest that currently reside in the trust.*

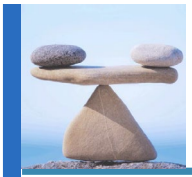
Key Assumptions

The following table displays key economic assumptions used in the actuarial valuation. There were no changes in these assumptions from our prior year's valuation.

Key Assumptions	
Valuation Interest Rate	7.40%
Salary Increase	3.50%
Inflation	2.75%
Growth in Membership*	1.25%

**Applies to the LEOFF 1 funding method only.*

II. ACTUARIAL EXHIBITS



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Actuarial Certification Letter
Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2
Actuarial Valuation Report
As of June 30, 2018

November 2019

This report documents the results of an actuarial valuation of the Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2 (LEOFF 2) as defined under Chapter 41.26 of the Revised Code of Washington. The primary purpose of this valuation is to determine contribution requirements for the retirement plan based on a June 30, 2018, measurement date, consistent with the prescribed funding policy established by the LEOFF 2 Retirement Board (the Board). These contribution requirements are purely informational since, according to state law, this "off-cycle" valuation is not used to determine contribution rates. This valuation also provides information on the funding progress and developments in the plan over the past year. This valuation report should not be used for other purposes. Please replace this report with a more recent report when available.

Future actuarial measurements may differ significantly from the current measurements presented in this report if plan experience differs from that anticipated by the assumptions, or if changes occur in the methods, assumptions, plan provisions, or applicable law. We have not performed analysis of the potential range of such future measurements for the purposes of this valuation. However, we do provide stochastic analysis of possible future outcomes on the Risk Assessment page of our website. We also provide additional risk education on the Commentary on Risk page of our website.

The valuation results summarized in this report involve calculations that require assumptions about future economic and demographic events. We believe that the assumptions and methods used in the underlying valuation are reasonable and appropriate for the primary purpose stated above. However, the use of another set of assumptions and methods could also be reasonable and could produce materially different results. Actual results may vary from our expectations.

The assumptions used in this valuation for investment return, inflation, and salary growth were adopted by the Board in the 2017 Interim. The membership growth assumption was prescribed by the Legislature. Please see our *2017 Economic Experience Study* for further information on the economic assumptions. We developed the demographic assumptions used in this valuation during the *2007-2012 Demographic Experience Study*. The Legislature prescribed the actuarial cost and asset valuation method. In our opinion, all methods, assumptions, and calculations are reasonable and are in conformity with generally accepted actuarial principles and standards of practice as of the date of this publication.

PO Box 40914 | Olympia, Washington 98504-0914 | state.actuary@leg.wa.gov | leg.wa.gov/osa
Phone: 360.786.6140 | Fax: 360.586.8135 | TDD: 711

Actuarial Certification Letter
Page 2 of 2

The Department of Retirement Systems (DRS) provided us with audited member and beneficiary data. We checked the data for reasonableness as appropriate based on the purpose of the valuation. The Washington State Investment Board (WSIB) and DRS provided audited financial and asset information. We relied on all the information provided as complete and accurate, however we did adjust the assets to reflect an expected future transfer to the LEOFF 2 Benefit Improvement Account. In our opinion, this information is adequate and substantially complete for purposes of this valuation.

The asset smoothing method adopted during the 2003 Legislative Session (Chapter 11, Laws of 2003, E1) was intended to address the volatility of contribution rates under the aggregate funding method when used in combination with the existing asset allocation policy of WSIB. The combination of the current asset smoothing method with any other funding method or asset allocation policy may not be appropriate.

The Board's rate adoption for 2019-23 represents a continuation of their funding policy that produces stable contribution rates, measured at June 30, 2017, that exceed the requirements under the aggregate actuarial cost method. In our opinion, this funding policy is reasonable and consistent with the Board's goals of risk management and stable contribution rates. The implementation of contribution rates below the rates adopted by the Board for 2019-23 could also be reasonable, but potentially inconsistent with the Board's goals.

