State of Washington Pension Funding Council LEOFF 2 Board

Actuarial Audit of June 30, 2019 Actuarial Valuation

Prepared by:

Mark C. Olleman, FSA, EA, MAAA
Consulting Actuary

Nick J. Collier, ASA, EA, MAAA
Consulting Actuary

Daniel R. Wade, FSA, EA, MAAA
Consulting Actuary

Milliman, Inc.
1301 Fifth Avenue, Suite 3800
Seattle, WA 98101-2605
Tel +1 206 624 7940
milliman.com

Issued July 30, 2020

1301 Fifth Avenue
Suite 3800
Seattle, WA 98101-2605
USA

Tel +1 206 624 7940

milliman.com

July 30, 2020

Shawn Merchant
Legislative & Stakeholder Relations Director
Department of Retirement Services

Steve Nelsen
Executive Director
LEOFF Plan 2 Retirement Board

Re: **Actuarial Audit of June 30, 2019 Actuarial Valuation**

Dear Shawn and Steve:

The enclosed report presents the findings and comments resulting from a detailed review of the June 30, 2019 actuarial valuation performed by the Office of the State Actuary (OSA) for the Pension Funding Council (PFC) and the LEOFF 2 Board. An overview of our findings is included in the Executive Summary section of the report. More detailed commentary on our review process is included in the latter sections.

All calculations for the actuarial valuation are based on the Revised Code of Washington (RCW) and the actuarial assumptions proposed by the OSA based on its 2013-2018 experience study for use in the June 30, 2019 actuarial valuation.

As discussed in our report, we believe the package of actuarial assumptions and methods is reasonable (taking into account the experience of Washington State Public Retirement Systems and reasonable expectations). Nevertheless, the emerging costs will vary from those presented in this report to the extent that actual experience differs from that projected by the actuarial assumptions. Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such as the following:

- Plan experience differing from the actuarial assumptions,
- Future changes in the actuarial assumptions,
- Increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as potential additional contribution requirements due to changes in the plan's funded status), and
- Changes in the plan provisions or accounting standards.

Due to the scope of this assignment, we did not perform an analysis of the potential range of such measurements.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by the OSA's staff. This information includes information supplied to the OSA by the Department of Retirement Systems (DRS) and the Washington State Investment Board (WSIB). This information includes, but is not limited to, statutory provisions, employee data, and financial information. In our examination of these data, we have found them to be reasonably consistent and comparable with data used for other purposes. Since the audit results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial

principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board and the Code of Professional Conduct and Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion in the United States of the American Academy of Actuaries. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein. [Add for OPEB reports where health actuary

Milliman's work product was prepared exclusively for the Pension Funding Council and the LEOFF 2 Board for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning the operations of the Washington State Public Retirement Systems, and uses DRS's census data, which Milliman has not audited. It is not for the use or benefit of any third party for any purpose. Any third party recipient of Milliman's work product who desires professional guidance should not rely upon Milliman's work product, but should engage qualified professionals for advice appropriate to its own specific needs.

The consultants who worked on this assignment are retirement actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

We would like to express our appreciation to the OSA's staff for their assistance in supplying the data and information on which this report is based.

We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

We respectfully submit the following report, and we look forward to discussing it with you.

Sincerely,

Mark C. Olleman, FSA, EA, MAAA
Consulting Actuary

Nick J. Collier, ASA, EA, MAAA
Consulting Actuary

Daniel R. Wade, FSA, EA, MAAA
Consulting Actuary

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1. Summary of the Findings

Purpose and Scope of the Actuarial Audit

This actuarial audit reviews the June 30, 2019 actuarial valuation performed by the Office of the State Actuary (OSA). The purpose of this audit is to verify that the results of the valuation are accurate and that the assumptions the valuation is based upon are reasonable. The following tasks were performed in this audit:

- Evaluation of the data used in the valuation
- Full independent replication of the key valuation results
- Evaluation of the reasonableness of the assumptions used in the valuation
- Analysis of valuation results and reconciliation of material differences (if any)
- Analysis of the written work product

Audit Conclusion

The results of this audit are very positive. Specifically, we want to highlight the following:

- Reasonable Assumptions: The demographic assumptions were all reviewed as part of the 2013 – 2018 Demographic Experience study. Milliman completed an actuarial audit of that study and based on our findings in that audit, we believe that all of the recommended assumptions used to value liabilities are reasonable. Please see our report dated May 1, 2020 for more information about our findings.
- Contributions toward Funding: Washington State has funding that is superior to that of most statewide systems. The use of the aggregate actuarial cost method, along with relatively short amortization periods for PERS and TRS Plans 1, limits the contributions deferred to future generations in comparison to what is done in most other states.
- Accurate Calculations: Our independent calculations matched OSA's closely in all material aspects of the valuation.

Based upon our review of the June 30, 2019 actuarial valuation, we found the actuarial work performed by OSA was reasonable, appropriate, and accurate. We closely matched the assets, liabilities, and contribution rates calculated by OSA.

Statement of Key Findings

Membership Data

We performed tests on both the raw data supplied by the Department of Retirement Systems (DRS) and the processed data used by the OSA in the June 30, 2019 actuarial valuation. We feel that there is an excellent match between the data supplied by DRS and the data used by OSA. Based on this review, we feel the individual member data used is complete. A summary is shown in the table below:

All Plans	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	330,445	330,445	100.0%
Total Salaries (millions)	$ 23,148	$ 23,147	100.0%
Average Age	46.5	46.5	100.0%
Average Service	11.1	11.1	100.0%
Average Salary	$ 70,051	$ 70,051	100.0%
Retirees and Survivors			
Total Number	192,866	192,866	100.0%
Average Monthly Pension	$ 1,983	$ 1,982	100.0%
Terminated Members			
Total Number Vested	64,194	64,194	100.0%
Total Number Non-Vested	145,423	145,422	100.0%

Actuarial Value of Assets

We have reviewed the calculations for the actuarial value of assets used for each plan in the June 30, 2019 valuation. We found the calculations to be reasonable and the methodology to be appropriate and in compliance with Actuarial Standards of Practice.

There is a change in the approach for assets and liabilities for Plan 3 members who have purchased Total Allocation Portfolio (TAP) annuities. This is a program that enables Plan 3 members to purchase annuities from their investment account balances. The assets in the TAP annuity accounts were added to the actuarial value of assets for PERS 2/3, TRS 2/3, and SERS 2/3.

Another item of note is the transfer from the LEOFF 2 system to the LEOFF 2 benefit improvements account. In accordance with RCW 41.26.802, on July 1, 2019, $300 million was transferred to the LEOFF benefits improvement account. Although the transfer out of the LEOFF 2 valuation assets was made one day after the valuation date, we agree that it was appropriate to exclude this amount from the actuarial value of assets for LEOFF 2.

The actuarial value of assets is discussed in more detail in Section 3 of this report.

Actuarial Liabilities

We independently calculated the Present Value of Benefits, Normal Cost, and Actuarial Accrued Liability under the Entry Age Normal actuarial cost method for all systems. We found that all significant benefit provisions were accounted for in an accurate manner, the actuarial assumptions and methods are being applied as reported, and

that our total liabilities matched those calculated by OSA closely. This was true both in aggregate and by individual plan.

A summary of the results for each system is shown in the table below. Further breakdowns are shown in Section 4.

	OSA	Milliman	Ratio OSA/Milliman
Present Value All Future Benefits (in $Millions)			
PERS 1	$ 11,445.2	$ 11,436.0	100.1%
PERS 2/3	51,592.4	51,648.2	99.9%
TRS 1	8,282.8	8,277.5	100.1%
TRS 2/3	23,168.1	23,283.5	99.5%
SERS 2/3	8,096.0	8,106.1	99.9%
PSERS 2	1,391.3	1,393.7	99.8%
LEOFF 1	4,077.4	4,106.7	99.3%
LEOFF 2	16,095.5	16,156.2	99.6%
WSPRS	1,585.8	1,595.3	99.4%
Total PVB	**$ 125,734.5**	**$ 126,003.2**	**99.8%**

Funding

We reviewed the funding methods and their application. We find them reasonable and consistent with the Actuarial Standards of Practice and the objectives stated in RCW 41.45.010. Based on the Systems' funding methods and assumptions, we believe the employer contribution rates for each membership class are appropriately calculated.

