



# Office of the State Actuary

*"Securing tomorrow's pensions today."*

September 11, 2009<sup>1</sup>

**To: Pension Funding Council Members**  
Senator Margarita Prentice, Chair,  
Senate Ways and Means Committee  
Senator Joseph Zarelli, Ranking Minority Member,  
Senate Ways and Means Committee  
Representative Kelli Linville, Chair,  
House Ways and Means Committee  
Representative Gary Alexander, Ranking Minority Member,  
House Ways and Means Committee  
Steve Hill, Director,  
Department of Retirement Systems and Administrator of State Health  
Care Authority  
Victor Moore, Director,  
Office of Financial Management

Dear Pension Funding Council Members:

In accordance with RCW 41.45.030, the Office of the State Actuary prepared reports on the financial condition and long-term economic assumptions of the state retirement systems. The report on long-term economic assumptions includes my recommended assumptions. I attached both reports to this letter.

I provide this information to assist you in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035.

## **Executive Summary**

On August 31, 2007, I reported a slow decline in the funded status of the state's retirement systems due to delayed and suspended contributions, increased benefits, and investment losses from 2001-2002. Since then, all plans of the retirement systems suffered a further decline in health in the wake of recent investment losses. These losses added pressure to already rising contribution rates. We project contribution rates will increase well above the highest levels ever collected, and we estimate a significant risk they could remain above these levels for over 15 years.

On August 31, 2007, I recommended a change in the current long-term economic assumptions, but concluded the assumptions at that time, while not my best estimate, were reasonable. After completing this economic experience study, I conclude the current assumptions remain reasonable, but not representative of my best estimate. In



my opinion, changing the assumptions today would strengthen the long-term health of the plans, but if done in isolation of other risk management exercises would make shorter-term health risks worse.

Because of the extraordinary economic events of the past year, addressing the financial condition and the long-term economic assumptions of the retirement systems will require extraordinary efforts. These efforts include coordinated planning and further study. I recommend a shift in focus to identifying, measuring, and managing retirement system risks. Without a plan to manage these risks, the retirement systems as we know them may not be sustainable.

## **Summary of Financial Condition**

### ***Thirty to Forty Percent Drop in Funded Status Expected***

A lot has changed since our report two years ago. Nearly all public pension plans experienced large investment losses, including Washington's. Investment returns for Washington's commingled retirement trust fund (CTF) for the fiscal years ending June 30, 2008, and June 30, 2009, were -1.2 percent and -22.8 percent, respectively. The assumed annual rate of investment return, set in state law, is 8.0 percent. In terms of actuarial funding, this means the plans must recover from a 30-40 percent drop in funded status. We expect this recovery to occur over the next ten to twenty years.

### ***Contribution Requirements Expected to Triple in the Next Six Years***

To make this recovery the plans will require significant increases in future contributions. We project contributions from all employers and the state general fund (GF-S) to triple in the next six years. The table below shows projected employer contributions for the next twelve fiscal years.

<b>Projected Employer Contributions</b>		
<i>(Dollars in Millions)</i>	<b>GF-S</b>	<b>Total Employer</b>
2009-11	\$661.0	\$1,739.6
2011-13	1,357.4	3,429.1
2013-15	1,887.9	4,765.7
2015-17	2,321.2	5,866.1
2017-19	2,730.8	6,922.6
2019-21	\$3,008.3	\$7,582.6

*Note: Excludes LEOFF 2.*



### **Future Investment Returns Unlikely to Prevent Significant Increase in Contributions**

The previous table shows projected, or what we call “expected,” contributions based on current assumptions. Employer contributions through the 2011-13 Biennium depend on the rate of return through June 30, 2009, and don’t change when we vary future investment returns. Employer contributions in 2013-2015 and beyond will depend heavily on actual investment returns during 2009-2011 and beyond. The next table shows how our projections change under different investment scenarios.

<b>Projected Employer Contributions Under Different Investment Scenarios</b>						
<i>(Dollars in Millions)</i>	<b>Pessimistic</b>	<b>Expected</b>	<b>Optimistic</b>	<b>Pessimistic</b>	<b>Expected</b>	<b>Optimistic</b>
	<b>GF-S</b>			<b>Total Employer</b>		
2009-11	\$661.0	\$661.0	\$661.0	\$1,739.6	\$1,739.6	\$1,739.6
2011-13	1,357.4	1,357.4	1,357.4	3,429.1	3,429.1	3,429.1
2013-15	2,040.8	1,887.9	1,761.0	5,187.8	4,765.7	4,447.8
2015-17	2,688.1	2,321.2	2,106.3	6,794.1	5,866.1	5,332.0
2017-19	3,483.8	2,730.8	2,371.5	8,425.2	6,922.6	6,009.2
2019-21	\$4,144.5	\$3,008.3	\$2,492.3	\$9,641.0	\$7,582.6	\$6,287.3

Note: Excludes LEOFF 2.

Even under an optimistic investment return scenario, biennial employer contributions still nearly triple over the next two biennia. Under a pessimistic scenario, biennial contributions could increase over five and a half times in the next 12 years. More likely than not, future contributions will fall between the pessimistic and optimistic scenarios. Please see the attached Report on Financial Condition for more details about the different rate of return scenarios.

### **PERS 1 and TRS 1 At-Risk of Running Out of Assets Prematurely; Plans 2/3 Remain Healthy**

As a result of delayed and suspended contributions, increased benefits, and the large investment losses of the last two fiscal years, previously healthy plans remain healthy, but are now at risk of becoming unhealthy. Previously unhealthy plans are now at risk of running out of assets before all benefits get paid.

The table below summarizes today’s health assessment for each major state retirement plan using “The Minimum Projected Funded Status.” This measure represents the lowest funded status we observe when we project the current valuation results into the future using current assumptions. This table shows only the expected results.



<b>Today's Health Assessment</b>			
<b>Plan</b>	<b>Funded Status*</b>	<b>Min. Projected Funded Status**</b>	<b>Health</b>
PERS 1	71.7%	47.0%	At-Risk
PERS 2/3	119.2%	88.0%	Healthy
TRS 1	77.3%	50.8%	At-Risk
TRS 2/3	125.8%	88.1%	Healthy
SERS 2/3	121.0%	88.1%	Healthy
PSERS 2	131.1%	103.9%	Healthy
LEOFF 1	128.6%	93.6%	Healthy***
WSPRS 1/2	121.4%	83.7%	Borderline Unhealthy

\* Based on preliminary 2008 Actuarial Valuation Report.

\*\* Based on current assumptions.

\*\*\*Assumes reinstatement of prior funding policy and resumption of contributions.

### ***Today's Health Assessment Assumes Employers Make All Future Contributions***

Alone, the table above does not tell the whole story. In making this health assessment, we assumed employers make all required contributions, regardless of their magnitude. We expect contribution rates in most plans will increase well above the maximum levels ever collected. This may call into question whether employers can afford such increases.

### ***Employer Contribution Rates Projected to Increase Above Highest Levels Ever Collected***

In all systems except LEOFF 1, we estimate contribution rates will increase above the maximum levels ever collected. The following table shows the number of years we expect total employer contribution rates to remain above their historical maximums.



<b>Years Total Employer Contribution Rates Exceed Historical Maximum</b>			
<b>System</b>	<b>First Year Above*</b>	<b>Total Years Above</b>	<b>Historical Maximum</b>
PERS	2013	16	8.65%
TRS	2014	15	13.06%
SERS	2012	18	7.38%
PSERS	2012	17	9.27%
LEOFF 1	NA	NA	101.2%
WSPRS	2018	8	24.12%

*\*Fiscal Year Ending.*

Please see the attached Report on Financial Condition for more details on projected employer contribution rates.

### ***Plan Health Weakens Further if Employers Can't Make Contributions***

The health of each plan weakens further if employers don't make the expected contributions. For example, healthy plans like the Plans 2/3, will likely become unhealthy. "At-risk" plans like PERS 1 and TRS 1 will likely run out of money with large contractual benefit payments remaining.

### ***Significant Chance Contribution Rates Could Increase Even More***

We estimate a 50 percent chance maximum contribution rates will fall between the pessimistic and optimistic investment scenarios identified in the next table. For example, in PERS there's a 25 percent chance total employer contribution rates could decrease below the 11.92 percent. However, there's also a 25 percent chance PERS employer contribution rates increase above 16.06 percent.



<b>Maximum Total Employer Contribution Rates</b>				
<b>System</b>	<b>Pessimistic / Year*</b>	<b>Expected / Year*</b>	<b>Optimistic/ Year*</b>	<b>Historical Maximum</b>
PERS	16.06% / 2020	13.72% / 2020	11.92% / 2018	8.65%
TRS	21.75% / 2020	17.93% / 2018	15.51% / 2018	13.06%
SERS	17.01% / 2020	14.29% / 2020	12.15% / 2016	7.38%
PSERS	13.99 / 2030	11.99% / 2018	11.65% / 2016	9.27%
LEOFF 1**	18.60% / 2024	1.72% / 2022	0.00% / Always	16.44%
WSPRS	41.88% / 2022	28.91% / 2020	13.13% / 2018	24.12%

\*Fiscal Year Ending.

\*\*Assumes reinstatement of prior funding policy. LEOFF 1 UAAL only.

Note: The year shown represents the peak in projected total employer contribution rates. The rate shown equals the rate collected in the year the rates peak.

### ***Some Funding Policies Designed to Improve Health of Plans***

The Legislature made some changes in the plans' funding policy during the last decade designed to stabilize or improve the health of the plans. In 2003, the Legislature adopted a change to the asset valuation, or smoothing method, to reduce the impact of short-term market swings on contribution rates. In 2006, the Legislature first adopted minimum contribution rates for many of the plans to help maintain an adequate and stable level of funding over the long-term. The minimum contribution rates were scheduled to go into effect in 2009, but the Legislature suspended them in all plans except LEOFF 2 and WSPRS rates until 2011.

The council adopted mortality assumptions recognizing projected improvements in future life spans in 2008, but the rates the Legislature adopted for 2009-2011 did not reflect these assumptions. Recognizing these future improvements in life expectancy before they appear in the plans' experience provides an opportunity to prefund those liabilities instead of realizing repeated losses.

Finally, the Legislature changed the PERS and TRS Plan 1 funding method in 2009 to address some of the health challenges faced by those plans. However, these funding policies alone will not fully address the plans' current financial condition.

### ***Opportunity to Address Financial Condition Using Risk Analysis and Planning***

Given the results of this health assessment, I recommend the Legislature, or its designee, develop a plan to manage the future health of the retirement systems. I suggest the following process:

- ❖ Clearly identify the health risks to the retirement systems.



- ❖ Establish a process for measuring these risks.
- ❖ Analyze the risks using risk measures.
- ❖ Develop recommendations to the Legislature for managing the risks.

I suggest completing this work before the 2011 Legislative Session. Please see the enclosed Primer on Risk Analysis and Risk Measures for additional details on this recommendation.

Since many of the risks facing the retirement systems involve future contribution rates, the Pension Funding Council (PFC) might consider doing this analysis as part of your work in recommending future contribution rates. This work could also fit within the statutory duty of the Select Committee on Pension Policy (SCPP) to study the financial condition of the state retirement systems, develop funding policies, and make recommendations to the Legislature. The Office of the State Actuary (OSA) has special expertise in measuring and analyzing retirement system risk and we're available to assist policy makers.

I made the same recommendation to the SCPP.

Please see the attached Report on Financial Condition for more details on this health assessment.

### **Summary of Long-Term Economic Assumptions**

According to RCW 41.45.030(2), by October 31, 2007, and every two years thereafter, the PFC may adopt changes to the long-term economic assumptions. Any changes adopted by the PFC are subject to revision by the Legislature.

Guided by applicable actuarial standards of practice, we performed an economic experience study to develop a best-estimate range for each long-term economic assumption. The recommended assumptions represent my best estimate from within each range. We developed them as a consistent set of economic assumptions and I advise you to review them as a set of assumptions.

### ***Several Changes in Long-Term Economic Assumptions Recommended***

The table below summarizes the current and recommended long-term economic assumptions.

<b>Assumption</b>	<b>Current</b>	<b>Recommended*</b>
Inflation	3.50%	3.25%
General salary growth	4.00%	4.00%
Annual investment return	8.00%	7.50%
Growth in system membership	0.90% (TRS), 1.25% (Others)	0.90% (TRS), 1.15% (Others)

\*Excludes LEOFF 2.



I consider all current economic assumptions reasonable, but not representative of my best estimate. I recommend decreasing the current inflation assumption from 3.50 percent to 3.25 percent. I also recommend decreasing the annual investment return assumption from 8.00 percent to 7.50 percent. Last year, you lowered the general salary growth assumption from 4.50 percent to 4.25 percent. The Legislature revised your action to lower the general salary growth assumption by another 0.25 percent to 4.00 percent. I do not recommend decreasing this assumption further at this time.

***Assumption Changes Help in Long Run, Worsen Short-Term Health***

Changing the assumptions today strengthens the long-term health of the plans by improving the plans' funded status, lowering future contribution rates, and reducing the impact of rate of return volatility. But if done in isolation of other risk management exercises, adopting the recommended assumptions makes shorter-term health risks worse.

Please see the enclosed Report on Long-Term Economic Assumptions for details and supporting data.

\*\*\*

Because of the extraordinary economic events of the past year, addressing the financial condition of the retirement systems and the long-term economic assumptions of those systems will require extraordinary efforts. These efforts include coordinated planning and further study. I recommend a shift in focus to identifying, measuring, and managing retirement system risks. Without a plan to manage these risks, the retirement systems as we know them may not be sustainable.

I look forward to working with you. I offer the expertise of my office to assist in your efforts to address the needs of the pension systems. I hope you find this information useful during your deliberations.

Sincerely,

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

**Enclosures:**

Primer on Risk Analysis and Risk Measures

**Attachments**

Report on Financial Condition

Report on Long-Term Economic Assumptions

<sup>1</sup>We have revised the letter transmitted on August 31, 2009. Please see the attached errata for information on the changes we made.



## **Primer on Risk Analysis and Risk Measures**

We intend the following primer to supplement and be used with the 2009 Report on Financial Condition. It provides a high-level overview of how general actuarial practice evolved over time in response to public pension plan sponsors increasing risk in their investment portfolios. The primer also describes how to apply the proposed risk analysis process from the letter above in Washington. For more information please see the Report on Financial Condition or contact the Office of the State Actuary.