The undersigned, with actuarial credentials, meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. While this report is intended to be complete, we are available to offer extra advice and explanations as needed.

Sincerely,

Luke Masselink, ASA, EA, MAAA
Senior Actuary

Matthew M. Smith, FCA, EA, MAAA
State Actuary

Contribution Rates

Member and Employer Rate Summary		
	2018	2017
Member	8.67%	8.59%
Employer*	5.20%	5.15%
State (Normal Cost)	3.47%	3.44%
State (Plan 1 UAAL)	0.00%	0.00%
Total State	3.47%	3.44%

**Excludes administrative expense rate.*

Development of Employer/State Rates	
a. Total Normal Cost	17.34%
b. Member Normal Cost (a x 50%)	8.67%
c. Total Employer/State Normal Cost (a - b)	**8.67%**
d. State Normal Cost (a x 20%)	3.47%
e. Employer Normal Cost (c - d)*	5.20%
f. Cost to Amortize UAAL**	0.00%
g. Total Employer Contribution Rate (e + f)***	**5.20%**

**Excludes administrative expense rate.*

***Prior funding policy required the state to amortize any LEOFF 1 Unfunded Actuarial Accrued Liability no later than June 30, 2024, using projected salaries of both LEOFF 1 and LEOFF 2 members.*

****The state pays 20% of the total normal cost for LEOFF 2. This reduces the total employer contribution rate from 8.67% to 5.20%.*

The following table shows the development of the normal cost rates. Consistent with the Board's funding policy, the normal cost rates include minimum contribution rates to provide stable and adequate contribution rates over time. The minimum rates are 100 percent of the normal cost calculated under the EAN funding method. Please see the **Glossary** for a more detailed explanation of EAN.

We provide additional contribution rate calculations on the Interactive Reports page of our website. This interactive report caclulates member and employer contribution rates that vary based on the asset valuation method and discount rate that the user selects. The state's funding policy, defined under Chapter 41.45 RCW, does not vary based on these selections.

Development of Normal Cost Rates	
(Dollars in Millions)	
1. Calculation of Member Normal Cost Rate	
a. Future Value of Fully Projected Benefits	$108,950
b. Present Value of Fully Projected Benefits	14,812
c. Valuation Assets	11,972
d. Unfunded Fully Projected Benefits (b - c)	2,841
e. Plan 1 Present Value of Future Salaries (PVS)	N/A
f. Plan 2 PVS	21,915
g. Weighted PVS (2e + 2f)	$43,829
h. Member Normal Cost (d / g)	6.48%
i. Member Minimum Contribution Rate	8.57%
j. Member Contribution Rate with Minimum	8.57%
k. Change In Plan Provisions (Laws of 2019)*	0.10%
l. Calculated Member Contribution Rate (j + k)	8.67%
2. Calculation of Employer/State Normal Cost Rate	
a. Present Value of Fully Projected Benefits	$14,812
b. Valuation Assets	11,972
c. Unfunded Fully Projected Benefits (a - b)	2,841
d. Present Value of Member Contributions	1,420
e. Employer/State Responsibility (c - d)	$1,420
f. Plan 2 PVS	$21,915
g. Employer/State Normal Cost (e / f)	6.48%
h. Employer/State Minimum Contribution Rate	8.57%
i. Employer/State Contribution Rate with Minimum	8.57%
j. Change In Plan Provisions (Laws of 2019)*	0.10%
k. Calculated Total Employer/State Contribution Rate (i + j)	8.67%
3. Adopted Contribution Rates for 2019-23	
a. Member Contribution Rate**	8.59%
b. Employer Contribution Rate (a - c)**	5.15%
c. State Contribution Rate**	3.44%
d. Total Contribution Rate (a + b + c)	**17.18%**

Note: Totals may not agree due to rounding.