When we used the liabilities, present value of future salaries, and actuarial assets calculated by OSA, we matched OSA's contribution rates.

When we used the liabilities, present value of future salaries, and actuarial assets calculated by Milliman, the results were close to OSA's calculated contribution rates, as shown below. It should be noted that there is a more noticeable difference between the OSA calculated employer contribution rate for WSPRS and Milliman's estimate. This difference is caused by the very leveraged nature of the calculation for WSPRS. There is leverage to the employer contribution rate for WSPRS based on the fact that the employee rate is limited by the member maximum rate.

This results in an employer contribution in excess of the 50% share of the Present Value of Future Contributions. In addition, there is leverage because, due to the Plan's maturity, the Present Value of Future Salaries that provide the base for future contributions are a smaller percentage of the actuarial value of assets. Given this leveraging and that Milliman was within about 0.6% of OSA's calculation of the Present Value of All Future Benefits, we feel the difference in the two calculations of the WSPRS employer contribution rate is reasonable.

Employer Contribution Rates

	OSA	Milliman	Difference OSA - Milliman
Employer Contribution Rates (Percent of Member Pay)			
PERS 1/2/3	10.07%	10.08%	-0.01%
TRS 2/3	14.24%	14.35%	-0.11%
SERS 2/3	11.47%	11.57%	-0.10%
PSERS 2	10.21%	10.23%	-0.02%
WSPRS	18.57%	19.45%	-0.88%
LEOFF 1	0.00%	0.00%	0.00%
LEOFF 2*	4.61%	4.60%	0.01%

** Based on a LEOFF 2 contribution rate structure of 90% of Entry Age Normal Cost rate with a 50%/30%/20% share for the member, employer and the state, respectively.*

Member Contribution Rates

	OSA	Milliman	Difference OSA - Milliman
Member Contribution Rates (Percent of Member Pay)			
PERS 1	6.00%	6.00%	0.00%
PERS 2	6.36%	6.37%	-0.01%
TRS 1	6.00%	6.00%	0.00%
TRS 2	8.05%	8.16%	-0.11%
SERS 2	7.76%	7.86%	-0.10%
PSERS 2	6.50%	6.52%	-0.02%
WSPRS	8.61%	8.61%	0.00%
LEOFF 1	0.00%	0.00%	0.00%
LEOFF 2*	7.68%	7.67%	0.01%

** Based on a LEOFF 2 contribution rate structure of 90% of Entry Age Normal Cost rate with a 50%/30%/20% share for the member, employer and the state, respectively.*

Funding is discussed in more detail in Section 5.

Actuarial Assumptions

We reviewed the assumptions used in the valuation and found them to be reasonable. A complete analysis of the demographic assumptions was done earlier this year for the 2013-2018 Demographic Experience Study. Please see our report dated May 1, 2020 for more information.

The economic assumptions used were based on the OSA's 2019 Report on Financial Condition and Economic Experience Study completed in August 2019. While a full audit of that report is beyond the scope of our assignment, we feel an actuarial audit would be incomplete without a review of the important economic assumptions used in the actuarial valuation.

We have the following comments regarding the economic assumptions:

- The expected return assumption of 7.40% recommended by the OSA is reasonable based on the future expectations of WSIB and reflecting the 2.75% inflation assumption. Although we also consider the 7.50% assumption used for non-LEOFF 2 plans to be reasonable, we believe that 7.40% is a slightly more realistic assumption and recommend that the investment return assumption continue to decrease. It should be noted that Milliman is generally recommending return assumptions of less than 7.40% to our retained clients.
- The inflation assumption of 2.75% is reasonable, as is the real wage growth assumption of 0.75% for productivity. The general salary increase assumption of 3.50% is the sum of these two assumptions.
- As prescribed, OSA assumes annual growth in active membership varying by plan from 0.95% to 1.25%. Most public sector pension plans assume no future growth in system membership. Please note that this assumption only impacts the amortization of the Plan 1 Unfunded Actuarial Accrued Liability (UAAL) over 10 years. The small membership growth assumption over the 10-year amortization period has a modest impact on the calculated contribution rates.

Risk Disclosures

Since the July 1, 2017 actuarial valuation, a new actuarial standard of practice (ASOP) regarding the assessment and disclosure of risk associated with measuring pension obligations and determining pension plan contributions became effective for work products with measurement dates on or after November 1, 2018. The new standard, ASOP 51 addresses these issues by providing actuaries with guidance for assessing and disclosing the risk associated with measuring pension liabilities and the determination of pension plan contributions. Specifically, it directs the actuary to:

- Identify risks that may be significant to the plan.
- Assess the risks identified as significant to the plan. The assessment does not need to include numerical calculations.
- Disclose plan maturity measures and historical information that are significant to understanding the plan's risks.

We believe OSA's work product including the disclosures on the web satisfy ASOP 51.

However, we offer the following specific suggestions for the risk disclosures provided by OSA in the summary at the end of the Risk Disclosures section. We believe these suggestions may improve the value of the Risk Disclosures. Note these are just suggestions that we feel would help the end user more easily follow the analysis. As previously discussed, we believe the risk discussion satisfies ASOP 51, so all of these changes are optional. Please refer to the summary at the end of the Risk Disclosures section for more detail.

- Provide a Roadmap.
- Highlight key metrics.

- Provide Separate LEOFF 2 Information.
- Provide LEOFF 2 information as a % of pay instead of as a % of GF-S (General Fund-State).
- Provide LEOFF 2 probability of funded statuses.
- Adjust the age service distributions so the number of retirement eligible members can be determined.
- Provide graphs by plan for historical data by plan.

We encourage direct communication between OSA, the PFC, the LEOFF 2 Board, and their respective staffs concerning their opinions on these suggestions since they are the primary users of the Risk Disclosures.

Review of Preliminary Report

Because the final 2019 Actuarial Valuation reports have not been completed at this time, we base the comments on the preliminary report. Overall, we found OSA's report to be very thorough. We have made comments for consideration for the upcoming reports that may enhance an outside reader's understanding. These comments are related to additional disclosure and do not impact any of the actuarial calculations. Please see Section 7 of this report for more information about our comments.

Recommendations from Prior Audit

We have also reviewed the comments from our prior actuarial audit and reported on the incorporation of those comments. Our one recommendation pertaining to the valuation calculations was implemented.

Recommendations and Other Considerations

Recommended Changes to the 2019 Preliminary Valuation

During the course of our review of the 2019 preliminary valuation, we noticed an issue that we discussed with OSA. The OSA has revised its calculations and will be incorporating the change in the final report.

Separate mortality tables are used for actively employed members and retired members. The mortality tables predict a lower incidence of death for active compared to retired members with the same age and gender characteristics. The OSA assumes that vested terminated members have mortality matching active employees prior to benefit commencement and retired member mortality after benefit commencement. This is a common and reasonable assumption. The calculations in the preliminary report used pre-retirement mortality for vested terminated employees after benefit commencement. The OSA has now revised its calculation to match the intended assumption for post-retirement mortality. The OSA calculations in this report reflect the revised calculations.

Recommended Changes for Future Valuations with a Material Financial Impact

None

Recommended Changes for Future Valuations and Experience Studies with a Non-Material Financial Impact

In the 2019 preliminary valuation, the disability rates used for PERS/TRS/SERS Plan 2 members were fractionally different for ages 50-54 than the valuation assumptions. We have discussed this with OSA and they will adjust the rates for the next valuation. This will not have a material impact on the results.

Suggested Changes for Future Valuations and Experience Studies with No Financial Impact

Please see the suggested changes to risk disclosures above and in Section 6 of this report.

2. Membership Data

Audit Conclusion and Comments

We performed tests on both the raw data supplied by DRS and the processed data used by OSA in the June 30, 2019 actuarial valuation. We found that the data used by OSA was consistent with the data supplied by DRS.

Based on this review, we feel the individual member data used is appropriate and complete.

Overall, the data process appears to be thorough and accurate. We would add the following comments:

- Raw Data: OSA provided us with the same files that were given to them by DRS for use in the actuarial valuation.

  Completeness: The data contained all the necessary fields to perform the actuarial valuation.