### ***Actuarial Practice Continues to Evolve***

Actuarial practice evolved as investment policies changed. The first public pension funds relied heavily on fixed income securities. In general, returns on fixed income investments vary less than returns on equity investments. As a result, actuaries could more easily estimate future pension costs, and their models and assumptions required less sophistication.

### ***Traditional Actuarial Models: Using Best-Estimate Assumptions***

Traditional actuarial models projected a pension plan's future benefit payments and discounted those payments to the valuation date. Actuaries used the plan's expected rate of investment return to determine the "present value" or today's value of all future pension payments. The resulting contribution rate, and underlying obligation, represented a single number actuaries updated every year.

### ***Projected Valuation Results: Using Best-Estimate Assumptions***

As pension benefits became a larger percent of government payrolls, plan sponsors began to invest more aggressively to lower the expected financing costs. Over time the single "snap shot" valuations became less effective at showing how future costs could change. The volatility of future contribution requirements became a larger concern for plan sponsors. Actuaries responded by giving more information or "risk analysis" using their traditional models. By projecting valuation results into the future, actuaries showed how future contribution requirements could change.

### ***Projected Valuation Results: Using Scenario-Based Assumptions***

The next evolution in actuarial practice added risk analysis around the actuary's best-estimate assumptions. Projected valuation results were helpful, but traditional projections still relied on the results of the latest "snap shot" valuation and projected those results forward only using best-estimate assumptions. To improve the relevance of their work, actuaries responded by projecting valuations using different assumptions or scenarios (i.e., pessimistic, optimistic, and expected). These results provided plan sponsors with a better idea of how widely plan costs could vary. Understanding the risk and how much the results can vary, is especially important considering today's asset allocations that invest more



heavily in volatile investment vehicles with higher expected returns (i.e., stocks and private equity).

### ***Projected Valuation Results: Using Simulated Assumptions***

The latest developments in actuarial practice take scenario-based projections to the next level. Since the assumed level of future investment return is by far the most important variable in pension funding, many actuaries let their investment return assumption vary using probability distributions. The mid-point of the distribution may represent an actuary's best estimate of future investment return. By using the distribution and underlying variance from the average, an actuary can communicate the chance that future plan costs will reach certain levels.

### ***Proposed Risk Analysis and Risk Measures***

To identify solutions to manage the future health of Washington's public pension plans, the state actuary recommends performing risk analysis using the latest advancements in actuarial practices. We suggest the following process:

- ❖ Clearly identify the health risks to the retirement systems.
- ❖ Establish a process for measuring these risks.
- ❖ Analyze the risks using risk measures.
- ❖ Develop recommendations to the Legislature for managing the risks.

### ***Identifying Risks***

Identifying risks is the most important step in this process, requiring input from all stakeholders. You'll need to answer key questions. For example:

- ❖ What's failure for the pension systems?
- ❖ What level of cost is unaffordable for employers and Plan 2 members?
- ❖ What level of funding is unacceptable?
- ❖ What level of contribution volatility is unacceptable for government budgeting?

### ***Analyzing Risks with Risk Measures***

After you've identified the risks and unacceptable outcomes for the plans, the next step is to measure and analyze those risks. For example, you could determine the chances that:

- ❖ Plans 1 run out of money.
- ❖ Plans 2/3 drop below a certain funded status (i.e., 80 percent).



- ❖ Contribution rates increase above a certain level (i.e., historical maximum).
- ❖ Contributions increase by more than a certain percent from one biennium to the next (i.e. 20 percent).

### ***Identifying Ways to Manage Risks***

After you've identified, measured, and analyzed the risks, the final step is to identify options to manage those risks. For example, what's the retirement systems' tolerance for future benefit improvements? How would a new funding or investment policy impact these risk measures? How much short-term flexibility in funding policy can the systems withstand? How would the creation of new benefit structures impact these risk measures? What about a combination of several changes?

Following this process can help educate all stakeholders about the current risks in our state retirement systems. Working together to identify ways to manage these risks improves the health of the state's retirement systems and creates shared ownership.

*O:\PFC\2009\1.Transmittal\_Letter.docx*





## **Errata Sheet**

September 11, 2009

### **Transmittal Letter**

Page 7 Added a "\*" to the footnote of the table at the bottom of page.

### **Primer on Risk Analysis and Risk Measures**

Page 3 Removed the word "to" after risks in the last sentence.

### **Report on Financial Condition**

Page 2 Changed "In 2000," to "In 2001," in the first paragraph under Investment Losses.

Page 2 Changed "2000" to "2001" in the fourth paragraph under Investment Losses.

Page 16 Added the third "\*" to the last footnote of the table.

### **Report on Long-Term Economic Assumptions**

Page 1 Changed the second paragraph under Key Finding to read:

Based on the Washington State Investment Board's (WSIB) Capital Market Assumptions (CMAs, described in more detail in Appendix H), we feel the current assumed rate of investment earnings is too optimistic in the long-term, given the current target asset allocation. We feel that over time the retirement systems would experience more actuarial losses than gains. This will continually put pressure on contribution rates to increase. See the Report on Financial Condition for more information on the current financial condition of the plans.

Page 2 Changed the "2000" to "2001" in the last sentence of the fourth paragraph under The Cycle of the Interest Rate Assumption.



- Page 2      Last paragraph, second sentence inserted "For example," at the beginning of the sentence.
- Page 3      Changed "2000" to "2001" in the sub-heading.
- Page 3      Changed the "2000" to "2001" in the first sentence of the first paragraph under An Example of the Cycle in Action Since 2000.
- Page 3      Changed the "2000" to "2001" in the second sentence of the first paragraph under An Example of the Cycle in Action Since 2000.
- Page 3      Changed the third sentence of the first paragraph under An Example of the Cycle in Action Since 2000 to:  
  
Over that time, the standard deviation around the expected return resulting from the target asset allocation of the portfolio increased from 13.27 percent to 13.89 percent.
- Page 3      Removed the fourth sentence of the first paragraph under An Example of the Cycle in Action Since 2000.
- Page 3      Removed the "the:" from the end of the second paragraph under Risk Measures
- Page 7      Removed the tab between "0.0 and percent" in the third paragraph under Best-Estimate Range.
- Page 8      Removed the tab from the middle of the word "with" in the third paragraph under Analysis.

*O:\PFC\2009\9-11-2009\_revised\Errata\_Sheet.docx*



**Office of the State Actuary**

*"Securing tomorrow's pensions today."*

## **Report on Financial Condition**



Prepared for the Pension Funding Council

*September 11, 2009*





## Office of the State Actuary

*"Securing tomorrow's pensions today."*

### Report prepared by the Office of the State Actuary

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

Kelly Burkhart  
Troy Dempsey, ASA  
Aaron Gutierrez  
Michael Harbour  
Laura Harper  
Elizabeth Hyde  
Chris Jasperson, ASA, MAAA  
Dave Nelsen  
Darren Painter  
Christi Steele  
Keri Wallis  
Charlene Winner  
Lisa Won, ASA, MAAA

### Contact Information

#### Mailing Address:

Office of the State Actuary  
PO Box 40914  
Olympia, Washington 98504-0914

#### Phone:

Phone: 360.786.6140  
TDD: 800.635.9993  
Fax: 360.586.8135

#### Physical Address:

2100 Evergreen Park Dr. SW  
Suite 150

#### Electronic Contact:

[actuary.state@leg.wa.gov](mailto:actuary.state@leg.wa.gov)  
<http://osa.leg.wa.gov>

### Additional Assistance Provided by

Washington State Investment Board





## Table of Contents

Letter of Introduction.....	i
Report on Financial Condition.....	1
Actuarial Certification.....	19
Appendix A.....	21





# Office of the State Actuary

*"Securing tomorrow's pensions today."*

## Letter of Introduction Report on Financial Condition

September 11, 2009<sup>1</sup>

As required under RCW 41.45.030, this report documents an actuarial assessment of the financial condition of the following Washington State retirement systems:

- ❖ Public Employees' Retirement System (PERS)
- ❖ Teachers' Retirement System (TRS)
- ❖ School Employees' Retirement System (SERS)
- ❖ Public Safety Employees' Retirement System (PSERS)
- ❖ Law Enforcement Officers' and Fire Fighters' Retirement System, Plan 1 (LEOFF 1)
- ❖ Washington State Patrol Retirement System (WSPRS)

The primary purpose of this assessment is to assist the Pension Funding Council in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035. Please see the Actuarial Certification for additional information concerning the development, purpose, and use of this assessment.

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

Sincerely,

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

Chris Jasperson, ASA, MAAA  
Associate Pension Actuary

<sup>1</sup>We have revised the report transmitted on August 31, 2009. Please see the errata attached to the transmittal letter for information on the changes we made.

O:\PFC\2009\9-11-2009\_revised\3.Letter\_of\_Introduction\_Revised.docx



## Report on Financial Condition

RCW 41.45.030 requires us to submit information to the Pension Funding Council (PFC) about the financial condition of the state retirement systems. The full report follows.

### Introduction

It's important to review the relevant history of our plans and their prognosis for the future before we assess their financial condition or health. We start with a review of the factors that caused the recent decline in health.

Many factors combine to cause the current decline in the financial condition of the retirement plans. These factors include:

- ❖ Large investment losses throughout the last decade.
- ❖ Delayed and suspended contributions.
- ❖ Increased benefits with no equivalent increase in funding.

These factors combined to cause the health of the plans to deteriorate, putting significant upward pressure on future contribution rates.

### Key Changes Since Last Report

Since we produced the last report in 2007, several events impacted the health of the retirement plans. These events include:

- ❖ Asset returns from 2003 to 2007 triggered a gain-sharing event to be paid in 2008, increasing Plan 1 benefits and decreasing Plan 3 assets.
- ❖ The Legislature repealed future gain-sharing after the 2008 distribution, and replaced it with a package of benefit improvements.
- ❖ During 2008-2009 the economy entered a recession, causing pension plan assets to drop by nearly 25 percent.
- ❖ In 2009, the Legislature decreased contributions to the pension systems in response to decreased revenue caused by the economic recession.
- ❖ Finally, in 2009, the Legislature changed the funding method for paying off the unfunded past liability in PERS and TRS Plans 1.

We discuss the impacts of these changes, and review some of the changes that occurred prior to 2007, in more detail below.

## **Factors Leading to the Deterioration of the Plans' Health**

Several factors caused the health of the plans to deteriorate. This weakening of the plans' health puts significant upward pressure on future contribution rates. We will discuss each of the following factors in more detail:

- ❖ Large investment losses throughout the last decade.
- ❖ Delayed and suspended contributions.
- ❖ Increased benefits with no equivalent increase in funding.

### ***Investment Losses***

In 2001, anticipating higher future rates of investment return, the Legislature increased the assumed rate of return for purposes of financing plan benefits from 7.50 percent to its current level of 8.00 percent. Along with the increase in the assumed rate of return came a corresponding decrease in the required contributions to the plans. What followed was one of the worst decades of investment performance on record.

The compound annual rate of return over the ten fiscal years ending from 2000-2009, equaled 3.95 percent. By law, we assumed an 8.00 percent annual rate of return over the same period. Only the 1930's yields a lower return over a decade. The compound annual rate of return for that ten-year period dropped to 3.56 percent. The largest single year loss since 1931 occurred in 2009 when the plans' assets fell -22.84 percent. This loss overshadows the five previous years of gains.

To add insult to the injury of investment losses, during this period the plans paid out nearly two billion dollars in gain-sharing benefits. These benefits reduced investment earnings during the decade making them unavailable.

The reduction in contributions from the Legislature's increase in the assumed rate of investment return in 2001 and the significant investment losses from 2000-2009, compounded by the payment of gain-sharing benefits, contributed to the declining health of the retirement plans.

### ***Delayed and Suspended Contributions***

Delayed and suspended contributions over the last decade also contributed to the declining health of the retirement plans. Historically, contributions to the pension plans were either made at or below the actuarially required level. When contributions are made below the required levels at some times, but never above the required levels at other times, contribution rates tend to rise over time. Recent history in Washington contains several examples of contributing less than actuarially required.

For three years during the 2003-05 and 2005-07 Biennia, the Legislature suspended contributions to the Unfunded Actuarial Accrued Liability (UAAL) in the Plans 1.

When contribution rates were reinstated beginning in 2006 and 2007, they were phased-in to their actuarially required levels over a three-year period. Total contributions to the UAAL for the three-year period were below the actuarially required level.

Contributions were also delayed when the costs of material liabilities were not recognized until after they occurred. For example, the gain-sharing benefit and projected improvements in mortality were not funded when the liabilities were first recognized.

Contribution rates did not reflect the long-term cost of gain-sharing when the benefit was enacted in 1998. Rather, the cost of the benefit was recognized incrementally as gain-sharing events occurred. Each event paid assets directly to Plan 3 members and increased the Plan 1 Uniform Cost-Of-Living Adjustment (COLA). The full long-term cost of gain-sharing wasn't recognized until 2007. By that time, the opportunity to pre-fund nine years of the cost of gain-sharing had passed.

Recognizing improvements in future life expectancy in the plans' mortality assumptions presents another example of delayed funding. Actuaries use assumptions about future life expectancy to determine the cost of plan benefits. Data consistently show that life expectancies get longer over time. This means the cost of plan benefits go up over time as benefits get paid out longer. Recognizing these improvements in life expectancy (and their associated costs) before they appear in the plan experience provides an opportunity to pre-fund those liabilities instead of realizing repeated losses. Adopting assumptions that don't recognize the expected cost of benefits will result in contributing less than actuarially required in the short-term and more than required over the long-term. The Office of the State Actuary (OSA) first presented this issue for rate adoption for the 2007-09 Biennium. The PFC adopted rates for the 2009-2011 Biennium in 2008 reflecting the improvements in life expectancy. The Legislature revised these rates, delaying the recognition of improvements in life expectancy until the 2011-2013 Biennium. Again, the opportunity to pre-fund four years of the cost will have passed.

Finally, in the 2009 Legislative Session, the Legislature placed caps on the UAAL rates for the period 2009-15. They set these caps below the rate actuarially required by the funding method to provide short-term rate relief, effectively delaying part of the required rate increases.