**This also includes the impacts from the PTSD Occupational Disease law (C 264 L 18) from 2018. The liability and rate impact from this law was applied as an add-on this year, and will be programmed into our base valuation next year.*

***LEOFF 2 rate: 50% Employee, 30% Employer, 20% State.*

Actuarial Liabilities

Actuarial Liabilities		
(Dollars in Millions)	Present Value of Fully Projected Benefits	Entry Age Normal Accrued Liability
Active Members		
Retirement	$9,380	$6,264
Termination	168	31
Death	134	46
Disability	434	235
Return of Contributions on Termination	114	(31)
Return of Contributions on Death	161	97
Total Active	**$10,390**	**$6,642**
Inactive Members		
Terminated Vested	$238	$238
Terminated Non-Vested*	$14	$14
Service Retired**	3,796	3,796
Disability Retired	229	229
Survivors	145	145
Total Inactive	**$4,422**	**$4,422**
Laws of 2019* **	**34**	**2**
2018 Total	**$14,846**	**$11,066**
2017 Total	**$13,689**	**$10,160**

Note: Totals may not agree due to rounding.

**Members who terminated without a vested lifetime benefit but are eligible for a refund of their employee contributions with interest that currently reside in the trust.*

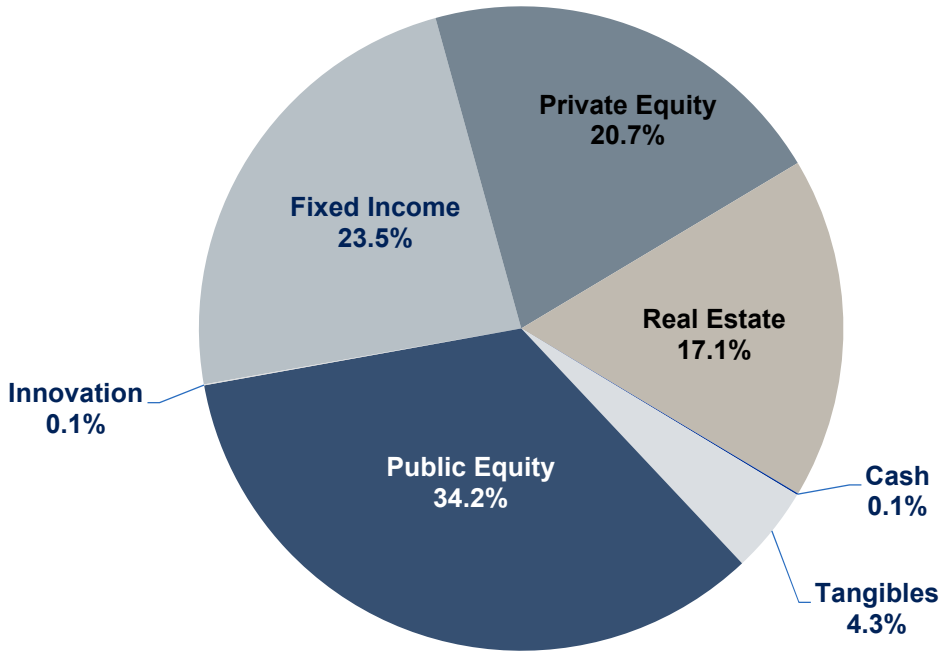
***Includes liability from individuals who are entitled to a portion of the primary member's benefit (legal order payees).*

****This also includes the impacts from the PTSD Occupational Disease law (C 264 L 18) from 2018. The liability and rate impact from this law was applied as an add-on this year, and will be programmed into our base valuation next year.*

We report the present and future value of benefit payments by year on our website. We also show how the present value of these benefit payments varies by interest rate assumptions. For more information or to view projected benefit payments, please visit the Interactive Reports page of our website.

Plan Assets

Retirement Commingled Trust Fund (CTF) Asset Allocation



Source: Washington State Investment Board.

Cash: Highly liquid, very safe investments that can be easily converted into cash, such as Treasury Bills and money-market funds.