  Quality: Although we did not audit the data at the source, we performed some independent checks to confirm the overall reasonableness of the data. We compared the total retiree and beneficiary benefit amounts with the actual benefit payments made, as reported in the asset statements.

  We also compared the total active member compensation on the DRS data with the estimated active payroll for 2018-2019. The actual member contribution amounts in the asset statements provided by DRS were divided by the applicable contribution rates for the prior year for each plan. This results in an estimated payroll for each plan. Based on this analysis, we found the compensation data to be reasonable.

- Parallel Data Processing: We performed independent edits on the raw data provided by DRS and then compared our results with the valuation data used by OSA, as summarized in the preliminary participant data summary on the OSA's website. Approximately 1,000 records that were reported in the DRS data as inactive were recategorized in the OSA data as active. We understand from discussions with OSA staff that these members transferred from one department to another effective July 1, 2019, and so were only "inactive" for a matter of hours. We believe this is a reasonable adjustment to make to the data, and after reflecting it, we found our results to be consistent.

  Our results do not match exactly, but do match very well. This is understandable, as some adjustments were made to annualize salary for those with less than one year of service during the valuation period and other adjustments were made for a few data elements outside of the expected range. Overall, each key data component matched very well, and we believe the individual member data used by the OSA was appropriate for valuation purposes.

  A summary of the data for each plan is shown in Exhibit 2-1. In all cases, the summarized totals for our edited data matched those for OSA's valuation data closely. The "Milliman" column reflects the DRS data after adjustments by Milliman. The "OSA" column reflects the actual data used in the OSA's valuation as summarized in the preliminary participant data summary on the OSA's website.

Exhibit 2-1
Member Statistics as of June 30, 2019

All Plans

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	330,445	330,445	100.0%
Total Salaries (millions)	$ 23,148	$ 23,147	100.0%
Average Age	46.5	46.5	100.0%
Average Service	11.1	11.1	100.0%
Average Salary	$ 70,051	$ 70,051	100.0%
Retirees and Survivors			
Total Number	192,866	192,866	100.0%
Average Monthly Pension	$ 1,983	$ 1,982	100.0%
Terminated Members			
Total Number Vested	64,194	64,194	100.0%
Total Number Non-Vested	145,423	145,422	100.0%

PERS 1

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	1,538	1,538	100.0%
Total Salaries (millions)	$ 105	$ 105	100.0%
Average Age	66.6	66.7	99.9%
Average Service	26.2	26.2	100.0%
Average Salary	$ 68,120	$ 68,120	100.0%
Retirees and Survivors			
Total Number	45,633	45,633	100.0%
Average Monthly Pension	$ 2,159	$ 2,157	100.1%
Terminated Members			
Total Number Vested	396	396	100.0%
Total Number Non-Vested	2,529	2,529	100.0%

PERS 2

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	122,454	122,454	100.0%
Total Salaries (millions)	$ 8,582	$ 8,581	100.0%
Average Age	47.7	47.7	100.0%
Average Service	11.9	11.9	100.0%
Average Salary	$ 70,079	$ 70,079	100.0%
Retirees and Survivors			
Total Number	54,948	54,948	100.0%
Average Monthly Pension	$ 1,777	$ 1,777	100.0%
Terminated Members			
Total Number Vested	28,726	28,726	100.0%
Total Number Non-Vested	113,586	113,585	100.0%

PERS 3

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	38,047	38,047	100.0%
Total Salaries (millions)	$ 2,449	$ 2,449	100.0%
Average Age	43.3	43.3	100.0%
Average Service	8.2	8.2	100.0%
Average Salary	$ 64,368	$ 64,368	100.0%
Retirees and Survivors			
Total Number	5,684	5,684	100.0%
Average Monthly Pension	$ 990	$ 988	100.2%
Terminated Members			
Total Number Vested	6,286	6,286	100.0%
Total Number Non-Vested	-	-	100.0%

TRS 1

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	350	350	100.0%
Total Salaries (millions)	$ 36	$ 36	100.0%
Average Age	68.0	68.1	99.9%
Average Service	33.4	33.4	100.0%
Average Salary	$ 102,091	$ 102,091	100.0%
Retirees and Survivors			
Total Number	32,570	32,570	100.0%
Average Monthly Pension	$ 2,262	$ 2,262	100.0%
Terminated Members			
Total Number Vested	119	119	100.0%
Total Number Non-Vested	243	243	100.0%

TRS 2

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	21,561	21,561	100.0%
Total Salaries (millions)	$ 1,687	$ 1,687	100.0%
Average Age	41.6	41.6	100.0%
Average Service	7.6	7.6	100.0%
Average Salary	$ 78,259	$ 78,259	100.0%
Retirees and Survivors			
Total Number	5,855	5,855	100.0%
Average Monthly Pension	$ 2,098	$ 2,098	100.0%
Terminated Members			
Total Number Vested	2,823	2,823	100.0%
Total Number Non-Vested	7,140	7,140	100.0%

TRS 3

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	55,351	55,351	100.0%
Total Salaries (millions)	$ 5,080	$ 5,080	100.0%
Average Age	46.3	46.3	100.0%
Average Service	14.1	14.1	100.0%
Average Salary	$ 91,770	$ 91,770	100.0%
Retirees and Survivors			
Total Number	13,701	13,701	100.0%
Average Monthly Pension	$ 1,272	$ 1,271	100.1%
Terminated Members			
Total Number Vested	8,831	8,831	100.0%
Total Number Non-Vested	-	-	100.0%

SERS 2

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	28,239	28,239	100.0%
Total Salaries (millions)	$ 1,087	$ 1,087	100.0%
Average Age	49.5	49.5	100.0%
Average Service	8.7	8.7	100.0%
Average Salary	$ 38,505	$ 38,505	100.0%
Retirees and Survivors			
Total Number	10,056	10,056	100.0%
Average Monthly Pension	$ 941	$ 941	100.0%
Terminated Members			
Total Number Vested	6,222	6,222	100.0%
Total Number Non-Vested	16,768	16,768	100.0%

SERS 3

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	35,527	35,527	100.0%
Total Salaries (millions)	$ 1,365	$ 1,365	100.0%
Average Age	49.0	49.0	100.0%
Average Service	9.5	9.5	100.0%
Average Salary	$ 38,427	$ 38,427	100.0%
Retirees and Survivors			
Total Number	9,987	9,987	100.0%
Average Monthly Pension	$ 523	$ 523	100.0%
Terminated Members			
Total Number Vested	9,049	9,049	100.0%
Total Number Non-Vested	-	-	100.0%

PSERS 2

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	7,758	7,758	100.0%
Total Salaries (millions)	$ 529	$ 529	100.0%
Average Age	40.4	40.4	100.0%
Average Service	5.4	5.5	98.2%
Average Salary	$ 68,236	$ 68,236	100.0%
Retirees and Survivors			
Total Number	296	296	100.0%
Average Monthly Pension	$ 900	$ 900	100.0%
Terminated Members			
Total Number Vested	629	629	100.0%
Total Number Non-Vested	2,856	2,856	100.0%

LEOFF 1

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	20	20	100.0%
Total Salaries (millions)	$ 2	$ 2	100.0%
Average Age	67.8	67.8	100.0%
Average Service	43.3	43.3	100.0%
Average Salary	$ 106,597	$ 106,597	100.0%
Retirees and Survivors			
Total Number	6,891	6,891	100.0%
Average Monthly Pension	$ 4,507	$ 4,507	100.0%
Terminated Members			
Total Number Vested	1	1	100.0%
Total Number Non-Vested	27	27	100.0%

LEOFF 2

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	18,557	18,557	100.0%
Total Salaries (millions)	$ 2,117	$ 2,117	100.0%
Average Age	42.8	42.8	100.0%
Average Service	13.6	13.6	100.0%
Average Salary	$ 114,085	$ 114,085	100.0%
Retirees and Survivors			
Total Number	6,064	6,064	100.0%
Average Monthly Pension	$ 4,260	$ 4,260	100.0%
Terminated Members			
Total Number Vested	969	969	100.0%
Total Number Non-Vested	2,193	2,193	100.0%