Recent history contains an example of how contribution rates can be delayed without hurting the health of the plans. In 2003-05, when contribution rates started to rise and return to historical levels, the Legislature phased-in the increases over a four-year period. In this case the Legislature structured the phase-in to ensure all required contributions eventually got paid – with contributions *less* than actuarially required during 2005-07 and *more* than required in 2007-09. The success of this phase-in relied on the recovery of the delayed contributions in the 2007-09 Biennium.

### ***Increased Benefits with No Equivalent Increase in Funding***

Benefit improvements also contributed to the declining health of the retirement plans. Benefit improvements increase the liabilities of the plan. Adding adequately funded liabilities to a plan does not necessarily decrease a plan's health. However, some benefit improvements pose a greater risk of not being adequately funded over the long-term, hurting the health of the plan. These include benefit improvements that are not fully funded, either when enacted or over the working lifetimes of members, and benefit improvements granted when contribution rates are at unsustainably low levels. Failure to adequately fund benefit improvements puts upward pressure on contribution rates and weakens the health of the plan.

Some benefit improvements impacted the health of the plans more than others. For example, the Uniform COLA, passed in 1989 for PERS and TRS Plans 1, comprises about half of the total UAAL for those plans today. The Uniform COLA was not funded over the working lifetimes of Plan 1 members. The introduction of gain-sharing in 1998 and its subsequent replacement in 2008 increased both liabilities and contribution rates significantly. Gain-sharing was not fully funded when originally provided. Employers continue to fund past gain-sharing distributions today.

In 2000 the Legislature introduced the subsidized early retirement reduction factors for Plan 2/3 members retiring after age 55 with at least 30 years of service. These subsidized retirement benefits increased the costs of the plans in two ways: they provide an incentive for retiring earlier and they pay larger benefits. These benefits apply to all service credit for current members. As a result, these benefit improvements won't be funded over the working lifetimes of most current members.

Furthermore, the Legislature provided both the package of benefits replacing gain-sharing and the subsidized early retirement benefits at a time when contribution rates were well below their expected long-term levels. Employers must now pay for these improved benefits at the same time contribution rates for all other benefits return to their expected long-term levels. This outcome may call into question the ability of employers to adequately fund benefit improvements enacted when the cost of the plans seemed low.

### **Some Funding Policies Designed to Improve Health of Plans**

The Legislature made some changes in the plans' funding policy during the last decade designed to stabilize or improve the health of the plans. In 2003, the Legislature adopted a change to the asset valuation, or smoothing method, to reduce the impact of short-term market swings on contribution rates. In 2006, the Legislature first adopted minimum contribution rates for many of the plans to help maintain an adequate and stable level of funding over the long-term. The minimum contribution rates were scheduled to go into effect in 2009, but the Legislature suspended the minimum rates until 2011. Along with minimum contribution rates, when they come into effect, the new asset valuation method should help eliminate some of the contribution rate volatility we've seen in the recent past.

The PFC adopted mortality assumptions recognizing projected improvements in future life spans in 2008, but the rates the Legislature adopted for 2009-2011 did not reflect these assumptions. Recognizing these future improvements in life expectancy before they appear in the plans' experience provides an opportunity to prefund those liabilities instead of realizing repeated losses.

Finally, the Legislature changed the PERS and TRS Plan 1 funding method in 2009 to address some of the health challenges faced by those plans. Those challenges include spiking contribution rates and a risk of running out of assets prematurely. This change traded much of the risk that the plans run out of money before all benefits get paid for contributions that extend beyond the original 2024 full funding date. The decrease in the risk of the Plans 1 running out of money assumes all contributions get paid when required.

Changes in funding policies alone will not fully address the plans' current financial condition.

### **Projected Contribution Rates**

We reviewed the relevant history of our plans and explored the factors contributing to the recent decline in health. Now we address how this decline in health will affect future contribution requirements. Since many of the improvements in funding policy have not gone into effect, they will not suffice to overcome the other factors contributing to the deterioration of the health of the retirement plans. Consequently, for all the plans (except LEOFF 1), we project contribution rates will rise to historically high levels over the next four to five biennia. Not coincidentally this peaking of contribution rates coincides with the complete recognition of the investment losses from 2008 and 2009. In many of the plans, we expect total employer contribution rates will exceed their previous historical maximums by more than 20 percent.

The following table shows the:

- ❖ Maximum total employer contribution rates we project the plans to pay over the next 15 years using the current assumptions.
- ❖ Current and historical maximum total employer contribution rates.
- ❖ Highest rates we expect employers to pay in the future.
- ❖ Percent we expect the projected rates to exceed the current rates and their historical maximums.

Total Employer Contribution Rates					
System	Current	Projected Max	Historical Max	% Over Current	% Over Historical Max
PERS	5.13%	13.72%	8.65%	167.45%	59%
TRS	5.98%	17.93%	13.06%	199.83%	37%
SERS	5.27%	14.29%	7.38%	171.16%	94%
PSERS	7.68%	11.99%	9.27%	56.12%	29%
LEOFF 1	0.00%	1.72%	101.2%	NA	NA
WSPRS	6.17%	28.91%	24.12%	368.56%	20%

These increases in contribution rates are not permanent. If all contributions can be made and future experience matches what we assume, contribution rates will return to and eventually drop below their historical maximums. We expect this could take over 25 years. The following table shows the number of years we expect total employer contribution rates to remain above their historical maximums.

Years Above Historical Maximum		
Total Employer Contribution Rates		
System	First Year Above*	Number of Years Above
PERS	2013	16
TRS	2014	15
SERS	2012	18
PSERS	2012	17
LEOFF 1	NA	NA
WSPRS	2018	8

\*Fiscal Year Ending

### ***Projected Employer Contributions***

We expect contributions, in dollar terms, to increase faster than contribution rates. Contribution rates are a percent of salary. Even if the rates remained constant from year to year, the contribution dollars would increase as salaries increased. In general, the increase in contribution dollars would increase at the rate of general salary growth and system growth each year. Using the current assumptions we expect contribution dollars to grow at about 5.3 percent per year (“one plus the general salary growth assumption” multiplied by “one plus system growth assumption”).

When contribution rates increase, we expect contribution dollars to increase more than 5.3 percent per year. The following table compares the year-to-year increases of the GF-S and Total Employer contribution dollars we expect using the current economic assumptions.

<i>(Dollars in Millions)</i>	Projected Dollar Contributions		Biennial Percent Increase		
	Biennium	GF-S	Total Employer	GF-S	Total Employer
2009-11	\$661.0	\$1,739.6			
2011-13	1,357.4	3,429.1	105.4%	97.1%	
2013-15	1,887.9	4,765.7	39.1%	39.0%	
2015-17	2,321.2	5,866.1	23.0%	23.1%	
2017-19	2,730.8	6,922.6	17.6%	18.0%	
2019-21	3,008.3	7,582.6	10.2%	9.5%	
2021-23	3,228.1	8,079.0	7.3%	6.5%	
2023-25	3,345.3	8,461.1	3.6%	4.7%	
2025-27	3,597.3	9,021.5	7.5%	6.6%	
2027-29	2,914.0	7,348.3	(19.0%)	(18.5%)	
2029-31	2,095.2	5,355.4	(28.1%)	(27.1%)	
2031-33	\$2,233.4	\$5,658.4	6.6%	5.7%	

The dollars contributed from one biennium to the next increase faster than system and salary growth until the 2025-27 Biennium. Then the dollars contributed decrease for two biennia. In the first year of the 2027-29 Biennium, we see the changes in dollars contributed decrease as the Plans 1 become fully funded. The next biennium combines decreasing Plans 2/3 contribution rates with the first full biennium with no UAAL contribution rates. As a result we see total dollars contributed decrease significantly for two straight biennia. Then in the 2031-2033 Biennium we begin to see contribution dollars return to the expected relationship of growing at the same pace as the salaries and systems.

### How Projections Change Under Different Investment Return Scenarios

Knowing how our expectation can vary provides just as much data as the expectation itself. When average returns exceed what we expect, contribution rates decrease, and when average returns don't meet our expectations, contribution rates increase. The table below shows contribution dollars under scenarios with the same likelihood of investments returning more or less than assumed. While the chances of getting outcomes above or below the median may be equal, the impact on contribution rates and dollars is not. The increase in contribution dollars when average returns are low is much larger than the decrease in contribution dollars when average returns are high. The risk is not symmetric around the 50th percentile, or median. For example, in the 2019-2021 Biennium the optimistic projections would require about \$516 million fewer GF-S contributions. The pessimistic projections would require about \$1,136.2 million more GF-S contributions, or more than double the difference between expected and optimistic.

(Dollars in Millions)	Pessimistic	Expected	Optimistic	Pessimistic	Expected	Optimistic
	GF-S			Total Employer		
09-11	\$661.0	\$661.0	\$661.0	\$1,739.6	\$1,739.6	\$1,739.6
11-13	1,357.4	1,357.4	1,357.4	3,429.1	3,429.1	3,429.1
13-15	2,040.8	1,887.9	1,761.0	5,187.8	4,765.7	4,447.8
15-17	2,688.1	2,321.2	2,106.3	6,794.1	5,866.1	5,332.0
17-19	3,483.8	2,730.8	2,371.5	8,425.2	6,922.6	6,009.2
19-21	\$4,144.5	\$3,008.3	\$2,492.3	\$9,641.0	\$7,582.6	\$6,287.3

Note: Excludes LEOFF 2.

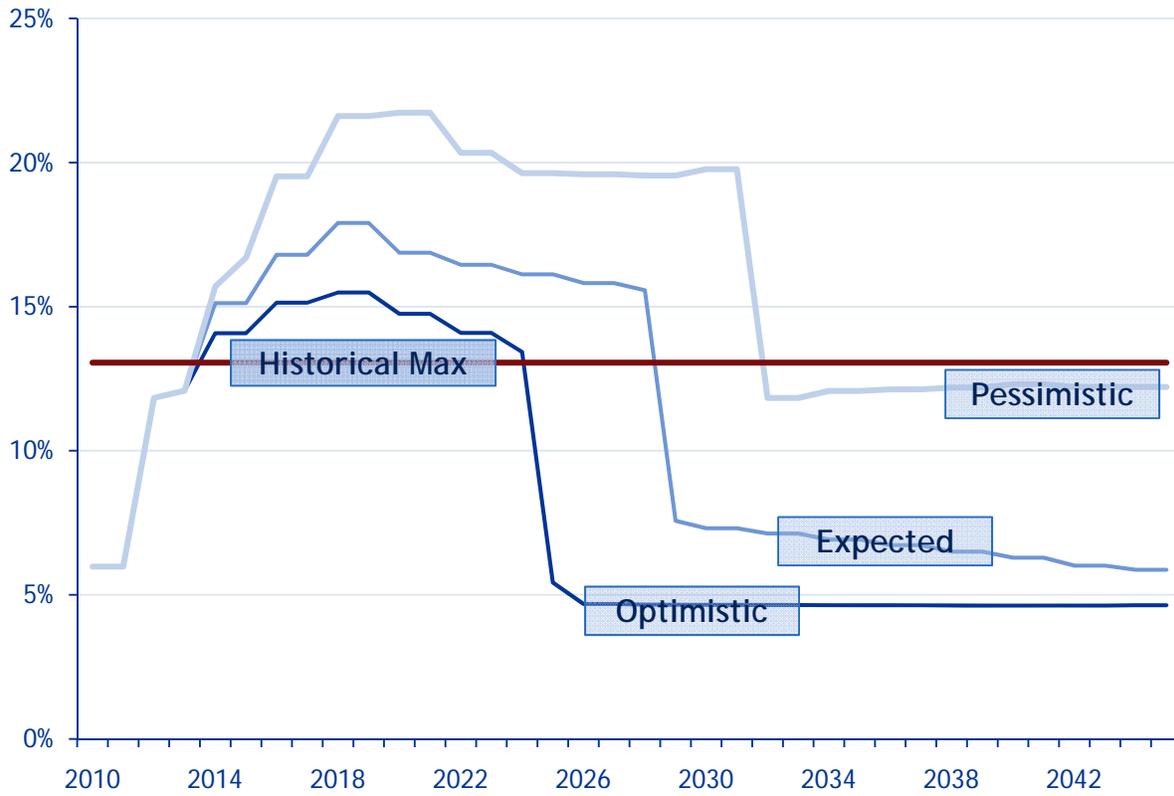
In the table above, and throughout this report, we show pessimistic and optimistic scenarios along with our expected numbers. Half of our simulations fall below the expected numbers and the other half above the expected. The expected column represents the median, or mid-point, of the simulations. To demonstrate how results could change around our expectation, we show what's called the "inter quartile range." This range represents the number of simulations that fall between the pessimistic and optimistic scenarios. Half of the simulations fall within the inter quartile range. That's why we say actual results will "more likely than not" fall between the pessimistic and optimistic scenarios. However, that does not mean that better or worse case scenarios may not occur. In terms of projected contributions, 25 percent of our simulations produce contributions below the optimistic scenario and twenty-five percent of simulations produce contributions above the pessimistic scenario.

The charts below compare the total employer contribution rates under pessimistic, expected, and optimistic scenarios.