Fixed Income: Securities representing debt obligations and usually having fixed payments and maturities. Different types of fixed income securities include government and corporate bonds, mortgage-backed securities, asset-backed securities, convertible issues, and may also include money-market instruments.

Innovation: Fund that provides the ability to invest in a broad range of assets that fall outside the traditional asset classes or management style of existing asset classes.

Public Equity: Shares of U.S. and non-U.S. corporations that trade on public exchanges or "over-the-counter." The ownership of a corporation is represented by shares that are claimed on the corporation's earnings and assets.

Private Equity: The infusion of equity capital into a private company (one that is not available on the public markets). Private equity investments include securities that are not listed on a public exchange and are not easily accessible to most individuals. These investments range from initial capital in start-up enterprises to leveraged buyouts of mature corporations.

Real Estate: An externally-managed selection of partnership investments with the majority of the partnerships invested in high-quality real estate leased to third parties.

Tangibles: The tangible asset portfolio invests in sectors such as infrastructure, timber, agriculture, natural resources, commodities, or other sectors consistent with the goals of the asset class.

The assets displayed below and throughout this report exclude the $20.2 million held in the LEOFF 2 BIA and have been further reduced by $300 million payable to the BIA effective July 1, 2019 (C 366 L 19). This reduction, which is listed as "Transfers Out" in the table below, is $279.3 million as of this June 30, 2018, valuation date, after discounting by LEOFF 2's interest rate of 7.40 percent.

Change in Market Value of Assets	
(Dollars in Millions)	
2017 Market Value	**$11,758**
Revenue	
Contributions	
Member	174
Employer/State	175
Total Contributions	**349**
Investment Return	1,125
Restorations*	23
Transfers In	1
Miscellaneous	0
Total Revenue	**$1,498**
Disbursements	
Monthly Benefits	260
Refunds	9
Total Benefits	**268**
Transfers Out	279
Expenses	2
Total Disbursements	**$549**
Payables	$0
2018 Market Value (MV)	$12,706
2018 Actuarial Value (AV)	$11,972
Ratio (AV / MV)	**94%**

Note: Totals may not agree due to rounding.
**Includes additional annuity purchases and service credit purchases.*

Calculation of Actuarial Value of Assets			
(Dollars in Millions)			
a. Market Value at 6/30/2018			$12,706
Deferred Gains and (Losses)			
Plan Year Ending	**Smoothing Period**	**Years Remaining**	
6/30/2018	3	2	170
6/30/2017	7	5	484
6/30/2016	6	3	(249)
6/30/2014	8	3	329
b. Total Deferral			**$734**
c. Market Value less Deferral (a - b)			$11,972
d. 70% of Market Value of Assets			$8,894
e. 130% of Market Value of Assets			$16,518
f. Actuarial Value of Assets*			**$11,972**

Note: Totals may not agree due to rounding. The gain/(loss) for 6/30/2015 has been fully realized.
**AVA can never be less than 70% or greater than 130% of the MVA.*

Investment Gains and (Losses) for Prior Year		
(Dollars in Millions)		
a.	2017 Market Value*	$11,720
b.	Total Cash Flow	(183)
c.	2018 Market Value*	12,662
d.	Actual Return (c - b - a)	$1,125
e.	Weighted Asset Amount	$11,769
f.	Expected Return (7.4% x e)	871
g.	Investment Gain/(Loss) for Prior Year (d - f)	254
h.	Dollar-Weighted Rate of Return*	9.56%

Note: Totals may not agree due to rounding.
**Source: Washington State Investment Board.*

Funded Status

In our actuarial valuation report, we calculate a plan's funded status by comparing the plan's current assets, determined under an asset valuation method, to the actuarial accrued liability of its members calculated under an actuarial cost method. Funded status can vary significantly depending on the purpose of the measurement and the assumptions and methods used to determine the funded status.