WSPRS 1

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	397	397	100.0%
Total Salaries (millions)	$ 47	$ 47	100.0%
Average Age	49.2	49.2	100.0%
Average Service	22.3	22.3	100.0%
Average Salary	$ 119,395	$ 119,395	100.0%
Retirees and Survivors			
Total Number	1,181	1,181	100.0%
Average Monthly Pension	$ 4,611	$ 4,611	100.0%
Terminated Members			
Total Number Vested*	106	106	100.0%
Total Number Non-Vested	17	17	100.0%

** Includes 37 disability retired members currently receiving benefits from outside the pension funds*

WSPRS 2

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	646	646	100.0%
Total Salaries (millions)	$ 62	$ 62	100.0%
Average Age	33.8	33.8	100.0%
Average Service	7.8	7.8	100.0%
Average Salary	$ 95,495	$ 95,495	100.0%
Retirees and Survivors			
Total Number	-	-	100.0%
Average Monthly Pension	$ -	$ -	100.0%
Terminated Members			
Total Number Vested	37	37	100.0%
Total Number Non-Vested	64	64	100.0%

Members Receiving TAP Annuities

		OSA		Milliman	Ratio OSA/Milliman
PERS 3					
Total Number		722		722	100.0%
Average Age		66.2		66.2	100.0%
Average Monthly Benefit	$	1,298	$	1,292	100.5%
TRS 3					
Total Number		1,668		1,668	100.0%
Average Age		66.8		66.8	100.0%
Average Monthly Benefit	$	1,402	$	1,413	99.2%
SERS 3					
Total Number		921		921	100.0%
Average Age		68.0		67.9	100.1%
Average Monthly Benefit	$	720	$	714	100.8%

3. Actuarial Value of Assets

Audit Conclusion and Comments

We have reviewed the calculations for the actuarial value of assets used for each plan in the June 30, 2019 valuation. We found the calculations to be reasonable and the methodology to be appropriate and in compliance with Actuarial Standards of Practice.

The method used to determine the actuarial value of assets smooths investment gains and losses by reflecting a portion of the difference between the actual market value of assets and the expected market value for every fiscal year. For each year and each plan, a base for smoothed recognition over time is established equal to that difference.

The larger the deviation from expectation, the longer the recognition period for that base, with a level dollar amount recognized for each year of that period. For the largest deviations (more than 7% above or below the assumption), the gains or losses are recognized over eight years, whereas when the actual return is within 1% of the assumption, the gain or loss is recognized immediately. Additionally, a "corridor" is applied to make sure that the smoothed actuarial value of assets stays within 30% of the market value of assets.

Although it is unusual to recognize investment gains and losses over different periods, we believe it is a reasonable approach since the maximum smoothing period is reasonable and the method allows the actuarial value of assets to converge to market more rapidly if gains and losses are small.

We independently calculated the actuarial value of assets for each plan based on financial information provided by DRS and the Washington State Investment Board (WSIB). DRS and WSIB both provide market values of assets by plan. Note that there are small differences between the values provided by DRS and WSIB. Per prior conversations with OSA, the DRS values are used for the market value of assets. The WSIB data is only used to determine the monthly cash flows (contributions minus benefit payments) needed to calculate the expected value of assets.

There is a change in the approach for assets and liabilities for Plan 3 members who have purchased Total Allocation Portfolio (TAP) annuities. This is a program that enables Plan 3 members to purchase annuities from their investment account balances. The assets in the TAP annuity accounts were added to the actuarial value of assets for PERS 2/3, TRS 2/3, and SERS 2/3.

Another change from previous valuations is to reflect the transfer from the LEOFF 2 system to the LEOFF 2 benefit improvements account. In accordance with RCW 41.26.802, on July 1, 2019, $300 million was transferred to the LEOFF benefits improvement account. Although the transfer was made the day after the valuation date, we agree that it was appropriate to exclude this amount from the actuarial value of assets for LEOFF 2.

We used the information from DRS, WSIB, along with the outstanding gain/loss bases as published in the 2019 Actuarial Valuation Report. With this information and the asset methodology, our independent calculations were within less than 0.02% of the OSA's calculation for every plan.

See the following exhibit for a comparison.

Exhibit 3-1
Comparison of Actuarial Value of Assets by Plan

AVA (millions)	OSA	Milliman	Ratio OSA/Milliman
PERS			
Plan 1	$ 7,461	$ 7,460	100.0%
Plan 2/3 (DB)	$ 40,766	$ 40,763	100.0%
TRS			
Plan 1	$ 5,558	$ 5,557	100.0%
Plan 2/3 (DB)	$ 15,311	$ 15,310	100.0%
SERS			
Plan 2/3 (DB)	$ 5,872	$ 5,871	100.0%
PSERS			
Plan 2	$ 690	$ 690	100.0%
LEOFF			
Plan 1	$ 5,734	$ 5,733	100.0%
Plan 2	$ 13,294	$ 13,293	100.0%
WSPRS			
Plan 1 & 2	$ 1,301	$ 1,301	100.0%

As discussed above, OSA uses an asset smoothing method to reduce volatility. A five-year smoothing method is the most commonly used method among large public retirement systems. OSA uses a variable length of smoothing period, with eight years as the longest possible period. We believe the use of an asset smoothing method is appropriate, and we generally recommend this to our clients, particularly in systems where contribution rates change annually or biennially.

When a smoothing method is used, the actuarial value of assets will deviate from the market value of assets. Many public retirement systems apply a corridor so that the actuarial value of assets is not allowed to deviate from the market value by more than a certain percentage. The potential downside of using a corridor is that it can cause significant contribution rate volatility when the assets are outside the corridor. OSA applies a corridor of 30% (if applicable).

Typically, the longer the recognition period, the more important it is to have a corridor. We believe that the eight-year smoothing period, coupled with the application of the corridor, is in compliance with ASOP No. 44, the actuarial standard of practice for the selection and use of asset valuation methods for pension valuations.

4. Actuarial Liabilities

Audit Conclusion and Comments

We independently calculated the present value of future benefits and future salaries, and the Entry Age Normal Cost rates for the Washington State Public Retirement Systems. We found that all significant benefit provisions were accounted for in an accurate manner and the actuarial assumptions and methods are being applied correctly. Our total liabilities closely matched those calculated by OSA. This was true both in aggregate and by System.

Note that there will always be differences in the calculated liabilities when calculated by different actuaries; however, the results should not deviate significantly. The level of consistency we found in this audit provides a high level of assurance that the results of the valuation accurately reflect the liabilities of the Washington State Public Retirement Systems based on the plan provisions, assumptions, methods, and census and financial data.

We incorporated the following information into our valuation system:

- **Data** – We used the same valuation data used by OSA. As discussed in Section 2, we confirmed that this data was very consistent with the data provided by DRS.
- **Assumptions and Methods** – We used the assumptions and methods used by OSA for the June 30, 2019 actuarial valuation. This was supplemented by discussions between OSA and Milliman on the technical application of these methods.
- **Benefit Provisions** – We obtained this information from the Revised Code of Washington and various member handbooks.

We then performed an independent parallel valuation as of June 30, 2019. Based on this valuation, we completed a detailed comparison of the Present Value of Future Benefits (PVFB) computed in our independent valuation and the amounts calculated by OSA. Exhibit 4-1 shows a summary of this analysis broken down by benefit type. Exhibit 4-2 shows a summary of this analysis broken down by System. The results were reasonable, and our calculated PVFB values match closely with those calculated by OSA.