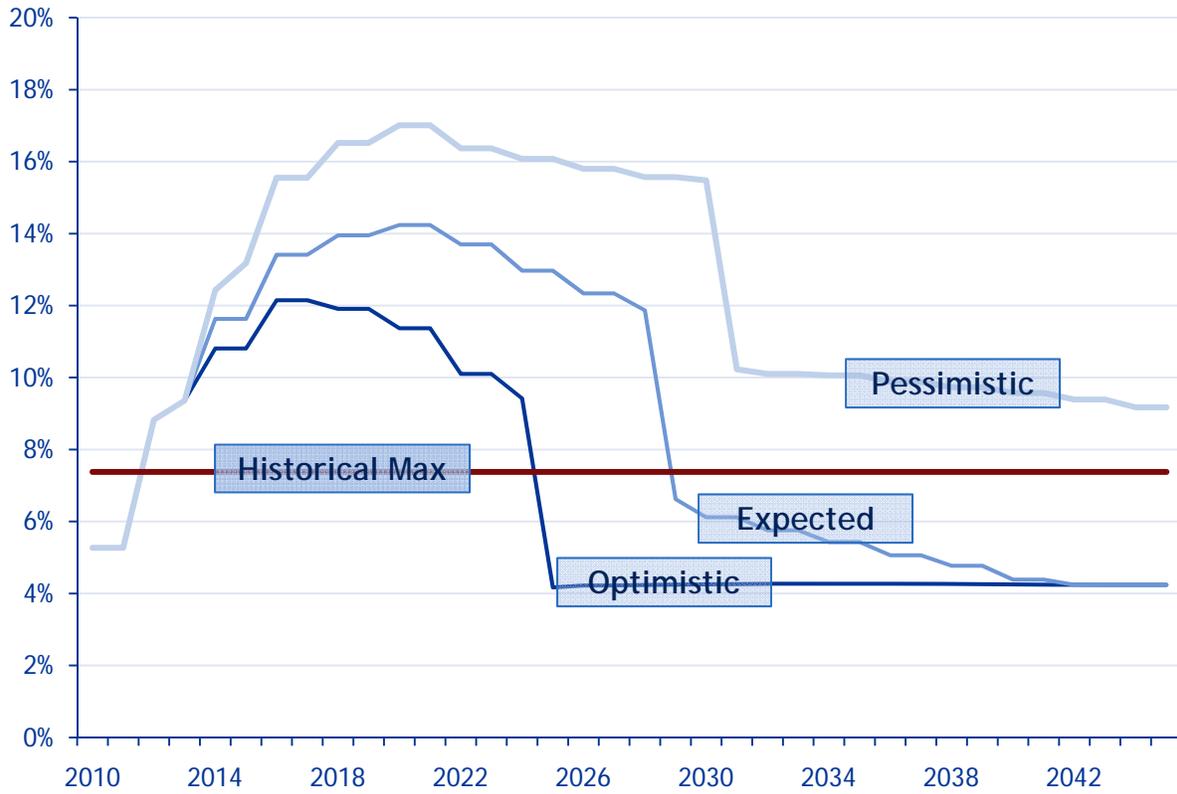
### Projected PERS Employer Contribution Rates



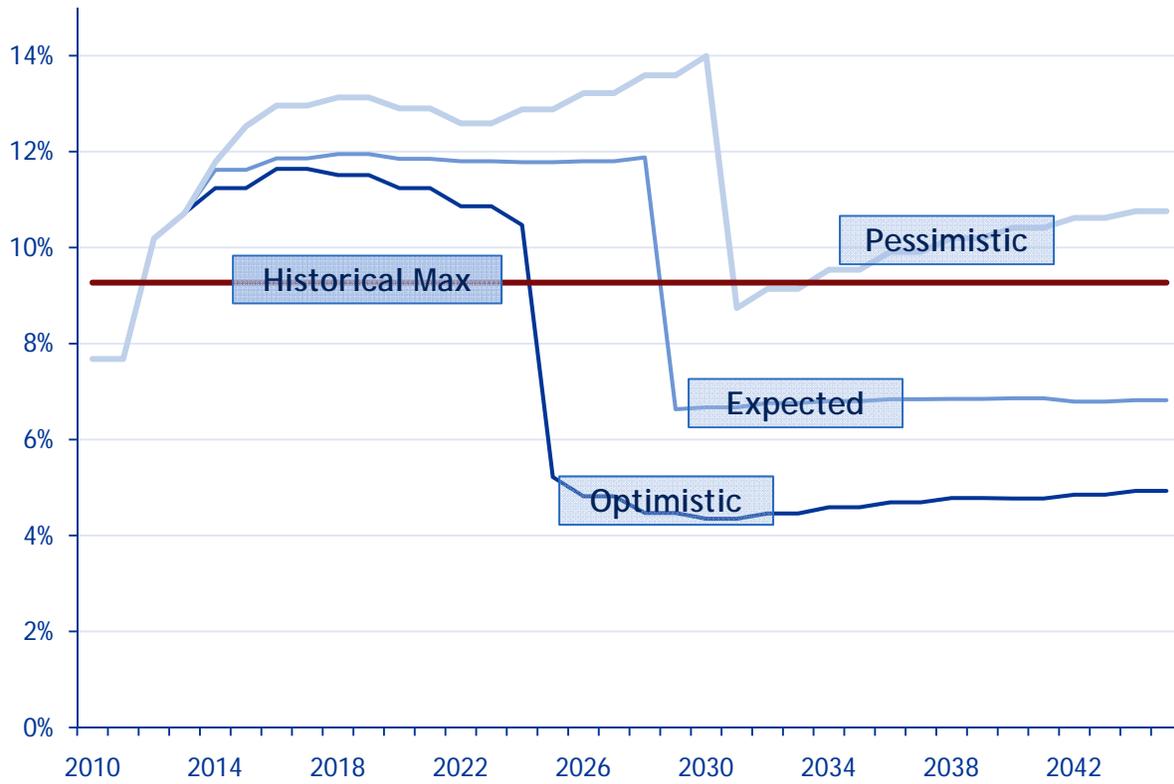
### Projected TRS Employer Contribution Rates



### Projected SERS Employer Contribution Rates



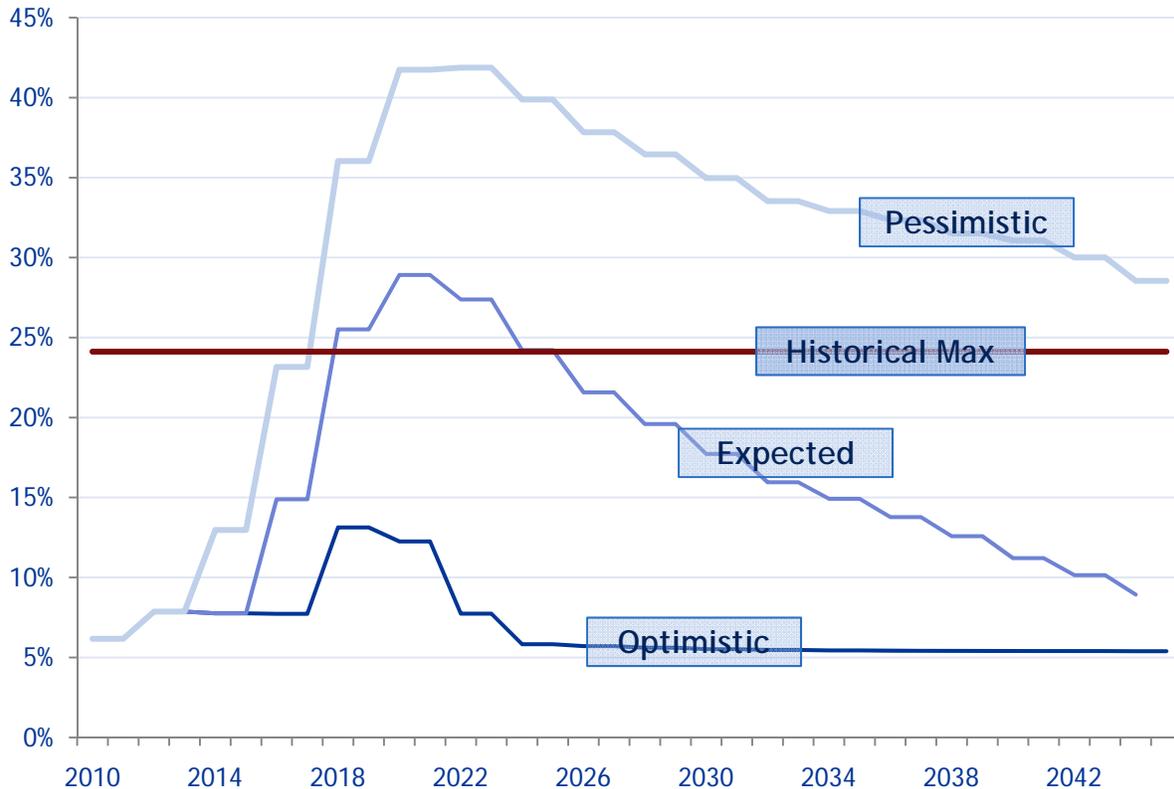
### Projected PSERS Employer Contribution Rates



### Projected LEOFF 1 UAAL Contribution Rates



### Projected WSPRS Employer Contribution Rates



### Today's Health Assessment

We reviewed the relevant history of our plans and the prognosis for future contributions. We now turn to today's health assessment of the plans. When we evaluate the health of the pension plans, we look at a number of different factors. We use the most current and relevant data we have, including participant data through June 30, 2008, and asset returns through June 30, 2009. We look at the current and projected levels of the funded status and contribution rates. We look at how the funded status behaves over time. For example, with the large asset losses in 2009, we expect the funded status for a given plan to decrease by around 30 to 40 percent over the next ten years, and then slowly increase over time. We also expect contribution rates to increase over the same ten to twelve year period, and then slowly decrease over time. Depending on the health of a plan prior to 2009, the large loss in 2009 will have different implications for future health.

The following table describes how we define the different levels of health of a pension plan based on its funded status.

Health Level	Funded Status
Healthy	Above 85%
Borderline Unhealthy	80-85%
Unhealthy	65-80%
Borderline At-Risk	60-65%
At-Risk	Below 60%

Just because a plan's funded status falls within one of the ranges above does not mean we automatically assign that health status to the plan. We also consider other factors when assessing the health of a plan, such as the maturity of the plan, amount of risk in the investment portfolio, and the likelihood of future required contributions being made.

For example, we project LEOFF 1's funded status will drop to 93.6 percent. This is well above the point where a plan would cross over from Healthy to Borderline Unhealthy. But LEOFF 1 does not currently have a funding policy in place for when the funded status drops below 100 percent. In this case we assumed reinstatement of the prior funding policy, requiring full funding by June 30, 2024. This former policy required the amortization of the entire UAAL in a short period of time. As 2024 approaches, contribution rates can get extremely high. After 2024, should the plan experience asset losses and a UAAL re-emerge, the prior funding method makes no provision for reinstating. Ultimately it's a fine line between funding the plan by 2024 and running out of money after 2024. Because of these additional considerations, we would still describe LEOFF 1 as healthy, but in the Recommendations section below, we recommend reviewing the LEOFF 1 funding policy.

The table below summarizes our assessment of the pension plans' current health. It also looks forward in our projections of the current valuation results, and finds the lowest funded status we expect for each plan. Based on those minimum projected funded statuses we show how we rate the health of the plans today.

Today's Health Assessment				
Plan	Funded Status*	Current Health	Min Projected Funded Status**	Expected Health
PERS 1	71.7%	Unhealthy	47.0%	At-Risk
PERS 2/3	119.2%	Healthy	88.0%	Healthy
TRS 1	77.3%	Unhealthy	50.8%	At-Risk
TRS 2/3	125.8%	Healthy	88.1%	Healthy
SERS 2/3	121.0%	Healthy	88.1%	Healthy
PSERS 2	131.1%	Healthy	103.9%	Healthy
LEOFF 1***	128.6%	Healthy	93.6%	Healthy
WSPRS 1/2	121.4%	Healthy	83.7%	Borderline Unhealthy

\* Based on preliminary 2008 Actuarial Valuation Report.

\*\* Based on current assumptions.

\*\*\*Assumes reinstatement of prior funding method.

When we look at minimum projected funded statuses we draw the following conclusions:

- ❖ The funded statuses of the Plans 2/3, with the exception of PSERS, all decrease below 90 percent, but remain in the healthy category.
- ❖ Of the open plans, only WSPRS funded status falls below 85 percent, resulting in a downgrade in health from Healthy to Borderline Unhealthy.
- ❖ The further deterioration of the PERS and TRS Plan 1 funded statuses causes the downgrade in their health to At-Risk.

In assessing the health of the plans, we assumed no future benefit improvements and that the employers will make all required future contributions under current funding policy. In the case of LEOFF 1, we assumed the Legislature would resume the prior funding policy. If there are future benefit improvements with associated unfunded liability or if employers can't afford future contribution requirements, it becomes much more likely that the Plans 2/3 receive downgrades in their health status. For more information on the projected contribution rates, see that section above.

### ***Opportunity to Address Financial Condition Using Risk Analysis and Planning***

Given the results of this health assessment, I recommend the Legislature, or its designee, develop a plan to manage the future health of the retirement systems. I suggest the following process:

- ❖ Clearly identify the health risks to the retirement systems.

- ❖ Establish a process for measuring these risks.
- ❖ Analyze the risks using risk measures.
- ❖ Develop recommendations to the Legislature for managing the risks.

I suggest completing this work before the 2011 Legislative Session. Please see the Primer on Risk Analysis and Risk Measures enclosed with the transmittal letter for additional explanation on this recommendation.

Since many of the risks facing the retirement systems involve future contribution rates, the PFC might consider doing this analysis as part of its work in recommending future contribution rates. This work could also fit within the statutory duty of the Select Committee on Pension Policy (SCPP) to study the financial condition of the state retirement systems, develop funding policies, and make recommendations to the Legislature. The OSA has special expertise in measuring and analyzing retirement system risk and we're available to assist policy makers.

Some of the areas we suggest you pay special attention to include:

- ❖ Short to medium-term affordability concerns caused by large projected increases in contribution rates.
- ❖ Unbalanced risk of higher future contribution requirements.
- ❖ Reinstating a funding method in LEOFF 1 should an unfunded liability return.

We have concerns about the affordability of future contributions due to the rapid increase in contribution rates we expect over the next 15 years. In that time frame contribution rates in the Plans 2/3 will increase two-fold for employers. First, employer contribution rates will increase due to the costs of making up the lost funding of the Plans 2/3, and second due to the underfunded legacy costs of the PERS 1 and TRS 1. By coordinating risk management efforts you can (1) address the short to medium-term funding pressures on the plans and (2) change the long-term economic assumptions. By addressing these items you will improve the long-term affordability of the plans.

We also have concerns associated with the unbalanced nature of the risk around the expected contribution rates. When assets earn more or less than we expect the plans will not face identical changes in contribution rates. When assets earn more than expected contribution rates decline, but the decline is small relative to the increases in contribution rates when assets earn less than expected. Some of this risk can be managed in the future by reconsidering how funding and benefit policies are best coordinated with the asset allocation policy of the commingled trust fund.

Two more risks to consider are the risk of a large short-term spike in LEOFF 1 contribution rates and the risk of running out of pre-funded assets to pay LEOFF 1 benefits. Both of

these risks occur if the LEOFF 1 funded status drops below 100 percent and the Legislature reinstates the previous funding policy for amortizing the UAAL by 2024.

Please see the executive summary contained in the transmittal letter for comments concerning the coordination of this report with the Economic Experience Study report.