Based on the purpose of the measurement, actuaries can select from several acceptable actuarial cost methods when measuring a plan's funded status. The cost methods vary in the manner they allocate benefits to past and future time periods. Generally speaking, benefits allocated to past service are considered accrued (or earned). Please see the Glossary on our website for an explanation of the actuarial cost methods we use in this actuarial valuation.

Consistent with financial reporting under GASB requirements, we report funded status using the EAN actuarial cost method. However, the funded status measures we share in this report may still vary from those presented in the DRS *Comprehensive Annual Financial Report*. These differences occur because the assumptions and methods applied to determine contribution requirements (under a funding valuation) may not apply for financial reporting under GASB accounting standards (an accounting valuation). Put another way, these measurements still represent distinct measurements for specific purposes and the results may vary between the two reports.

To determine the present value (today's value) of accrued benefits we discount future benefits to the valuation date using the valuation interest rate. This rate is adopted by the Board and is intended to be consistent with the long-term expected return under the plan's funding policy. (Note: This discount rate may vary from the rate used for financial reporting under GASB accounting standards.)

In addition to the valuation interest rate, we use the same long-term assumptions to develop the funded status measure in this report that we use to determine the contribution requirements of the plan. We don't expect the assumptions to match actual experience over short-term periods. However, we do expect these assumptions to reasonably approximate average annual experience over long-term periods. This measure of funded status is consistent with the Board's current funding policy and financing plan for future retirement benefits.

For reporting funded status and calculating contribution requirements, we also use an asset valuation method to determine the AVA. This asset valuation method smooths the inherent volatility in the MVA by deferring a portion of annual investment gains or losses for a certain number of years. Investment gains and losses occur when the annual return on investments varies from the long-term assumed rate. To determine the 2018 investment gains or losses, we used an investment return assumption of 7.40 percent. The AVA provides a more stable measure of the plan's assets on an ongoing basis.

With this background in mind, we display the funded status on an "actuarial value" basis in the following table. For the actuarial value basis, we use the assumed long-term rate of return and AVA consistent with the plan's funding policy.

It's also reasonable and acceptable to report funded status using other assumptions and methods. The resulting funded status will change with the use of assumptions and methods that vary from what we present in this report. Please visit the Interactive Reports page of our website for funded status measures that vary by interest rate assumptions and asset valuation methods.

We include information for LEOFF 1 because the prior funding policy required the state to amortize any LEOFF 1 Unfunded Actuarial Accrued Liability (UAAL) no later than June 30, 2024, using projected salaries of both LEOFF 1 and LEOFF 2 members. Given LEOFF 1 is currently fully funded, no UAAL exists. If a positive UAAL in LEOFF 1 re-emerges, future funding policy may vary from the past funding policy.

Generally speaking, under current funding policy, when a plan is less/more than 100 percent funded, we expect higher/lower contribution requirements in the near term to return the plan to a 100 percent funded status over time. A plan with a funded status above 100 percent will require future contributions if the plan has not yet accumulated sufficient assets to pay both the expected cost of benefits that have been earned today and the expected cost of benefits that will be earned by current members in the future. As of the valuation date, and under the data, assumptions and methods used for this actuarial valuation, only LEOFF 1 has sufficient assets to cease ongoing contributions.

Funded Status on an Actuarial Value Basis*

(Dollars in Millions)	LEOFF 1	LEOFF 2
EAN Accrued Liability	$4,095	$11,066
Valuation Assets	$5,538	$11,972
Unfunded Liability	($1,444)	($906)
Funded Ratio		
2018	**135%**	**108%**
2017	131%	109%
2016	126%	105%
2015	125%	105%
2014	127%	107%

**Liabilities valued using the EAN cost method at an interest rate of 7.5% for LEOFF 1 and 7.4% for LEOFF 2. All assets have been valued under the actuarial asset method.*

Actuarial Gain/Loss

The following table displays actuarial gains and losses, expressed as contribution rate changes. Actuaries use gain/loss analysis to compare actual changes to assumed changes from various sources with respect to assets, liabilities, and salaries. We also use this analysis to determine:

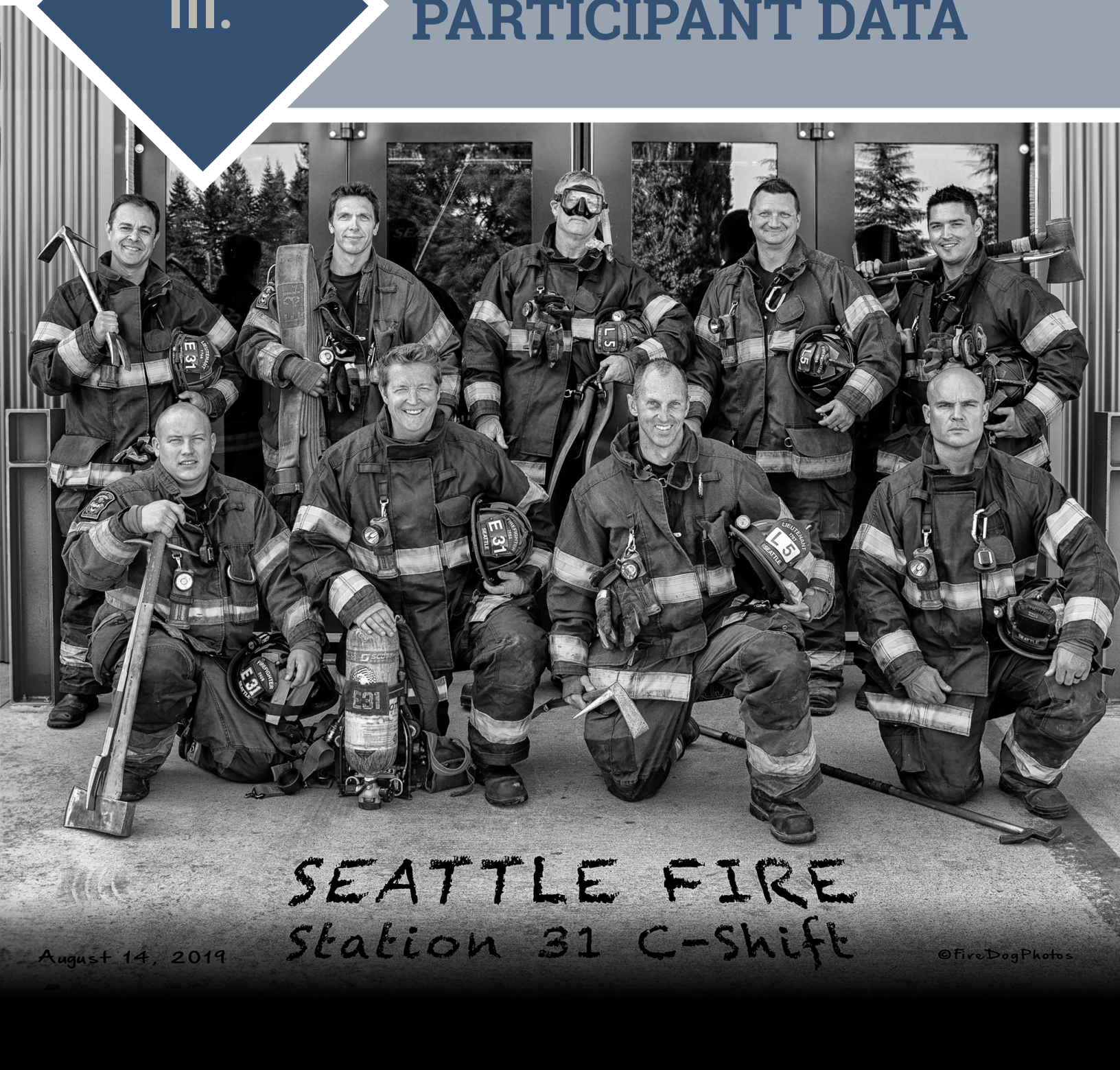
- The accuracy of our valuation model and annual processing.
- Why contribution rates changed.
- The reasonableness of the actuarial assumptions.