Exhibit 4-1
Present Value of Future Benefits by Benefit Type

(in $Millions)	All Systems in Aggregate OSA	Milliman	O / M Ratio
Present Value All Future Benefits			
Retirement	$58,625.6	$58,733.2	99.8%
Termination	8,089.2	8,151.5	99.2%
Death	744.4	737.7	100.9%
Disability	725.8	735.0	98.7%
Total Actives	**$68,185.0**	**$68,357.4**	**99.7%**
Terminated Vested	$5,642.7	$5,714.0	98.8%
Terminated Not Vested	459.3	459.2	100.0%
Total Inactive, not in Payment	**$6,102.0**	**$6,173.2**	**98.8%**
Retired	$45,733.2	$45,707.5	100.1%
Disabled	2,172.4	2,192.6	99.1%
Survivor	2,646.0	2,674.6	98.9%
LOP Liability	188.4	189.1	99.6%
Total Annuitants	**$50,740.0**	**$50,763.8**	**100.0%**
Total Members	**$125,027.0**	**$125,294.4**	**99.8%**

Exhibit 4-2
Present Value of Future Benefits by System

	OSA	Milliman	Ratio OSA/Milliman
Present Value All Future Benefits (in $Millions)			
PERS 1			
Active Members	$ 526.6	$ 523.4	100.6%
Inactive Members	10,918.6	10,912.5	100.1%
Total	$ 11,445.2	$ 11,436.0	100.1%
PERS 2/3			
Active Members	$ 32,648.4	$ 32,699.1	99.8%
Inactive Members	18,944.1	18,949.1	100.0%
Total	$ 51,592.4	$ 51,648.2	99.9%
TRS 1			
Active Members	$ 189.8	$ 189.9	99.9%
Inactive Members	8,093.0	8,087.6	100.1%
Total	$ 8,282.8	$ 8,277.5	100.1%
TRS 2/3			
Active Members	$ 16,771.6	$ 16,868.4	99.4%
Inactive Members	6,396.4	6,415.1	99.7%
Total	$ 23,168.1	$ 23,283.5	99.5%
SERS 2/3			
Active Members	$ 5,070.9	$ 5,077.5	99.9%
Inactive Members	3,025.1	3,028.6	99.9%
Total	$ 8,096.0	$ 8,106.1	99.9%
PSERS 2			
Active Members	$ 1,284.9	$ 1,286.0	99.9%
Inactive Members	106.4	107.6	98.8%
Total	$ 1,391.3	$ 1,393.7	99.8%
LEOFF 1			
Active Members	$ 25.2	$ 26.5	95.2%
Inactive Members	4,052.2	4,080.2	99.3%
Total	$ 4,077.4	$ 4,106.7	99.3%
LEOFF 2			
Active Members	$ 11,018.3	$ 11,035.8	99.8%
Inactive Members	5,077.1	5,120.4	99.2%
Total	$ 16,095.5	$ 16,156.2	99.6%
WSPRS			
Active Members	$ 649.3	$ 650.8	99.8%
Inactive Members	936.4	944.5	99.1%
Total	$ 1,585.8	$ 1,595.3	99.4%

We also looked at the Entry Age Normal Accrued Liability (EAN AL). EAN AL is used by OSA to measure the funded ratios and is described in Section 5 of this report. Exhibit 4.3 shows the audit had a good match of EAN AL. The EAN AL is consistent with the requirements of GASB No. 67 and GASB No. 68.

Exhibit 4-3
Comparison of Entry Age Normal Accrued Liability

	OSA	Milliman	Ratio OSA/Milliman
Entry Age Normal Accrued Liability (EAN AL) (in $Millions)			
PERS 1	$ 11,405.1	$ 11,397.0	100.1%
PERS 2/3	42,599.8	42,626.9	99.9%
TRS 1	8,272.6	8,267.7	100.1%
TRS 2/3	16,882.7	17,088.5	98.8%
SERS 2/3	6,474.3	6,488.9	99.8%
PSERS 2	684.7	688.4	99.5%
LEOFF 1	4,076.8	4,106.0	99.3%
LEOFF 2	11,991.6	12,041.2	99.6%
WSPRS	1,367.8	1,385.0	98.8%
Total EAN AL	**$103,755.5**	**$ 104,089.6**	**99.7%**

Lastly, we looked at both the present value of future salaries and the Entry Age Normal Cost (EANC) rates, which are used in the determination of the minimum contribution rates.

Exhibit 4-4
Present Value of Future Salaries and EANC Rate

(in $Millions)	All Systems in Aggregate OSA	Milliman	O / M Ratio
Present Value of Future Salaries	$222,346.0	$226,195.6	98.3%
Entry Age Normal Cost Rate	10.03%	9.90%	101.4%

Recommendations

As mentioned in the executive summary, a change was made to the preliminary results from the OSA. The numbers in the OSA column in this report reflect the revised calculations.

We also found a non-material difference in the application of the disability assumptions for people aged 50-54. We recommend that this is changed for the next valuation. This did not have a material impact on the results.

No other changes are recommended to the calculations of the liabilities and normal cost rate in the 2019 valuation.

5. Funding

Audit Conclusion and Comments

We reviewed the funding methods and their application. We find them reasonable and consistent with the Actuarial Standards of Practice and the objectives stated in RCW 41.45.010. Based on the Systems' funding methods and assumptions, we believe the employer contribution rates for each membership class are appropriately calculated.

When we used the liabilities, present value of future salaries, and actuarial assets calculated by OSA, we matched OSA's contribution rate calculations. When we used the liabilities, present value of future salaries, and actuarial assets calculated by Milliman, the results were close to OSA's calculated contribution rates, as shown below. It should be noted that there is a more noticeable difference between the OSA calculated employer contribution rate for WSPRS and Milliman's estimate. This difference is caused by the very leveraged nature of the calculation for WSPRS. There is leverage to the employer contribution rate for WSPRS based on the fact that the employee rate is limited by the member maximum rate. This results in an employer contribution in excess of the 50% share of the Present Value of Future Contributions. In addition, there is leverage because, due to the Plan's maturity, the Present Value of Future Salaries that provide the base for future contributions are a smaller percentage of the actuarial value of assets. Given this leveraging and that Milliman was within about 0.6% of OSA's calculation of the Present Value of All Future Benefits, we feel the difference in the two calculations of the WSPRS employer contribution rate is reasonable.

Employer Contribution Rates

	OSA	Milliman	Difference OSA - Milliman
Employer Contribution Rates (Percent of Member Pay)			
PERS 1/2/3	10.07%	10.08%	-0.01%
TRS 2/3	14.24%	14.35%	-0.11%
SERS 2/3	11.47%	11.57%	-0.10%
PSERS 2	10.21%	10.23%	-0.02%
WSPRS	18.57%	19.45%	-0.88%
LEOFF 1	0.00%	0.00%	0.00%
LEOFF 2*	4.61%	4.60%	0.01%

** Based on a LEOFF 2 contribution rate structure of 90% of Entry Age Normal Cost rate with a 50%/30%/20% share for the member, employer and the state, respectively.*

Member Contribution Rates

	OSA	Milliman	Difference OSA - Milliman
Member Contribution Rates (Percent of Member Pay)			
PERS 1	6.00%	6.00%	0.00%
PERS 2	6.36%	6.37%	-0.01%
TRS 1	6.00%	6.00%	0.00%
TRS 2	8.05%	8.16%	-0.11%
SERS 2	7.76%	7.86%	-0.10%
PSERS 2	6.50%	6.52%	-0.02%
WSPRS	8.61%	8.61%	0.00%
LEOFF 1	0.00%	0.00%	0.00%
LEOFF 2*	7.68%	7.67%	0.01%

** Based on a LEOFF 2 contribution rate structure of 90% of Entry Age Normal Cost rate with a 50%/30%/20% share for the member, employer and the state, respectively.*

The remainder of this section describes in detail why we believe the funding policies used to calculate contribution rates are reasonable and consistent with the objectives described in the RCW.

Policy Objectives

The contribution rate calculations for the Washington State Retirement Systems are complex. Much of this complexity is due to efforts to conform to articulated policy objectives. RCW 41.45.010 states that it is the intent of the legislature to provide a dependable and systematic process for funding the benefits provided to members and retirees of the State's retirement systems and sets out five specific goals:

1. To fully fund the Plans 2 and 3 as provided by law;
2. To fully amortize LEOFF Plan 1 costs not later than June 30, 2024;
3. To fully amortize the unfunded actuarial accrued liability for PERS and TRS Plans 1 within a rolling 10-year period, using methods and assumptions that balance needs for increased benefit security, decreased contribution rate volatility, and affordability of pension contribution rates;
4. To establish long-term employer contribution rates which will remain a relatively predictable proportion of the future state budgets; and
5. To fund, to the extent feasible, all benefits for Plans 2 and 3 members over the working lives of those members so that the cost of those benefits are paid by the taxpayers who receive the benefit of those members' service.