# Office of the State Actuary

*"Securing tomorrow's pensions today."*

## **Actuarial Certification Report on Financial Condition**

September 11, 2009

This report documents the results of an actuarial assessment of the financial condition of the retirement plans defined under Chapters 41.26 (excluding Plan 2), 41.32, 41.35, 41.37, 41.40, and 43.43 of the Revised Code of Washington. The primary purpose of this assessment is to assist the Pension Funding Council in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035. I understand the report may be used for other purposes, including a preliminary identification of the health risks facing the retirement plans documented above. However, this report does not represent a complete risk analysis of these retirement plans. Please replace this report in the future when the results of a more recent health assessment become available.

This health assessment involved a projection of future actuarial valuation results using simulated rates of future investment return and projected new entrants. Please see the 2007 Actuarial Valuation Report (AVR) for the data, assumptions, and methods used in determining the initial actuarial valuation results for this projection. Please see the Actuarial Certification in the 2007 AVR for additional information concerning the development, purpose, and use of the 2007 actuarial valuation results.

We updated the results of the 2007 AVR to reflect the most recent and available plan provisions and participant and asset data. Plan provisions reflect changes from the 2008 Legislative Session. We did not include supplemental contribution rates from the 2009 Legislative Session. Participant data reflects preliminary retirement system census data through June 30, 2008. Asset data reflects preliminary returns through June 30, 2009.

The Department of Retirement Systems provided preliminary 2008 member and beneficiary data to us. We checked the data for reasonableness as appropriate based on the purpose of this assessment. The Washington State Investment Board (WSIB) provided preliminary asset information as of June 30, 2009. An audit of the financial and participant data was not performed. I relied on all the information provided as complete and accurate. In my opinion, this information is adequate and substantially complete for purposes of this assessment.



We relied on the capital market assumptions (CMAs) from the WSIB to perform our asset projections. We reviewed the CMAs for reasonableness as appropriate based on the purpose of this assessment.

The health assessment summarized in this report involves the interpretation of many factors and the application of professional judgment. I believe that the data, assumptions, and methods used in the underlying assessment are reasonable and appropriate for the primary purpose stated above. The use of another set of data, assumptions, and methods, however, could also be reasonable and could produce materially different results. Another actuary may review the results of this analysis and reach different conclusions.

In my opinion, all methods, assumptions, and calculations are reasonable and are in conformity with generally accepted actuarial principles and applicable standards of practice as of the date of this publication.

The undersigned, with actuarial credentials, meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Sincerely,

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

*O:\PFC\2009\9-11-2009\_revised\2.Certification\_Letter\_Revised.docx*

## Appendix A

### How we developed and varied our projections

To produce the projections used in this report, we relied on the preliminary results of the 2008 Actuarial Valuation Report (AVR). We also relied on the Washington State Investment Board (WSIB) capital market assumptions (CMAs) and reported returns through June 30, 2009.

“Our projections” refers to the projections we produce by taking the most recent AVR and projecting it forward 50 years. For each future year, we look at the data, assets, and liabilities as though we were producing a new AVR in that year. The data reflects the current population and includes new entrants. From the group of members currently active, we expect some to remain active, some to retire, some to quit and terminate service, etc. When members leave the active workforce, we replace them with new entrants. We assume future new entrants will have the same demographics as recent new entrants. Over time those new entrants also leave active status, and the cycle continues for each projected year. The result is a 50 year projection of valuation results that we use to generate future contribution rates.

Aside from the characteristics of new entrants, we made other assumptions to produce our projections. We assume no new benefit improvements throughout the projection. We assume all required member and employer contributions get made, regardless of their amounts. We assume no changes in WSIB asset allocation or CMAs.

Since the future is uncertain and rates of return cause most of the variation we see in contribution rates, we vary the rate of return earned on plan assets in each year of our projections. This gives us a good idea of the range of results we can expect based on the current asset allocation. We adjusted WSIB’s CMAs for the time horizon of the pension systems (see the Report On Long-Term Economic Assumptions for more detail about how we adjusted the CMAs). Using these assumptions we produced a distribution of annual asset returns that could arise given the asset allocation targets of the current WSIB CTF portfolio.

When we vary the annual rates of return earned by the plan, our projections produce different contribution rates. We generated and compared the results of over ten thousand scenarios. In theory each simulation has an equally likely chance of occurring. We relied on this fact to sort and compare the results.

For each scenario we randomly selected a rate of return for each year of the projection. Since each scenario used 50 random returns, we saw some scenarios with very high returns and some with very low returns. Since we looked at a very large number of scenarios, we feel confident that the spectrum of results represents the possible futures. We looked at the 25th, 50th, and 75th percentile of possible future scenarios. The 50th percentile represents the expected future. In this report, we based all projected contribution rates and associated

contribution dollars labeled “Expected” on the 50th percentile of the distribution of scenarios. Similarly, we based all projected results labeled Pessimistic and Optimistic on the 25<sup>th</sup> and 75<sup>th</sup> percentiles respectively, of the distribution.

Unless otherwise stated in the report, all other data, methods, and assumptions are consistent with the AVR. Plan provisions reflect all changes through the 2008 Legislative Session. We did not include the supplemental rates from the 2009 Legislative Session. We will not publish the final AVR until later this year. As a result we expect the results of this report to be slightly different than if we’d used the final results of the AVR. However, we expect these differences would not be material and would not change our findings and recommendations.



**Office of the State Actuary**

*"Securing tomorrow's pensions today."*

## **Report on Long-Term Economic Assumptions**



Prepared for the Pension Funding Council

*September 11, 2009*





## Office of the State Actuary

*"Securing tomorrow's pensions today."*

### Report prepared by the Office of the State Actuary

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

Kelly Burkhart  
Troy Dempsey, ASA  
Aaron Gutierrez  
Michael Harbour  
Laura Harper  
Elizabeth Hyde  
Chris Jaspersen, ASA, MAAA  
Dave Nelsen  
Darren Painter  
Christi Steele  
Keri Wallis  
Charlene Winner  
Lisa Won, ASA, MAAA

### Contact Information

#### Mailing Address:

Office of the State Actuary  
PO Box 40914  
Olympia, Washington 98504-0914

#### Phone:

Phone: 360.786.6140  
TDD: 800.635.9993  
Fax: 360.586.8135

#### Physical Address:

2100 Evergreen Park Dr. SW  
Suite 150

#### Electronic Contact:

[actuary.state@leg.wa.gov](mailto:actuary.state@leg.wa.gov)  
<http://osa.leg.wa.gov>

### Additional Assistance Provided by

Washington State Investment Board





## Table of Contents

Letter of Introduction.....	i
Section I: Summary of Key Results.....	1
Report on Long-Term Economic Assumptions .....	1
Section II: Economic Experience Study.....	6
Section III: Appendices .....	18





# Office of the State Actuary

*“Securing tomorrow’s pensions today.”*

## **Letter of Introduction**

### **Report on Long-Term Economic Assumptions**

September 11, 2009<sup>1</sup>

As required under RCW 41.45.030, this report documents the results of an economic experience study of the following Washington State retirement systems:

- ❖ Public Employees’ Retirement System (PERS)
- ❖ Teachers’ Retirement System (TRS)
- ❖ School Employees’ Retirement System (SERS)
- ❖ Public Safety Employees’ Retirement System (PSERS)
- ❖ Law Enforcement Officers’ and Fire Fighters’ Retirement System, Plan 1 (LEOFF 1)
- ❖ Washington State Patrol Retirement System (WSPRS)

The primary purpose of this report is to assist the Pension Funding Council in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035. Please see the Actuarial Certification for additional information concerning the development, purpose, and use of this experience study. We organized the report in the following sections:

- ❖ Summary of Key Results
- ❖ Economic Experience Study
- ❖ Appendices

The Summary of Key Results section provides a high-level executive summary of the results and key findings of the economic experience study. The Economic Experience Study section of the report details the experience study results for each underlying economic assumption. The Appendices contain most of the data supporting our analysis of this experience study.



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

Sincerely,

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

Chris Jasperson, ASA, MAAA  
Associate Pension Actuary

*<sup>1</sup>We have revised the report transmitted on August 31, 2009. Please see the errata attached to the transmittal letter for information on the changes we made.*

*O:\PFC\2009\9-11-2009\_revised\4.Letter\_of\_Introduction\_Revised.docx*

# **Section I**

## **Summary of Key Results**





## Report On Long-Term Economic Assumptions

RCW 41.45.030 requires us to submit information to the Pension Funding Council (the council) about the economic experience of the state retirement systems and recommend long-term economic assumptions. The full report follows.

### Summary of Recommendations

I consider all current economic assumptions reasonable, but not representative of my best estimate. The table below shows my recommended economic assumptions.

Assumption	Current*	Recommended*
Inflation	3.50%	3.25%
General salary growth	4.00%	4.00%
Annual investment return	8.00%	7.50%
Growth in system membership	0.90% (TRS), 1.25% (Others)	0.90% (TRS), 1.15% (Others)

\*Excludes LEOFF 2.

### Key Findings

Not surprisingly, we've determined the assumed rate of return on investments is the most important economic assumption for funding the plans. Therefore, reducing the interest rate assumption is the most significant recommendation we make in this report. We also recommend reducing the assumed rate of inflation and slightly decreasing the system growth assumption for most plans. Changes in these assumptions have far less impact on plan funding than the recommended change in the rate of return assumption.

Based on the Washington State Investment Board's (WSIB) Capital Market Assumptions (CMAs, described in more detail in Appendix H), we feel the current assumed rate of investment earnings is too optimistic in the long-term, given the current target asset allocation. We feel that over time the retirement systems would experience more actuarial losses than gains. This will continually put pressure on contribution rates to increase. See the Report on Financial Condition for more information on the current financial condition of the plans.

We've also observed a propensity to increase benefits when returns exceed the assumed rate and delay or simply not make required increases in contributions when returns fall below the assumed rate. The effects of this tendency have not been offset by reducing future benefits when returns fall below the assumed rate or by employers contributing more than what's actuarially required when returns exceed the assumed rate. For these reasons, we feel that assuming a rate of return on the high end of the best estimate range, such as 8 percent, does not help improve the long-term health of the plans.

However, this recommended assumption change, if done in isolation of other risk management exercises, would make shorter-term health risks worse. Adopting a lower interest rate assumption will increase pension costs in the short to medium term. As discussed in the Report on the Financial Condition, contribution rates will increase throughout this period whether the rate of return assumption changes or not. However, if contributions can be made at the required level using the recommended interest rate assumption, the long-term health of the plans will be improved.

Please see the Executive Summary contained in the Transmittal Letter for comments concerning the coordination of this report with the Report on the Financial Condition.

### **The Cycle of the Interest Rate Assumption**

Using a statutorily assumed rate of return starts a circular process that includes the WSIB asset allocation and our actuarial recommendations.

The cycle repeats as follows:

- ❖ The Legislature mandates a rate of return assumption.
- ❖ The WSIB adopts an asset allocation to attempt to reach the mandated rate of return assumption while taking a prudent level of risk (per their statutory mandate).
- ❖ The State Actuary recommends a rate of return assumption for the Pension Funding Council and Legislature to adopt, based on the WSIB's asset allocation and CMAs.

The statutory mandate for the WSIB is “to maximize returns at a prudent level of risk.” We believe the statutory investment return assumption for funding the retirement systems sets a benchmark rate of return the WSIB strives to reach within their statutory mandate. Over time WSIB changed their asset allocations. We believe one reason they changed their asset allocation has been to achieve the statutorily prescribed interest rate. To earn a higher return they have to invest more heavily in asset classes with a higher level of risk. Over time, the return WSIB expects to earn on investments has increased in relation to the risk of their portfolio. However, portfolios with greater levels of risk, and greater expected returns, will usually have greater volatility in returns.

WSIB's current CMAs, adjusted to fit the time horizon of the pension systems, gives them a 41 percent chance of getting or exceeding the 8.00 percent annual return over the next 50 years. It also gives them a 21 percent chance of returning less than 6.00 percent annually. Although the current statutory target equals 8.00 percent (and has since 2001), WSIB's CMAs have never predicted a median return that exceeds 8.00 percent.

We use the WSIB's CMAs to recommend what we feel the rate of return assumption should be. For example, if the WSIB lowered the level of risk in the CTF's portfolio, it would flow through the CMAs and result in a lower median rate of return. We would then recommend

a lower assumption for the rate of return. And the cycle continues. Decreasing the risk in the portfolio leads to lower expected annual returns. Lower expected annual returns lead to lower recommended rate of return assumptions.

### ***An example of the Cycle in Action since 2001***

In 2001, the Legislature adopted a higher rate of return assumption, increasing the assumption from 7.50 percent to 8.00 percent. Since 2001 the level of risk in the WSIB portfolio increased to produce an expected return close to the statutorily assumed rate. Over that time, the standard deviation around the expected return resulting from the target asset allocation of the portfolio increased from 13.27 percent to 13.89 percent. Since the 2004 CMAs, the median return has increased from about 7.40 percent to a high of about 7.80 percent in 2008. Based on the CMAs we're using, the median return equals 7.56 percent. In 2007, our recommend rate of 7.75 percent coordinated with the 2007 CMAs. Now, with the decrease in expected return of private equities over public equities of 1.00 percent per year, and 25 percent of the target asset allocation in private equities, we lower our assumption by 0.25 percent to 7.50 percent.

### ***Risk Measures***

We began our analysis by looking at what happens to the funded status and contribution rates in the future using the current assumptions. We looked at changes in these "risk measures" based on possible rate of return scenarios produced by the current asset allocations. For each risk measure we look at three different scenarios. The expected scenario corresponds to the median, or mid-point, rate of return scenario. The pessimistic scenario corresponds to the 25<sup>th</sup> percentile of returns and the optimistic scenario corresponds to the 75<sup>th</sup> percentile of returns.

We organize the following table by system. Since the systems differ slightly, we'll describe the five risk measures shown for PERS in more detail. The interpretations of the risk measures for the other systems are similar. We looked at the following risk measures:

- ❖ **Expected Full Funding Date** for the Plans 1 UAAL represents the date we expect the UAAL contribution rates to go zero.
- ❖ **Min Funded Status** represents the lowest funded status we saw in any future year for the given scenario.
- ❖ **Max Total Employer Contribution Rate** represents the sum of the Plan 1 UAAL contribution rates and the ongoing cost to fund the Plans 2/3. The measure shown represents the highest level that the total employer contribution rate climbs to in our projections.
- ❖ **Max Ever Paid by Employers** compares the previous measure to the historical maximum.