Actuarial gains will reduce contribution rates; actuarial losses will increase contribution rates. Under a reasonable set of actuarial assumptions, actuarial gains and losses will offset over long-term experience periods.

Change in State Contribution Rate by Source	
Change in Rate	**LEOFF 2***
2017 Rate Before Laws of 2018	**3.42%**
Remove Rate Floor	(0.86%)
2017 Adjusted Rate	**2.56%**
Liabilities	
Salaries	0.01%
Termination	(0.01%)
Retirement	0.01%
Disability	0.00%
Mortality	0.01%
Return to Work	0.34%
Other Liabilities	0.05%
Total Liability Gains/Losses	**0.41%**
Assets**	
Contributions	(0.12%)
Disbursements	0.27%
Investment Returns	(0.29%)
Asset Gains/Losses	**(0.14%)**
Incremental Changes	
Plan Change	0.00%
Method Change	0.00%
Assumption Change	0.00%
Correction Change	0.00%
Experience Study Change	0.00%
Total Incremental Changes Gains/Losses	**0.00%**
Present Value of Future Salaries Gains/Losses	**(0.22%)**
Other Gains/Losses	**(0.02%)**
Total Change	**0.03%**
2018 Preliminary Rate	**2.59%**
Increase from Applied Rate Floor	0.84%
Laws of 2019***	0.04%
2018 Adjusted Rate	**3.47%**

**The state contribution rate to LEOFF 2 is 20% of the Normal Cost.*
***Asset Gain/Loss performed on AVA not MVA.*
****This also includes the impacts from the PTSD Occupational Disease law (C 264 L 18) from 2018. The liability and rate impact from this law was applied as an add-on this year, and will be programmed into our base valuation next year.*

III. PARTICIPANT DATA



Overview Of System Membership

LEOFF 2 membership includes fire fighters; emergency medical technicians; law enforcement officers including sheriffs; university, port, and city police officers; and enforcement officers with the Department of Fish and Wildlife.

Active Membership By Employer as of June 30, 2018	
State Agencies	132
Higher Education	114
Counties	2,850
County Sub Divisions	432
First Class Cities	5,276
Other Cities	5,023
Ports	214
Fire Districts	4,089
TOTAL	**18,130**

The following table shows participant data changes from last year's valuation to this year's valuation. We divide the participant data into two main categories:

- **Actives**: Members accruing benefits in the plan.
- **Annuitants**: Members and beneficiaries receiving benefits from the plan.

Reconciliation of Active and Annuitant Data	
2017 Actives	**17,694**
Transfers	0
Hires/Rehires	1,345
New Retirees	(519)
Deaths	(13)
Terminations	(377)
2018 Actives	**18,130**
2017 Annuitants	4,851
New Retirees*	610
Annuitant Deaths	(34)
New Survivors	17
Other	(8)
2018 Annuitants	**5,436**
Ratio of Actives to Annuitants	**3.34**

**Includes service and disability retirees.*

Summary Of Plan Participants

Summary of Plan Participants	2018	2017
Active Members		
Number	18,130	17,694
Total Salaries (Millions)	$1,982	$1,879
Average Age	43.1	43.2
Average Service	13.9	14.2
Average Salary	$109,319	$106,169
Terminated Members		
Vested	934	863
Non-Vested*	2,055	1,917
Total Terminated	**2,989**	**2,780**
Annuitants		
Service Retired**	4,733	4,200
Disability Retired	446	409
Survivors	257	242
Total Annuitants	**5,436**	**4,851**
Average Monthly Benefit, All Annuitants	$4,070	$3,894
Number of New Service Retirees	575	572
Average Monthly Benefit, New Service Retirees	$4,896	$4,798

**Members who terminated without a vested lifetime benefit but are eligible for a refund of their employee contributions with interest that currently reside in the trust.*
***Includes retirements from active and terminated with vested status.*