Although not specifically stated in RCW 41.45.010, the funding policies also achieve the following goals:

1. The same employer contribution rate is maintained for all members in the same class regardless of Plan. For example: employers make the same contribution for all TRS members regardless of whether the individual members are in Plans 1, 2, or 3. There is an exception to this rule for LEOFF Plans 1 and 2.
2. Funding risk is shared by both employers and members. In Plan 2, both employer and member contribution rates vary based on plan experience. In Plan 3, members take the risk associated with their contributions since they are deposited in the defined contribution plan.

Actuarial Cost Methods

The funding policies of the Washington State Retirement Systems are based on two actuarial cost methods: the Aggregate cost method and the Entry Age cost method. The Funded Ratios are measured based on the Entry Age cost method. The following text describes these methods.

Purpose of a Cost Method and Normal Cost

The purpose of any actuarial cost method is to allocate the cost of future benefits to specific time periods, typically during a member's projected working career. This is clearly stated in Pension Mathematics for Actuaries, A.W. Anderson, second edition, 1990, p. 5.

> *"The painful lesson which has been learned over and over again in the last century by various types of employers – first private employers, and later public employers – is that the cost of a pension plan must be recognized during the working lifetimes of the employees who are ultimately going to receive pensions, preferably by actually funding amounts sufficient to provide completely for each employee's life annuity at the time of retirement." The text goes on to state on p. 6: "This is where actuaries come into the picture, … The actuary can … assign to each fiscal year a portion of the present value of future benefit payments in such a way as generally to accrue costs over the working lifetimes of employees. Any scheme for making such an assignment of costs is called an actuarial cost method – which we shall henceforth refer to simply as a "cost method."*

The cost assigned to a specific year is called the Normal Cost.

Aggregate Cost Method

Under the Aggregate cost method, the Normal Cost rate is equal to the level percentage of pay necessary to fund the difference between the present value of all future benefits for current members (PVFB) and the actuarial value of assets (AVA). The difference between PVFB and AVA is funded by future contributions. Each year, the Normal Cost spreads all required future contributions evenly over the present value of future salaries for current members. When actual experience is better or worse than expected experience, the Normal Cost in subsequent years will go down or up, respectively. The contribution calculated by the Aggregate cost method is therefore equal to the Aggregate Normal Cost.

Note that while appropriate for funding, this method does not result in a calculation of the liability independent of assets and therefore does not provide a meaningful "Funded Ratio." OSA currently addresses this by use of the Entry Age actuarial cost method. That method is used to calculate the Funded Ratio and is used for GASB accounting and financial reporting.

Plans 2 and 3 employer and member contribution rates are primarily set using the Aggregate cost method.

Entry Age Actuarial Cost Method

The Entry Age cost method is the most common method used by public plans. The goal of the Entry Age method is the theoretical allocation of projected benefit costs as a level percent of pay over the members' entire working lifetimes. The Entry Age Normal Cost (EANC) is the theoretical level percent of pay which, if contributed from the members' dates of hire to their dates of projected retirement, would exactly fund their benefits if all experience exactly matched the actuarial assumptions. Actual experience better or worse than expected will not change the EANC. The EANC as a percentage of pay is not anticipated to increase or decrease from year to year. Experience better or worse than expected creates a positive or negative Unfunded Actuarial Accrued Liability (UAAL), which is funded separately from the EANC.

Therefore, systems using the Entry Age cost method have two components to their calculated costs: (1) the EANC, which is meant to be a level % of pay, and (2) the UAAL amortization contribution, which is the balancing item that makes sure all future benefits are financed if future experience follows the assumptions, and contributions are made according to schedule.

For the purposes of the Washington State plans, the Entry Age method is only used to set minimum contribution rates based on the EANC. This is a logical use of EANC and should increase contribution stability since it represents the theoretical level percentage of pay contribution required to fund benefits if future experience follows the actuarial assumptions. Specifically, RCW sets minimum contribution rates as follows:

- PERS, TRS, SERS and PSERS Plans 2 and 3 employers and Plan 2 members have a minimum contribution rate based on sharing 80% of EANC. [RCW 41.45.155 and RCW 41.45.158]
- WSPRS employers and members have a minimum contribution rate based on sharing 70% of EANC [RCW 41.45.0631].
- The LEOFF Plan 2 Board has established a policy that considers contribution rates equal to both 90% and 100% of the EANC. The 90% rate is used when the funded ratio is over 105% based on the Entry Age actuarial cost method, which is the case as of July 1, 2019.

Plans 2 and 3 Funding Policy

In general, the Plans 2 and 3 funding policies for PERS, TRS, SERS, PSERS, and WSPRS are based on the Aggregate Cost method and work as described below. Note that where the following text makes references to "Plans 2 and 3" the references should be substituted with "Plans 1 and 2" for WSPRS. Also, please note that PSERS has no Plan 3. RCW 41.45 describes the actuarial funding of state retirement systems. The primary

references for Plans 1, 2, and 3 funding are [RCW 41.45.060 Basic State and Employer Contribution Rates], [RCW 41.45.061 Required Contribution Rates for Plan 2 Members] and [RCW 41.45.0631 Washington State Patrol Retirement System].

1. First, the remaining Plans 2 and 3 "past liability balances," which are financed entirely by employer contributions, are determined. For PERS, TRS and SERS, these are due to gain sharing, and for WSPRS these are due to distributions under RCW 43.43.270(2) for survivors of members who became disabled under RCW 43.43.040(2) prior to July 1, 2006.

   The remaining past liability balances are determined by taking the prior year's balance, adding interest, and subtracting employer contributions based on the corresponding supplemental employer percent of pay contribution rates. The SERS balance was depleted during the 2017-2019 biennium and the PERS and TRS balances are scheduled to be depleted during the 2019-2021 biennium. This means that the gain sharing balances do not result in supplemental employer contributions for the rates calculated with the July 1, 2019 actuarial valuation for SERS, PERS, or TRS. WSPRS continues with the rate of 1.32% for the survivors of members who became disabled prior to July 1, 2006.

2. The Plans 2 and 3 Present Value of Future Contributions shared by employers and members is calculated as:

	Present Value All Future Benefits
minus	Actuarial Value of Assets
minus	Past Liability Balance
	Present Value of Future Contributions

3. The Plans 2 and 3 Aggregate Normal Cost Rate is determined by spreading the present value of future contributions shared by employers and members over the present value of future Plans 2 and 3 member salaries. The calculation takes into account that Plan 3 members do not contribute to the defined benefit plans.

4. Plans 2 and 3 minimum employer and member contribution rates are applied based on the EANC. The minimum rate for PERS, TRS, SERS, and PSERS is 80% of EANC. The minimum rate for WSPRS is 70% of EANC. LEOFF 2 contributions have a minimum of 90% of EANC when the plan funded ratio is over 105%, which is the case as of July 1, 2019. Otherwise, the minimum contribution would be 100% of EANC.

5. Plans 2 maximum member contribution rates are applied to TRS [RCW 41.45.061] and both Plans 1 and 2 of WSPRS [RCW 41.45.0631]. For TRS, the 50% share of the Present Value of Future Contributions described in item 2 above is currently less than the maximum member contribution rate, so the maximum rate does not apply this year. For WSPRS, the maximum member contribution rate does apply, as it is less than the 50% share of the Present Value of Future Contributions. The employer rate is higher than 50% of the Present Value of Future Contributions. Note that this adds leverage to the employer contribution rate calculation. The OSA's calculation of the Present Value of All Future Benefits was 99.4% of Milliman's calculation, but the calculated employer contribution rate was 18.57% compared to Milliman's estimate of 19.45%.

6. The Plans 2 and 3 employer rates are increased by the supplemental contributions rates used to finance past liability balances. As described above, these are: WSPRS 1.32%.

7. WSPRS rates are also adjusted for benefit improvements effective in the year 2020. The WSPRS rates are also subject to rate smoothing, but the impact of smoothing is not reflected in the actuarial valuation calculations.

LEOFF 2 Funding Policy

The LEOFF 2 funding policy follows the same general pattern as the other Plans 2 and 3 with fewer details. total contribution is paid 50% by employees, 30% by employers, and 20% by the State [RCW 41.26.725].

The current LEOFF 2 funding policy might be interpreted as: paying the greater of 100% of EANC or the Aggregate Normal Cost, when the funded ratio is less than 105% based on the Entry Age actuarial cost method. If the funded ratio is greater than 105%, as is the case with the July 1, 2019 actuarial valuation, the rate is based on the greater of 90% of the EANC or the Aggregate Normal Cost. Currently, the rate is based on 90% of the EANC.