We calculated the measures shown below using the current assumptions. See the Report on Financial Condition for more information on the outlook of the plans using the current assumptions.

<b>Risk Measure</b>	<b>Pessimistic</b>	<b>Expected</b>	<b>Optimistic</b>
<b>Expected PERS 1 Full Funding Date</b>	<b>6/30/2030</b>	<b>6/30/2028</b>	<b>6/30/2024</b>
PERS 1 Min Funded Status	37.2%	47.0%	58.6%
PERS 2/3 Min Funded Status	78.2%	88.0%	99.1%
PERS Max Total Employer Contribution Rate	16.06%	13.72%	11.92%
PERS Max Ever Paid by Employers		8.65%	

<b>Expected TRS 1 Full Funding Date</b>	<b>6/30/2031</b>	<b>6/30/2028</b>	<b>6/30/2024</b>
TRS 1 Min Funded Status	40.0%	50.8%	63.2%
TRS 2/3 Min Funded Status	78.5%	88.1%	99.3%
TRS Max Total Employer Contribution Rate	21.75%	17.93%	15.51%
TRS Max Ever Paid by Employers		13.06%	

SERS 2/3 Min Funded Status	78.6%	88.1%	99.3%
SERS Max Total Employer Contribution Rate	17.01%	14.29%	12.15%
SERS Max Ever Paid by Employers		7.38%	

PSERS 2 Min Funded Status	81.2%	103.9%	119.5%
PSERS 2 Max Total Employer Contribution Rate	13.35%	11.99%	11.65%
PSERS 2 Max Ever Paid by Employers		9.27%	

LEOFF 1 Min Funded Status	0.0%	93.6%	120.1%
LEOFF 1 Max UAAL Contribution Rate	18.60%	1.72%	0.00%
LEOFF 1 Max Ever Paid by the State		101.2%	

LEOFF 2 Min Funded Status	79.6%	96.9%	111.8%
LEOFF 2 Max Total Employer Contribution Rate	13.30%	9.23%	8.45%
LEOFF 2 Max Ever Paid by Employers		8.83%	

WSPRS 1/2 Min Funded Status	69.0%	83.7%	99.2%
WSPRS 1/2 Max Total Employer Contribution Rate	41.88%	28.91%	13.13%
WSPRS 1/2 Max Ever Paid by Employers		24.12%	

After completing the economic experience study and selecting recommended assumptions, we calculated the same risk measures using the recommended assumptions. We compared the results to the risk measures for the current assumptions. We found that things get worse before they get better. The funded statuses drop lower and contribution rates increase higher in the short-term, before these measures improve in the long-run. This result highlights the funding challenges facing the retirement plans in the short-term. Therefore, we recommend a shift in focus to identifying, measuring, and managing retirement system risks. Without a plan to manage these risks, the retirement systems as we know them may not be sustainable.

Actual costs will ultimately follow from the difference between (1) actual benefits paid by the system and (2) the contributions collected plus the actual investment earnings. The economic assumptions impact the estimated amount of benefits the systems will pay and the timing of the funding. Using a lower investment return assumption puts more money in earlier and less money in later. If actual rates of return fall below expected, the systems will require more contributions whether funding occurred at a higher or a lower assumed interest rate. Since we don't know how future investments will fair, funding at an appropriately conservative interest rate improves the long-term health of the plan.

For more information on the budget impacts of adopting the recommendations see the Budget Impact of Adopting the Recommended Assumptions section at the end of this report.

*O:\PFC\2009\3.Report\_on\_Long-Term\_Economic\_Assumptions.docx*



## **Section II**

### **Economic Experience Study**





## **Background and General Approach to Setting Economic Assumptions**

Actuarial Standard of Practice Number 27 (ASOP 27), titled Selection of Economic Assumptions for Measuring Pension Obligations, identifies the following process for selecting economic assumptions:

- ❖ Identify components, if any, of each assumption and evaluate relevant data.
- ❖ Develop a best-estimate range for each economic assumption.
- ❖ Select a specific point estimate within the best-estimate range.
- ❖ Review the set of assumptions for consistency.

For each economic assumption, the best-estimate range is “the narrowest range within which the actuary reasonably anticipates that the actual results, compounded over the measurement period, are more likely than not to fall.” The measurement period is the time period after the valuation date when a particular economic assumption will apply. Pension funding occurs over long time periods; therefore, the measurement period for economic assumptions can easily exceed 50 years.

One acceptable approach for setting economic assumptions identified in ASOP 27 is the “building block” method. Using this method, the actuary determines individual components for each assumption. Then the actuary may combine estimates for each component to arrive at a best-estimate range for the given assumption. With the exception of annual growth in system membership, we used the building block approach for developing the following assumptions.

### **Experience Study and Recommended Assumptions**

For each assumption we studied we will identify:

- ❖ How we use the assumption for funding in our model.
- ❖ The best-estimate range.
- ❖ The single-point best estimate.
- ❖ The data we studied and how we analyzed it.

### ***Inflation Assumption***

We use the inflation assumption as a building-block component of the nominal investment return assumption and the general salary growth assumption. For funding purposes, we primarily use the inflation assumption to model post-retirement cost-of-living-adjustments (COLAs). Since we use different types of inflation for different purposes, we studied three

different measures of inflation and how they compare to each other: broad economic inflation, national price inflation, and regional price inflation.

One readily available measure of inflation is the Gross Domestic Product (GDP) deflator. We studied the GDP deflator produced by the Federal Bureau of Economic Analysis. The GDP deflator measures the changes in both price and quantity of the goods produced in a country. This measure generally provides a good measure of broad economic inflation because it does not react solely to changes in price. The GDP deflator reflects changes in consumption habits that occur when prices of goods rise, such as reduced consumption and the substitution of lower priced goods. Because the GDP represents a measure of total economic productivity in a given country, the GDP deflator reflects a changing basket of goods. In general the GDP deflator provides a good indication of whether an economy is growing or shrinking.

The Consumer Price Index (CPI) provides another measure of inflation. The Federal Bureau of Labor and Statistics (BLS) produces the CPI that we studied. It measures changes in price for a fixed basket of goods. BLS produces different CPIs based on different baskets of goods, for different regions of the country, or both. A CPI strictly measures price inflation. It does not take into account changes in consumption habits. State law requires the Plans 2/3 to pay post-retirement COLAs based on changes in the CPI for Urban Wage Earners and Clerical Workers (CPI-W) for Seattle, Tacoma, Bremerton (STB).

We studied both the national CPI-W and the CPI-W STB and reviewed how they compared to the GDP deflator. We built our inflation assumption by adding adjustments for both the national and regional CPI-W to broad economic inflation as measured by the GDP deflator.

*Best-Estimate Range:*

Broad Economic Inflation  
1.25 percent to 3.25 percent

National CPI –W Adjustment  
0.25 percent to 0.75 percent

Seattle, Tacoma, Bremerton CPI-W Adjustment  
0.0 percent to 0.25 percent

Total Inflation  
1.50 percent to 4.25 percent

*Recommendation:*

Broad Economic Inflation  
2.50 percent

National CPI –W Adjustment  
0.50 percent

Seattle, Tacoma, Bremerton CPI-W Adjustment  
0.25 percent

Total Inflation  
3.25 percent

Current Assumption:

3.50 percent

Data:

Inflation Data (Appendix A)

Analysis:

We reviewed the indices provided in Appendix A from 1950 to 2008. We used the GDP Deflator for Personal Consumption Expenditures as a proxy for broad economic inflation. The low end of the best estimate range corresponds to the low and high estimates of the GDP deflator in the 2009 Report of the Trustees on the Financial Condition of OASDI. For the remainder of this report we will refer to this as the Social Security Report (SSR).

The high end of the range is slightly lower than the data shown in Appendix A for the entire period. The low end of the range is slightly lower than the GDP deflator forecasts done by GlobalInsight and the Congressional Budget Office. The best-estimate single-point assumption for broad economic inflation, 2.50 percent per year, corresponds with the average of the data shown in Appendix A over the last 20 years and with the Intermediate assumptions in the SSR. Furthermore this equals the level of inflation assumed in the WSIB capital market assumptions.

We based the National CPI-W adjustment on the average difference between that index and the GDP deflator over the last 30 years. Similarly, we based the STB CPI-W adjustment on the average difference between that index and National CPI-W over the last 25 years. The best-estimate single-point assumption for total inflation, 3.25 percent per year, corresponds with the average of the CPI-W STB since 1983. This date generally corresponds to the implementation of the strict monetary policy that kept inflation low over the past 25 years.

Despite the impact of strict monetary policy, we see a mixed outlook for future inflation given the status of the Social Security Program. The actuaries who produce the SSR project annual Social Security costs will exceed tax income starting in 2016. When that occurs, the SSA will cover the annual gap by redeeming special obligations of the Treasury. This scenario may limit the effectiveness of current monetary policy as a means of managing future inflation.

In recognition of the persistently low inflation for the past 20 years and the risk of increasing inflation in the future, I'm recommending a modest reduction in the current inflation assumption from 3.5 percent to 3.25 percent. However, the current, legislatively prescribed, inflation assumption of 3.5 percent falls within the best-estimate range and is reasonable.

### ***General Salary Growth***

We use this assumption to project salaries to determine future retirement benefits and contribution rates as a percent of payroll. We also use it to determine employer contribution rates to the Plan 1 UAAL as a level percentage of future system payrolls. Generally, a participant's salary will change over the long term in accordance with inflation, productivity growth, merit or longevity increases, and promotional increases.

Our actuarial model assumes two separate sources of salary increases: general salary growth; and merit or longevity increases. Because we use the building block method, we model general salary growth as long-term inflation plus productivity growth. ASOP 27 defines productivity growth as "the rates of change in a group's compensation attributable to the change in real value of goods or services per unit of work." Merit or longevity increases are defined as "the rates of change in an individual's compensation attributable to personal performance, promotion, seniority, or other individual factors." In other words, general salary growth applies broadly to many different groups, while merit or longevity increases apply to specific groups and individuals.

Because we apply the assumptions in different ways, we study the two sources of salary increases separately. We review general salary growth as part of the economic experience study when we look at broad trends. We typically study merit or longevity increases as part of the demographic experience study process when we focus more on trends within individual plans. Ideally, the combination of the two assumptions would model total salary growth.

For this experience study we studied general salary growth. To develop this assumption, we reviewed growth in salaries for active members, growth in total and average salaries for each plan, and average salary growth for full-time members.

#### ***Best-Estimate Range:***

3.25 percent to 4.50 percent

#### ***Recommendation:***

4.00 percent

#### ***Current Assumption:***

4.00 percent

Growth in Salaries for Members Active in Three Years in a Row (**Appendix B**)  
Growth in Total and Average Salaries for All Members (**Appendix C**)  
Growth in Average Salary for Full-Time Members (**Appendix D**)

Analysis:

We provide the growth in average annual salary for each retirement system in Appendix B. These data represent the total growth in salaries from all sources from 1984 to 2008. We only included members in this data if they had three consecutive years of service. As a result, the beginning and end of year salaries are for the same group. That ensures we don't see any salary growth due to changes in the population – current members leaving or new members entering the system. The change in salaries from the beginning to the end of each year represents total salary growth in a closed group. It provides a measure of general salary growth and merit or longevity increases combined. This data shows a downward trend over the last 20 years, with total salary growth decreasing from averaging over 5.30 percent in the last 20 years to averaging 5.00 percent over the last ten years.

In Appendix C we provide the change in total and average system salaries from year to year. This measure of salary growth includes members coming and going. When we divide the total salary in a given year by the number of active members covered by the plan in the same year we get a measure of average salary growth. This measure provides a good proxy for general salary growth. This measure includes all active members, both full and part-time employees.

When we combine all plans, we see annual salary growth averaged slightly above 3.50 percent since 1982. We see similar results when we look at PERS, SERS, and PSERS combined. When we look at all plans except LEOFF 2, we see the average drop to slightly below 3.50 percent. LEOFF 2's annual salary growth over the period averaged about 4.40 percent.

In Appendix D we show general salary growth for full-time members of each system. We consider a member full-time in a given year if they receive a full year of retirement system service credit. We found that full-time members of both LEOFF and PERS had general salary growth of about 4.00 percent. TRS and SERS had general salary growth of about 3.75 percent. General salary growth in WSPRS, with a much smaller sample of members, averaged about 4.50 percent. We considered this data heavily when setting the general salary growth assumption. This data coordinates well with our model and merit scale assumption. Our model projects all members as though they were full-time. Also this data comes from the method we use to set the merit scales.

Total annual salary growth from all sources has declined over the last ten years. However, total annual salary growth exceeded the current 4.00 percent general salary growth assumption over the period of 1984 through 2008 due to the impact of merit or longevity increases. Over this period, the data suggest about 1.00 percent annual average growth for merit or longevity increases (5.00% - 4.00% = 1.00%).

Future collective bargaining at the state level and the I-732 COLA increases for Teachers represent two factors that may impact actual salary experience in PERS and TRS, respectively. Undoubtedly, these relatively new processes will impact the level and pattern of future salary changes. Since we have limited experience data for affected Washington state employees and teachers, we have not included an adjustment for these factors. We will closely monitor the impact of collective bargaining and I-732 as it emerges in our experience data and recommend adjustments to the council if necessary.

The current legislatively prescribed general salary growth assumption equals the inflation assumption plus productivity. Productivity currently prescribed in statute equals 0.50 percent. In order to lower the inflation assumption to 3.25 percent and maintain the general salary growth assumption at 4.00 percent productivity assumption in statute needs to increase to 0.75 percent. Our recommendation reallocates parts of general salary growth between the building blocks. If inflation is not lowered, we recommend not changing the productivity assumption.

Should LEOFF 1 come out of fully funded status and the previous funding method gets reinstated we would likely recommend using the assumptions adopted by the LEOFF 2 Retirement Board for LEOFF 1 funding. For information on the salary growth assumption we recommend for the LEOFF 2 Board please see their separate Report on Long-Term Economic Assumptions.

### ***Annual Rate of Investment Return***

This assumption reflects anticipated returns on the retirement plan's current and future assets - net of expenses. ASOP 27 identifies two methods for setting the rate of return assumption. We described the first method, the building block method in the Background section of this report. ASOP 27 also describes the "cash-flow matching" method for setting the rate of return assumption. Under this method, a well diversified bond portfolio is used to closely match expected benefit payments with income from the bond portfolio. Due to the asset allocation of the CTF, this option is not a reasonable method for setting the rate of return assumption.