Retirement Age and Service	2018	2017
All Law Enforcement Officers		
Average Entry Age	33.1	33.0
Average Age at Retirement	55.8	55.7
Average Service at Retirement	22.7	22.7
All Fire Fighters		
Average Entry Age	32.3	32.1
Average Age at Retirement	56.9	56.8
Average Service at Retirement	24.6	24.6
All Members who Retired in the Last Year (With 21-25 Years of Service)		
Average Monthly Final Average Salary	$8,610	$8,720

IV. APPENDICES

Actuarial Methods And Assumptions

To calculate the contribution rates necessary to pre-fund a plan's benefits, an actuary uses an actuarial cost method, an asset valuation method, a funding policy, economic assumptions, and demographic assumptions. The sections below list the methods and assumptions that change regularly or are new since the last actuarial valuation report. Please see the Actuarial Methods web page for descriptions of the actuarial cost methods and asset valuation method we use for this valuation, and please see the Actuarial Assumptions web page for descriptions of all remaining assumptions.

FREQUENTLY CHANGING ASSUMPTIONS

We make an assumption to help us project the value of accumulated employee contributions with interest if a member elects a refund of contributions instead of a deferred retirement allowance upon termination. For this valuation year, we used a LEOFF 2 member contribution rate for savings fund accruals of 8.54 percent.

CHANGES IN METHODS AND ASSUMPTIONS SINCE THE LAST VALUATION

We updated our modeling to reflect DRS' policy of providing benefit payments retroactively to the date of initial retirement eligibility for terminated vested members who delay retirement.

Summary Of Plan Provisions

The summary of key plan provisions used in the actuarial valuation are provided in two sets of tables. The table below contains plan provisions that can change frequently, while the provisions that change less frequently can be found on the **Summary of General Plan Provisions** page of our website.

These tables present high-level summaries and are not meant to be exhaustive lists. For complete details of plan provisions, please refer to the statutes governing the retirement systems or contact the plan administrator (DRS). In the unlikely event that information contained in these summary tables conflicts with state law, the law takes precedence.

Summary of Frequently Changing Plan Provisions	
COLA	Lesser of CPI* or 3%
Changes in Plan Provisions Since Last Valuation	Occupational Disease Presumption (C 133 L 19), Benefit Improvement Account Transfer (C 366 L 19)

**CPI: Urban Wage Earners & Clerical Workers, Seattle-Tacoma-Bellevue, WA - All Items.*

The Office Of The State Actuary's Website

Our website (leg.wa.gov/osa) contains additional information and educational material not included in this report. The site also contains an archive of other recent studies that OSA has produced. The following is a list of materials found on our website that could be useful to the reader.

GLOSSARY
Definitions for frequently used actuarial and pension terms.

AGE DISTRIBUTIONS
Tables summarizing valuation statistics by member/annuitant age.

HISTORICAL DATA
Table summarizing valuation statistics by valuation period.

2017 REPORT ON FINANCIAL CONDITION AND ECONOMIC EXPERIENCE STUDY
Report examining the financial health of the retirement systems and long-term economic assumptions.

2019 REPORT ON FINANCIAL CONDITION AND ECONOMIC EXPERIENCE STUDY
Report examining the financial health of the retirement systems and long-term economic assumptions.

2007-2012 DEMOGRAPHIC EXPERIENCE STUDY
Most recent report examining demographic behavior.

2016 RISK ASSESSMENT
Information examining the effect of unexpected experience on the retirement plan.

COMMENTARY ON RISK
Educational information on the risks inherent in our actuarial measurements and how these measurements could vary under different circumstances.

CONTRIBUTION RATE PROJECTIONS
Forecasts for future contribution rates based on projected assets and liabilities.

INTERACTIVE REPORTS
Set of reports displaying funded status, projected benefit payments, and contribution rates that vary by key inputs the user selects.

Office of the State Actuary

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