This funding approach works well to establish a stable contribution rate (EANC-based rate) while ensuring liabilities are financed over a responsible period (Aggregate Normal Cost).

Plans 1 Funding Policy (PERS, TRS, SERS and PSERS)

PERS and TRS Plans 1 have both been closed to new members since 1977. The PERS and TRS Plans 1 funding policies have been designed to produce equal total contribution rates for PERS and TRS employers regardless of whether their employees are in Plans 1, 2, or 3, and to share the responsibility of PERS Plan 1 benefits with SERS and PSERS employers. It works as follows:

1. All remaining PERS and TRS Plans 1 members have fixed contribution rates equal to 6.00% of pay.
2. The remaining balances for any liability from Plan 1 benefit improvements effective after June 30, 2009 are determined. These liabilities are financed based on rates that were calculated to amortize them over a fixed 10-year period using combined Plans 1, 2, and 3 salaries. The remaining balances are determined by taking the prior year's balance, adding interest, and subtracting employer contributions. PERS and TRS Plan 1 members had two separate cost-of-living (COLA) benefit increases effective July 1, 2018 and July 1, 2020. For PERS, SERS, and PSERS employers, there are contributions of 0.10% of payroll and 0.11% of payroll for the two COLA increases. For TRS employers, the amounts are 0.21% and 0.23%. The balances for benefit improvements prior to the July 1, 2018 COLAs have now been exhausted.
3. The Present Value of Future Normal Costs (PVFNC) is determined. The Plan 1 funding policy defines this to be the present value of future contributions made by Plan 1 employees plus the present value of future employer contributions made as a percent of Plan 1 member pay based on the Plans 2 and 3 employer contribution rates calculated above. This must be taken into account to keep the contribution rates equal for Plans 1, 2, and 3.
4. The Plan 1 UAAL is calculated as:

	Present Value All Future Benefits
minus	PVFNC
minus	Actuarial Value of Assets
minus	Balance Post 2009 Improvements
	Unfunded Actuarial Accrued Liability

5. The UAAL Rate is calculated as the percent of Plans 1, 2, and 3 member pay to amortize the Plan 1 UAAL over 10 years as a level percentage of projected payroll. This is based on a rolling 10-year period which means every year the UAAL is amortized over a new 10-year period. This helps to keep rates stable while amortizing a material portion of the remaining UAAL each year.
6. Minimum contribution rates of 3.50% of pay for PERS 1 UAAL and 5.75% of pay for TRS 1 UAAL are applied. When combined with the rolling 10-year period, these will help to get the UAAL for the Plans 1 completely financed over a reasonable period instead of indefinitely re-amortizing it over 10 years. Note that the payments for the post-2009 benefit increases are added to the minimum contribution rates.

Conference of Consulting Actuaries White Paper

In October 2014, the Conference of Consulting Actuaries (CCA) issued a white paper titled Actuarial Funding Policies and Practices for Public Pension Plans. The white paper was composed by a group of public plan actuaries from the major consulting firms that work with public plans and was the result of an extensive series of meetings which lasted for over two years. The white paper was not meant as a replacement for the actuarial standards of practice. The white paper focuses on a Level Cost Allocation Model (LCAM) and provides detailed analysis for classifying each of the three major components of LCAM funding policies: (a) cost methods, (b) asset methods and (c) amortization methods. The classification system uses the following terms:

Categories Under CCA Guidelines	
Model Practices	Those practices most consistent with the Level Cost Allocation Model (LCAM).
Acceptable Practices	Generally those which, while not consistent with the LCAM, are well established in practice and typically do not require additional analysis.
Acceptable Practices with Conditions	May be acceptable in some circumstances either to reflect different policy objectives or on the basis of additional analysis.
Non-Recommended Practices	Systems using these practices should acknowledge the policy concerns identified in the CCA Guidelines or acknowledge they reflect different policy objectives.
Unacceptable Practices	No description provided by CCA, but implication is that these should not be used.

We will make reference to the CCA white paper in our discussion below.

Evaluation of Funding Policy

As stated earlier, we believe the funding policies are consistent with Actuarial Standards of Practice and with the intended policy objectives. Additional specific comments follow below.

The Aggregate cost method is used as the foundation for the funding policies. The Aggregate cost method is classified as “Acceptable” by the CCA white paper, is well established in practice, and is consistent with the objectives in that document.

The Aggregate cost method is specifically designed to fully fund all future benefits for current members (that are not financed by accumulated assets) over the remaining projected working lifetimes of those members. This represents excellent “demographic matching,” which is to say benefits are funded over the working lifetimes of the members receiving them. It is also excellent at avoiding “agency risk” issues, which means use of the Aggregate method makes it very difficult to push the cost of benefits for current members onto future generations.

The Aggregate method is also consistent with the policy objectives identified in RCW 41.45.010, which is particularly evidenced by how well the fifth policy objective is satisfied: to fund, to the extent feasible, all benefits for Plans 2 and 3 members over the working lives of those members so that the cost of those benefits are paid by the taxpayers who receive the benefit of those members' service.

The Aggregate method’s primary shortcoming is that it passes all gains and losses through to the Normal Cost, which pays for them over the comparatively short period of the active members’ projected remaining working lifetimes. The downside of this is that it can decrease the stability of short-term costs.

This shortcoming is addressed in the funding policy by smoothing asset gains and losses over as much as eight years, as well as by applying the minimum contribution rates. Eight-year asset smoothing is longer than five years, which is the most common length of asset smoothing. The comparatively longer asset smoothing period helps partially offset the comparatively shorter financing period for gains and losses under the Aggregate cost method. The minimum contribution rates equal to 70% or 80% of the EANC help avoid temporary large decreases in contributions due to good investment experience at the peak of a market cycle.

The Plans 1 policy of contributing at a level which finances the UAAL over a rolling 10-year period based on the pay of Plans 1, 2, and 3 is a rough equivalent of the Aggregate Cost Method. The 10-year rolling period bears a very general similarity to financing UAAL over the members' projected remaining working lifetimes. When the minimum contribution rates of 3.50% for PERS 1 and 5.75% for TRS are added, the policy also has an element that will help to get the UAAL for the Plans 1 completely financed over a reasonable period instead of indefinitely re-amortizing it over a rolling 10-year period. The funding policy is very consistent with the third policy objective listed in RCW 41.45.010, which is to fully amortize the UAAL for PERS and TRS Plans 1 within a rolling 10-year period, using methods and assumptions that balance needs for increased benefit security, decreased contribution rate volatility, and affordability of pension contribution rates.

Paying 90% or more of EANC for LEOFF Plan 2 avoids making contributions which are less than the expected long-term cost of benefits. Short-term rate stability is increased since rates will not fluctuate every year due to gains and losses, particularly investment gains and losses, being reflected in the Aggregate Normal Cost. Some margin is provided for adverse experience since the rates are higher than the Aggregate Normal Cost.

6. Review of Risk Disclosures

This section focuses on (a) compliance with Actuarial Standard of Practice No. 51, and (b) Risk Disclosure suggestions which may improve the usefulness of OSA's communications for all stakeholders.

Actuarial Standard of Practice No. 51 (ASOP 51)

Actuaries are required to follow the applicable Actuarial Standards of Practice (ASOPs) for certain work, such as actuarial valuations. ASOP 51 provides actuaries with guidance for assessing and disclosing the risk associated with measuring pension liabilities and the determination of pension plan contributions. ASOP 51 is a relatively new ASOP that was adopted by the Actuarial Standards Board in September of 2017 and was effective for work products with measurement dates on or after November 1, 2018. The July 1, 2019 actuarial valuation was the first valuation after the effective date.

Specifically, ASOP 51 directs the actuary to:

- Identify risks that may be significant to the plan.
- Assess the risks identified as significant to the plan. The assessment does not need to include numerical calculations.
- Disclose plan maturity measures and historical information that are significant to understanding the plan's risks.

ASOP 51 states that if in the actuary's professional judgment, a more detailed assessment would be significantly beneficial in helping the individuals responsible for the plan to understand the risks identified by the actuary, then the actuary should recommend that such an assessment be performed.