In addition to the items discussed in the general economic assumption selection process, we consider several key factors when selecting this assumption, namely – the:

- ❖ Purpose of measurement (i.e. on-going plan valuation, plan termination, etc).
- ❖ Measurement period.
- ❖ Investment policy.

We assumed the primary purpose of the measurement is to set contribution rates for the ongoing retirement systems. Setting contribution rates requires us to value the liabilities and salaries in today's dollars. We determine today's value using an assumed rate of future investment returns.

The recommended rate of return assumption represents a single rate that applies to all plans invested in the commingled trust fund (CTF). We base that rate on the average measurement period for all plans combined. Because not all plans in the CTF have equivalent measurement periods, the rate of return assumption could vary on an individual plan basis. As the membership of the Plans 1 moves to 100 percent retired status and the Plans 1 remain in the CTF, it may become necessary to use separate investment return assumptions for these plans. We considered making this change, but do not recommend plan specific rate of return assumptions at this time.

The liabilities of the Plans 1 show less sensitivity to the investment return assumption than the liabilities of the Plans 2/3. This occurs because the Plans 1 have been closed to new entrants since 1977 and all the benefits will be paid well before the last Plans 2/3 benefits. As a result, we say the Plan 1 liabilities have a shorter duration than the liabilities of the Plans 2/3 and would require a shorter measurement period. However, the Plans 2/3 have members who just entered the system and will remain members for a long time. The liabilities for these plans show much more sensitivity to the interest rate assumption. The liabilities of the Plans 2/3 have long durations and require long measurement periods.

Ideally, the rate of return assumption would be coordinated with the WSIB's current asset allocation policy, or targets, for the CTF. As of the date of this communication, the WSIB reviewed their asset allocation policy and decided not to make significant changes. We based the recommendation on the current asset allocation policy. Future changes to the CTF asset allocation policy may require a new recommendation for the rate of return assumption.

*Best-Estimate Range:*

6.25 percent to 8.875 percent

*Recommendation:*

7.50 percent

*Current Assumption:*

8.00 percent

*Data:*

Historical Plan Performance (**Appendix E**)

Historical Investment Data - Current Allocations (**Appendix F**)

Historical Investment Data - Alternate Allocations (**Appendix G**)

Simulated Future Returns based on WSIB capital market assumptions (**Appendix H**)

*Analysis:*

We reviewed the experience data provided in Appendices E-G and relied upon the capital market assumptions provided by the Washington State Investment Board (WSIB). We used the capital market assumptions (CMAs) to determine rate of return simulations. We used those simulated returns to set the best-estimate range and the recommended rate of return assumption.

The CMAs include three pieces of information for each class of assets the WSIB might choose to invest in, - the

- ❖ Expected annual return.
- ❖ Standard deviation of the annual return.
- ❖ Correlations between the annual returns of each asset class with every other asset class.

The WSIB set the 2009 CMAs with a 15 year time horizon. Due to the large loss in 2009, the assumed rates of return include some reversion to the mean. That is, they were set higher to reflect short-term expectations.

In consultation with the WSIB staff, we used the following changes to the CMAs. We used the rates of return from the 2008 CMAs. These assumptions equal the 2009 rates of return with the reversion to the mean removed. We felt this was reasonable since the time horizon for the pension plans is much longer than 15 years. WSIB staff suggested one change to the 2008 rates of return, lower the expected premium on private equity above public equity from 4.00% to 3.00%, consistent with the 2009 expectations. Otherwise we used the 2009 standard deviations and correlations.

We set the best estimate range equal to the 75<sup>th</sup> and 25<sup>th</sup> percentile of the simulated 50-year compound annual rate of return distribution. We selected the best estimate as approximately equal to the median of the simulated returns. As described in the Inflation section, the rate of return assumption uses broad economic inflation as its base building block. Since the best estimate for that assumption equals 2.50 percent, the remaining building block, the real rate of investment return, equals 5.00 percent.

However, the current, legislatively prescribed, rate of return assumption of 8.00 percent falls within the best-estimate range and is reasonable.

### ***Growth in System Membership***

We use this assumption in the valuation in the amortization of Plan 1 UAAL. LEOFF Plan 1 does not currently have a UAAL. The UAAL in PERS and TRS Plan 1 must be amortized over a rolling ten-year period, as a percentage of projected payrolls. The projected payroll includes pay from PERS, SERS, TRS Plans 2/3, and PSERS Plan 2 as well as projected payroll from future new members. We use the growth in system membership assumption to estimate the payroll for future new members.

Best-Estimate Range:

0.25 percent to 1.50 percent for TRS  
1.00 percent to 2.25 percent for PERS, SERS, and PSERS

Recommendation:

0.90 percent for TRS  
1.15 percent for PERS, SERS, and PSERS

Current Assumption:

0.90 percent for TRS  
1.25 percent for PERS, SERS, and PSERS

Data:

Growth in System Membership Data (**Appendix I**)  
Growth in Washington State Population (**Appendix J**)

Analysis:

We based the best-estimate ranges on actual retirement system membership growth since 1982. System growth in all plans declined from an average of just over 2.50 percent since 1982, to an average of just over 1.00 percent over the last five years. When we look at LEOFF separate from the other systems we see a similar pattern, but with a much slower decrease in growth. Average annual LEOFF system growth only drops below 2.00 percent when we look at the last 5 years.

We also reviewed historical data from the Office of Financial Management (OFM) for state population, state FTE counts, and K-12 and Higher Education enrollment counts. OFM projects declining state population growth – leveling off at 0.90 percent per year in 2030. The combined retirement system growth and the growth of the state population show a correlation of about 0.98. K-12 enrollment and TRS system growth shows a correlation of about 0.96. A correlation of zero indicates no correlation; whereas a correlation of one indicates a perfect correlation. For more data from OFM, please visit their website at [www.ofm.wa.gov](http://www.ofm.wa.gov).

I recommend maintaining the 0.90 percent growth in system membership assumption for TRS. I recommend lowering the assumption from 1.25 percent in PERS, SERS, and PSERS to 1.15 percent. Should LEOFF 1 come out of fully funded status and the previous funding method gets reinstated, we would likely recommend using the assumptions adopted by the LEOFF 2 Retirement Board for LEOFF 1 funding. For information on the system growth assumption we recommend for the LEOFF 2 Board please see their separate Report on Long-Term Economic Assumptions.

However, the current, legislatively prescribed assumptions fall within the best-estimate ranges and are reasonable.

### ***Budget Impact of Adopting the Recommended Assumptions***

We developed projected contribution rates based on both the current and recommended set of economic assumptions. Since the system growth assumption impacts actual future salaries, we applied both sets of contribution rates to salaries projected using the recommended system growth assumptions.

In the short to medium-term, adopting the recommended assumptions would increase required contributions relative to the contributions required under the current assumptions. In the long-term adopting the recommended assumptions decreases the required contributions relative to the contributions required under the current assumptions. The contributions shown below clearly demonstrate the first comparison. The second point is not clearly shown. In the long-term, the contribution rates fall below the minimum contribution rates. Using the recommended assumptions results in higher minimum contribution rates than those calculated using the current assumptions. Because of the higher minimum contribution rates, the long-term savings caused by using the recommended assumptions does not show up in the summarized contribution dollars. Instead, the plans retain the long-term savings and show healthier funded statuses. The table below shows the additional contributions required to fund the plans using the recommended assumptions.

<b>GF-S and Total Employer Contributions (\$ in Millions)</b>							
<b>09-11 Biennium</b>	<b>PERS</b>	<b>TRS</b>	<b>SERS</b>	<b>PSERS</b>	<b>LEOFF</b>	<b>WSPRS</b>	<b>All Systems</b>
GF-S	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total Employer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>11-13 Biennium</b>							
GF-S	72.9	142.1	25.1	3.7	0.0	0.2	244.0
Total Employer	365.9	214.4	56.3	5.2	0.0	2.7	644.5
<b>50 Year Totals</b>							
GF-S	951.4	1,571.4	411.5	-38.2	-64.6	0.9	2,832.5
Total Employer	\$4,776.3	\$2,370.1	\$923.0	-\$53.8	-\$64.6	\$11.7	\$7,962.8

Note: Excludes LEOFF 2

O:\PFC\2009\9-11-2009\_revised\3.Report\_on\_Long-Term\_Economic\_Assumptions\_Revised.docx



# Office of the State Actuary

*"Securing tomorrow's pensions today."*

## **Actuarial Certification**

### **Report on Long-Term Economic Assumptions**

September 11, 2009

This report documents the results of an economic experience study of the retirement plans defined under Chapters 41.26 (excluding LEOFF 2), 41.32, 41.35, 41.37, 41.40, and 43.43 of the Revised Code of Washington. The primary purpose of this report is to assist the Pension Funding Council in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035. This report should not be used for other purposes.

An economic experience study involves comparing actual economic experience with the assumptions we made for applicable experience study periods. We also review other relevant data to form expectations for the future. The analysis concludes with the selection of a recommended set of economic assumptions. We use Actuarial Standard of Practice Number 27 (ASOP 27), titled Selection of Economic Assumptions for Measuring Pension Obligations, to guide our work in this area.

This economic experience study includes the most recent and available plan provisions and participant and asset data. Plan provisions reflect changes from the 2008 Legislative Session. We did not include supplemental contribution rates from the 2009 Legislative Session. Participant data reflects preliminary retirement system census data through June 30, 2008. Asset data reflects preliminary returns through June 30, 2009.

The Department of Retirement Systems provided preliminary 2008 member and beneficiary data to us. We checked the data for reasonableness as appropriate based on the purpose of this experience study. The Washington State Investment Board (WSIB) provided preliminary asset information as of June 30, 2009. An audit of the financial and participant data was not performed. I relied on all the information provided as complete and accurate. In my opinion, this information is adequate and substantially complete for purposes of this experience study.

We relied on the capital market assumptions (CMAs) from the WSIB to formulate expectations for future rates of investment return. We reviewed the CMAs for reasonableness as appropriate based on the purpose of this experiences study.

The recommendations in this experience study involve the interpretation of many factors and the application of professional judgment. I believe that the data,



assumptions, and methods used in the underlying experience study are reasonable and appropriate for the primary purpose stated above. The use of another set of data, assumptions, and methods, however, could also be reasonable and could produce materially different results. Another actuary may review the results of this analysis and reach different conclusions.

In my opinion, all methods, assumptions, and calculations are reasonable and are in conformity with generally accepted actuarial principles and applicable standards of practice as of the date of this publication.

The undersigned, with actuarial credentials, meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Sincerely,

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

*O:\PFC\2009\9-11-2009\_revised\4.Certification\_Letter\_Revised.docx*

## **Section III**

### **Appendices**





## Appendices

The data and information contained in the following appendices supports the analysis in the previous report. Since we intended for readers to use this report in its entirety, this data should not be used or distributed independent of this analysis.

### Appendix A

Inflation Data						
Year	Seattle-Tacoma-Bremerton, WA CPI-W	U.S. City Average CPI-W	GDP Deflator for Personal Consumption Expenditures	Annual % Change		
				Seattle CPI-W	U.S. CPI-W	GDP PCE
1950	70.3	72.1	16.675	1.44%	0.98%	1.22%
1951	75.7	77.8	17.805	7.68%	7.91%	6.78%
1952	77.6	79.5	18.169	2.51%	2.19%	2.04%
1953	78.6	80.1	18.416	1.29%	0.75%	1.36%
1954	78.6	80.5	18.585	0.00%	0.50%	0.92%
1955	79.0	80.2	18.676	0.51%	-0.37%	0.49%
1956	80.0	81.4	19.059	1.27%	1.50%	2.05%
1957	83.3	84.3	19.639	4.13%	3.56%	3.04%
1958	85.2	86.6	20.117	2.28%	2.73%	2.43%
1959	86.8	87.3	20.432	1.88%	0.81%	1.57%
1960	87.9	88.7	20.767	1.27%	1.60%	1.64%
1961	89.3	89.6	20.985	1.59%	1.01%	1.05%
1962	90.6	90.6	21.232	1.46%	1.12%	1.18%
1963	92.1	91.7	21.479	1.66%	1.21%	1.16%
1964	93.4	92.9	21.786	1.41%	1.31%	1.43%
1965	94.5	94.5	22.103	1.18%	1.72%	1.46%
1966	97.1	97.2	22.662	2.75%	2.86%	2.53%
1967	100.0	100.0	23.237	2.99%	2.88%	2.54%
1968	104.1	104.2	24.151	4.10%	4.20%	3.93%
1969	109.2	109.8	25.255	4.90%	5.37%	4.57%
1970	114.0	116.3	26.448	4.40%	5.92%	4.72%
1971	116.4	121.3	27.574	2.11%	4.30%	4.26%
1972	119.7	125.3	28.528	2.84%	3.30%	3.46%
1973	127.5	133.1	30.081	6.52%	6.23%	5.44%
1974	141.5	147.7	33.191	10.98%	10.97%	10.34%
1975	155.8	161.2	35.955	10.11%	9.14%	8.33%
1976	164.5	170.5	37.948	5.58%	5.77%	5.54%
1977	177.6	181.5	40.410	7.96%	6.45%	6.49%
1978	193.8	195.3	43.248	9.12%	7.60%	7.02%
1979	214.6	217.7	47.059	10.73%	11.47%	8.81%
1980	249.1	247.0	52.078	16.08%	13.46%	10.67%
1981	276.1	272.3	56.720	10.84%	10.24%	8.91%
1982	294.0	288.6	59.859	6.48%	5.99%	5.53%

Inflation Data						
Year	Seattle-Tacoma-Bremerton, WA CPI-W	U.S. City Average CPI-W	GDP Deflator for Personal Consumption Expenditures	Annual % Change		
				Seattle CPI-W	U.S. CPI-W	GDP PCE
1983	293.2	297.4	62.436	-0.27%	3.05%	4.31%
1984	302.8	307.6	64.795	3.27%	3.43%	3.78%
1985	309.1	318.5	66.936	2.08%	3.54%	3.30%
1986	311.3	323.4	68.569	0.71%	1.54%	2.44%
1987	318.6	335.0	70.947	2.35%	3.59%	3.47%
1988	329.1	348.4	73.755	3.30%	4.00%	3.96%
1989	344.5	365.2	76.972	4.68%	4.82%	4.36%
1990	369.0	384.4	80.498	7.11%	5.26%	4.58%
1991	389.4	399.9	83.419	5.53%	4.03%	3.63%
1992	403.2	411.5	85.824	3.54%	2.90%	2.88%
1993	415.2	423.1	87.804	2.98%	2.82%	2.31%
1994	430.4	433.8	89.654	3.66%	2.53%	2.11%
1995	442.9	446.1	91.577	2.90%	2.84%	2.14%
1996	457.5	459.1	93.547	3.30%	2.91%	2.15%
1997	471.7	469.3	95.124	3.10%	2.22%	1.69%
1998	484.1	475.6	95.978	2.63%	1.34%	0.90%
1999	499.1	486.2	97.575	3.10%	2.23%	1.66%
2000	517.8	503.1	100.000	3.75%	3.48%	2.49%
2001	536.2	516.8	102.094	3.55%	2.72%	2.09%
2002	545.9	523.9	103.542	1.81%	1.37%	1.42%
2003	553.6	535.6	105.597	1.41%	2.23%	1.98%
2004	562.3	549.5	108.373	1.57%	2.60%	2.63%
2005	579.3	568.9	111.493	3.02%	3.53%	2.88%
2006	600.9	587.2	114.552	3.73%	3.22%	2.74%
2007	623.7	604.0	117.625	3.79%	2.86%	2.68%
2008	651.6	628.7	121.559	4.48%	4.09%	3.34%
Geometric Averages						
All years				3.87%	3.76%	3.45%
Last 30 years				4.12%	3.97%	3.50%
Last 25 years				3.25%	3.04%	2.70%
Last 20 years				3.47%	3.00%	2.53%
Last 10 years				3.02%	2.83%	2.39%

Data sources: Department of Labor, Bureau of Labor Statistics (BLS) and Department of Commerce, Bureau of Economic Analysis (BEA).