OSA provides a short discussion of risk in the actuarial report, along with links to where more detailed information on risk can be found on the web. In our opinion, OSA's work product is consistent with ASOP 51.

Importance of Risk and Maturity Disclosures

The future is not certain and informed decisions should reflect the risks associated with this uncertainty. Risk disclosures are important to help the Legislature and the LEOFF 2 Board make informed decisions about the future funding of the Retirement Systems which reflect the risks of insufficient future funding and future contribution increases. This information can also be valuable when communicating to other stakeholders who may not be aware of these risks when they inquire about contribution decreases or benefit increases. Maturity disclosures are important because as a plan matures it accumulates larger pools of investments and therefore the investment gains and losses on those larger pools of assets have a larger impact on contribution changes whether the impact is measured as a percent of the General Fund or a percent of member payroll. The importance of considering risk and the potential impact of maturity is highlighted by the fact that, in the economic cycle investment losses are often followed by decreases in government revenue, which in turn increases the difficulty of financing losses.

Ease of Access / Road Map

A road map of the available risk disclosure information would improve ease of access. OSA produces a large amount of valuable information concerning risk disclosures and maturity measures. This information is provided on the web. However, the very fact that a large amount of information is provided, combined with the need to follow links and assess each piece of information to determine what is available, may make it difficult for some users to sort through all of the information to form an overall picture of the risks to the Systems. It can be difficult to know where to start.

The actuarial valuation report has a Commentary on Risk section in the Summary of Key Results which primarily provides links to the web resources. Demonstrations of the impact of changes in rates of future mortality improvement and the investment return assumption are also provided in the actuarial exhibits section and referred to in the Actuarial Valuation's Commentary on Risk. Through discussions with OSA we understand OSA is making a concerted effort to provide the risk disclosure information on the web which is in part a strategic resources decision. With this as context, we provide the suggestions below which are labeled as "Provide a Roadmap" and "Highlight Key Metrics" to make this valuable information provided by OSA more accessible to the users of the actuarial valuation.

In our review, it is possible we have overlooked some of the information available. A road map would help with this.

Commentary on Risk Webpage

The Commentary on Risk Webpage which is directly referenced and linked in the actuarial valuation appears to be the primary tool for organizing the risk disclosure information on the various web pages. The information available through this organization satisfies the requirements of ASOP 51. It is divided into 5 easy to expand/collapse sections on: (1) Ways to Measure Risk, (2) Risk Measurements for Washington's Public Pension Plans, (3) Demographic Risks, (4) Historical Information, and (5) Plan Maturity Measures.

Based on conversations with OSA and notes on the web, updates to the Commentary on Risk Webpage are anticipated to be available by the end of July including more plan-specific information and other changes. This allows for more regular updates than under the biennial valuation cycle. Our comments here are based on the organization provided by the Commentary on Risk Webpage available at the time we are writing this report.

Summary of Suggestions

The following is a summary of our suggestions for the Risk Disclosures associated with the actuarial valuation. Note these are just suggestions that we feel would help the end user more easily follow the analysis. As previously discussed, we believe the risk discussion satisfies ASOP 51, so all of these changes are optional.

- **Provide a Roadmap.** A brief summary of risk disclosure information provided by OSA in the actuarial valuation, or a summary at the top of the Commentary on Risk Webpage would save users the time of searching the web to find what is provided by OSA. For example, this could be thought of as a table of contents where each risk measure and maturity disclosure is listed with a link.

  In fact, many of these same objectives could be achieved by producing a single electronic pdf report on the web, with a table of contents, tabs, and a robust executive summary at the beginning that included the "key metrics" discussed below. Different pieces of content in the electronic risk report could be updated as often as the information that is currently on the web and the report could include links. The report would provide a collection place for all risk and maturity measures including those currently on the Commentary on Risk Webpage, the Interactive Reports Webpage, the Risk Assessment Webpage and any others. Users who wished could read it as a report to get a comprehensive picture, instead of following links in different directions around the web. Providing a single report dedicated to risk disclosures and analysis is not uncommon for large retirement systems.
- **Highlight key metrics.** Putting some of the most useful risk disclosure information in the valuation report would make it more likely users focus appropriate attention on risk and also provide some idea where to start sifting through the large amount of valuable information provided by OSA. It is very easy to overlook links in a report, particularly for busy people. Our suggestions for risk metrics to include in the valuation report are:
  1. the table of Select Measures of Pension Risk, in the Risk Assessment and

2. the graph currently labeled as Percentage of GF-S (General Fund-State) Allocated to Pensions in the Risk Assessment Graphs showing the probability of different levels of contributions over the next 50 years.

Our preliminary suggestions for Plan Maturity Measures include:

1. the Ratio of Market Assets to Participant Payroll (sometimes call the Asset Volatility Ratio) currently in the Plan Maturity Measures section of the Commentary on Risk Webpage,
2. the Ratio of Retired to Active members either on a liability or a head count basis, and
3. cash flow metrics which are currently listed as Select Liquidity Measures in the Plan Maturity Measures section of the Commentary on Risk Webpage.

OSA currently provides most or perhaps all of this information on the web. However, the user may need to click through as many as four links and screen expansions to get there starting with the link to the Commentary on Risk Webpage in the actuarial valuation. There are many opportunities to go down different paths along the way.

- **Provide Separate LEOFF 2 Information.** The LEOFF 2 Board administers a separate System. Risk disclosure information that combines all Plans is not as useful for them as information provided separately for their Plan. As an example, the Percentage of GF-S Allocated to Pensions graph would be more useful to the LEOFF 2 Board if LEOFF 2 was provided separately.
- **Provide LEOFF 2 information as a % of pay instead of as a % of GF-S.** Some information such as the graph showing the probability of different contribution levels over the next 50 years presents contributions as a percent of GF-S. We compliment OSA for using this metric since it likely addresses the Legislature's most direct need and we do not often see the metric of contributions as a % of the General Fund used. However, the LEOFF 2 Board's goal is to maintain contribution rates at a percent of pay that is as stable as practical. Therefore showing this information as a percent of pay will be more useful for the LEOFF 2 Board.
- **Provide** LEOFF **2 probability of funded statuses.** The LEOFF 2 Board found the information provided by OSA on slide 12 of the October 2019 OSA Board Presentation and slide 6 of the November 2019 Funding Work Session materials to be extremely useful in making funding policy decisions. Specifically, the chart showing the probability of having different levels of future funded status for the current funding policy is a metric that would be useful for them to review every year. This could perhaps be added to the table of Select Measures of Pension Risk referred to as a key metric above or could be provided in combination with that table.
- **Adjust the age service distributions so the number of retirement eligible members can be** determined**.** This request came from discussion with the LEOFF 2 Board Staff. Knowing how many members are eligible for retirement can be useful for planning purposes.
- **Provide graphs by plan for historical data by plan.** Tables with much useful historical data are available on the Historical Data Webpage. Information provided such as the ratio of actives to annuitants can help track maturity. However, it can be hard to visualize the trends using numbers. Also columns in the tables often alternate between Plan 1 and Plan 2/3 making it harder to follow the trend for a specific plan. Providing graphs for some of the more important information by plan would enhance the ability to follow trends.

Lastly, since most of these suggestions are intended to help the PFC, the LEOFF 2 Board, and their respective staffs in their use of risk disclosures, we encourage direct communication between the OSA, PFC, and LEOFF 2 Board concerning their opinions on our suggestions.

7. Preliminary Report and Recommendations from Prior Audit

Audit Conclusion and Comments Regarding OSA's Reports

Because the final 2019 Actuarial Valuation report has not been completed at this time, we base the comments in this section on the preliminary report. We have one comment for consideration for the upcoming reports that may enhance an outside reader's understanding. On page 18 of the preliminary report, the OSA could specify that the funded ratio for LEOFF 2 is currently above 105% and that therefore the minimum contribution rate is based on 90% of the Entry Age normal cost rate based on Board policy. Alternatively, there could be a footnote of this in the chart on page 20. The funded ratios do appear on page 31. This comment is related to additional disclosure and has no impact on the contribution rates.

Recommendations Addressed from Prior Audits

Between the experience study and the preliminary actuarial valuation report, the OSA has incorporated all of Milliman's prior recommendations.