## Appendix B

Growth in Salaries*									
Year	Plan 1			Plans 2/3			All Plans		
	Average Salary		%	Average Salary		%	Average Salary		%
	BOY	EOY	Change	BOY	EOY	Change	BOY	EOY	Change
1984	23,621	25,191	6.65%	19,134	20,793	8.67%	23,621	25,191	6.65%
1985	25,094	26,825	6.90%	19,994	22,010	10.08%	25,094	26,825	6.90%
1986	26,741	27,832	4.08%	21,348	22,815	6.87%	26,741	27,832	4.08%
1987	27,754	28,780	3.70%	22,281	23,971	7.58%	27,754	28,780	3.70%
1988	28,681	30,094	4.93%	23,458	24,865	6.00%	28,681	30,094	4.93%
1989	29,989	31,610	5.41%	24,307	26,033	7.10%	29,989	31,610	5.41%
1990	31,458	33,619	6.87%	25,499	27,835	9.16%	31,458	33,619	6.87%
1991	33,563	36,712	9.38%	27,200	29,934	10.05%	33,563	36,712	9.38%
1992	36,611	38,706	5.72%	29,109	30,891	6.12%	36,611	38,706	5.72%
1993	38,415	40,430	5.25%	29,942	31,976	6.79%	38,415	40,430	5.25%
1994	40,140	40,942	2.00%	31,297	32,540	3.97%	40,140	40,942	2.00%
1995	40,823	41,995	2.87%	32,079	33,568	4.64%	40,823	41,995	2.87%
1996	41,884	43,737	4.42%	33,074	34,956	5.69%	41,884	43,737	4.42%
1997	43,614	44,709	2.51%	34,508	35,993	4.30%	43,614	44,709	2.51%
1998	44,500	46,304	4.05%	35,481	37,107	4.58%	44,500	46,304	4.05%
1999	46,067	47,492	3.09%	36,545	38,310	4.83%	46,067	47,492	3.09%
2000	47,207	49,733	5.35%	37,680	40,045	6.28%	47,207	49,733	5.35%
2001	48,941	50,977	4.16%	39,259	41,152	4.82%	48,941	50,977	4.16%
2002	50,508	52,925	4.79%	40,370	42,897	6.26%	50,508	52,925	4.79%
2003	52,466	54,330	3.55%	42,370	44,451	4.91%	52,466	54,330	3.55%
2004	53,811	54,835	1.90%	43,917	45,494	3.59%	53,811	54,835	1.90%
2005	54,389	55,749	2.50%	45,136	46,998	4.13%	54,389	55,749	2.50%
2006	55,231	57,460	4.04%	46,442	48,827	5.14%	55,231	57,460	4.04%
2007	56,826	58,868	3.59%	48,089	50,286	4.57%	56,826	58,868	3.59%
2008	58,706	62,280	6.09%	49,672	53,435	7.58%	58,706	62,280	6.09%
Geometric Averages									
	Plan 1			Plans 2/3			All Plans		
Total Period	4.54%			6.13%			5.48%		
Last 20 Years	4.36%			5.71%			5.32%		
Last 15 Years	3.65%			5.01%			4.71%		
Last 10 Years	3.90%			5.20%			5.00%		
Last 5 Years	3.61%			4.99%			4.83%		

\*Among those members active at least three years in a row. Excludes first year salary increase.

Note: BOY stands for Beginning of Year; EOY stands for End of Year.

## Appendix C

Growth in Salaries*				
PERS - All plans				
Salaries				
Year	Count	Total	Average	% Change*
1982	103,284	\$1,922,009,071	\$18,609	
1983	107,777	\$2,083,987,099	\$19,336	3.91%
1984	112,740	\$2,263,886,046	\$20,081	3.85%
1985	117,112	\$2,523,732,620	\$21,550	7.32%
1986	119,469	\$2,668,215,867	\$22,334	3.64%
1987	125,581	\$2,930,318,938	\$23,334	4.48%
1988	133,210	\$3,184,848,016	\$23,908	2.46%
1989	139,146	\$3,453,163,306	\$24,817	3.80%
1990	150,241	\$3,910,916,032	\$26,031	4.89%
1991	165,008	\$4,597,812,925	\$27,864	7.04%
1992	171,947	\$4,905,538,244	\$28,529	2.39%
1993	174,576	\$5,196,025,639	\$29,764	4.33%
1994	177,456	\$5,327,554,117	\$30,022	0.87%
1995	178,833	\$5,525,275,211	\$30,896	2.91%
1996	182,603	\$5,817,349,997	\$31,858	3.11%
1997	186,440	\$6,078,153,763	\$32,601	2.33%
1998	191,850	\$6,364,569,143	\$33,175	1.76%
1999	196,382	\$6,730,408,684	\$34,272	3.31%
2000	152,261	\$6,096,351,570	\$40,039	16.83%**
2001	152,936	\$6,333,889,555	\$41,415	3.44%
2002	154,185	\$6,683,833,053	\$43,349	4.67%
2003	154,550	\$6,874,132,701	\$44,478	2.60%
2004	156,256	\$7,083,167,802	\$45,331	1.92%
2005	155,578	\$7,230,590,053	\$46,476	2.53%
2006	155,027	\$7,496,020,876	\$48,353	4.04%**
2007	158,022	\$7,832,992,303	\$49,569	2.51%
2008	161,668	\$8,507,753,236	\$52,625	6.16%
Geometric Averages				
				PERS
Total Period				4.08%
Last 20 Years				4.02%
Last 15 Years				3.87%
Last 10 Years				4.72%
Last 5 Years				3.42%

\* % Change in Average Salaries.

\*\* New System Created.

<b>Growth in Salaries*</b>				
<b>SERS - All plans</b>				
<b>Salaries</b>				
<b>Year</b>	<b>Count</b>	<b>Total</b>	<b>Average</b>	<b>% Change*</b>
2000	47,725	\$1,012,130,843	\$21,208	
2001	48,347	\$1,003,737,911	\$20,761	(2.11%)
2002	49,791	\$1,085,774,473	\$21,807	5.04%
2003	49,214	\$1,132,618,032	\$23,014	5.54%
2004	49,854	\$1,168,251,347	\$23,433	1.82%
2005	50,350	\$1,201,321,625	\$23,859	1.82%
2006	50,818	\$1,242,883,648	\$24,458	2.51%
2007	50,825	\$1,282,739,869	\$25,238	3.19%
2008	51,774	\$1,379,480,319	\$26,644	5.57%
<b>Geometric Averages:</b>				
				<b>SERS</b>
Total Period				2.89%
Last 20 Years				NA
Last 15 Years				NA
Last 10 Years				NA
Last 5 Years				2.97%

\* % Change in Average Salaries.

<b>Growth in Salaries*</b>				
<b>PSERS - All plans</b>				
<b>Salaries</b>				
<b>Year</b>	<b>Count</b>	<b>Total</b>	<b>Average</b>	<b>% Change*</b>
2006	2,073	\$103,056,513	\$49,714	
2007	2,755	\$134,195,429	\$48,710	(2.02%)
2008	3,981	\$199,968,558	\$50,231	3.12%
<b>Geometric Averages</b>				
				<b>PSERS</b>
Total Period				0.52%
Last 20 Years				NA
Last 15 Years				NA
Last 10 Years				NA
Last 5 Years				NA

\* % Change in Average Salaries.

<b>Growth in Salaries*</b>				
<b>TRS - All plans</b>				
<b>Salaries</b>				
<b>Year</b>	<b>Count</b>	<b>Total</b>	<b>Average</b>	<b>% Change*</b>
1982	44,408	\$1,099,192,895	\$24,752	
1983	43,449	\$1,072,053,504	\$24,674	(0.32%)
1984	44,817	\$1,177,491,105	\$26,273	6.48%
1985	45,687	\$1,254,539,625	\$27,459	4.51%
1986	46,489	\$1,317,903,232	\$28,349	3.24%
1987	47,210	\$1,362,294,360	\$28,856	1.79%
1988	48,355	\$1,458,307,972	\$30,158	4.51%
1989	49,189	\$1,562,003,993	\$31,755	5.29%
1990	51,323	\$1,717,585,470	\$33,466	5.39%
1991	52,779	\$1,932,854,682	\$36,622	9.43%
1992	55,276	\$2,118,834,558	\$38,332	4.67%
1993	56,571	\$2,288,712,468	\$40,457	5.54%
1994	57,731	\$2,349,973,752	\$40,706	0.61%
1995	59,103	\$2,437,088,503	\$41,235	1.30%
1996	59,425	\$2,561,961,042	\$43,113	4.55%
1997	60,815	\$2,632,238,663	\$43,283	0.39%
1998	61,828	\$2,754,452,811	\$44,550	2.93%
1999	62,684	\$2,803,036,295	\$44,717	0.37%
2000	63,858	\$3,000,553,335	\$46,988	5.08%
2001	66,220	\$3,152,203,993	\$47,602	1.31%
2002	66,063	\$3,263,893,154	\$49,406	3.79%
2003	66,075	\$3,415,392,955	\$51,690	4.62%
2004	66,634	\$3,493,972,824	\$52,435	1.44%
2005	67,270	\$3,604,284,885	\$53,579	2.18%
2006	67,736	\$3,703,519,435	\$54,676	2.05%
2007	64,939	\$3,743,844,133	\$57,652	5.44%
2008	66,524	\$4,053,847,954	\$60,938	5.70%
<b>Geometric Averages</b>				
				<b>TRS</b>
Total Period				3.53%
Last 20 Years				3.58%
Last 15 Years				2.77%
Last 10 Years				3.18%
Last 5 Years				3.35%

\* % Change in Average Salaries.

<b>Growth in Salaries*</b>				
<b>LEOFF - All plans</b>				
<b>Salaries</b>				
<b>Year</b>	<b>Count</b>	<b>Total</b>	<b>Average</b>	<b>% Change*</b>
1982	8,975	\$235,978,892	\$26,293	
1983	9,187	\$256,387,286	\$27,908	6.14%
1984	9,374	\$276,133,441	\$29,457	5.55%
1985	9,599	\$294,702,177	\$30,701	4.22%
1986	9,720	\$313,948,627	\$32,299	5.20%
1987	10,015	\$327,536,134	\$32,705	1.25%
1988	10,454	\$363,161,671	\$34,739	6.22%
1989	10,785	\$384,702,575	\$35,670	2.68%
1990	11,260	\$428,874,768	\$38,088	6.78%
1991	11,736	\$467,926,848	\$39,871	4.68%
1992	11,979	\$506,563,882	\$42,288	6.06%
1993	12,255	\$545,894,511	\$44,545	5.34%
1994	12,725	\$591,694,565	\$46,499	4.39%
1995	13,125	\$635,768,105	\$48,439	4.17%
1996	13,420	\$675,684,696	\$50,349	3.94%
1997	13,714	\$719,113,751	\$52,436	4.15%
1998	13,856	\$766,141,882	\$55,293	5.45%
1999	14,456	\$830,801,430	\$57,471	3.94%
2000	14,632	\$875,118,695	\$59,809	4.07%
2001	14,900	\$917,312,451	\$61,565	2.94%
2002	15,158	\$981,473,315	\$64,750	5.17%
2003	15,551	\$1,037,889,562	\$66,741	3.08%
2004	15,602	\$1,083,253,110	\$69,430	4.03%
2005	15,891	\$1,148,099,507	\$72,248	4.06%
2006	16,314	\$1,220,018,724	\$74,784	3.51%
2007	16,612	\$1,276,412,477	\$76,837	2.75%
2008	17,047	\$1,381,930,351	\$81,066	5.50%
<b>Geometric Averages</b>				<b>LEOFF</b>
Total Period				4.43%
Last 20 Years				4.33%
Last 15 Years				4.07%
Last 10 Years				3.90%
Last 5 Years				3.97%

\* % Change in Average Salaries.

<b>Growth in Salaries*</b>				
<b>WSPRS - All plans</b>				
<b>Salaries</b>				
<b>Year</b>	<b>Count</b>	<b>Total</b>	<b>Average</b>	<b>% Change*</b>
1982	740	\$21,882,563	\$29,571	
1983	772	\$22,042,620	\$28,553	(3.44%)
1984	742	\$23,880,828	\$32,184	12.72%
1985	728	\$24,030,731	\$33,009	2.56%
1986	815	\$25,589,960	\$31,399	(4.88%)
1987	844	\$27,978,176	\$33,149	5.58%
1988	860	\$29,138,186	\$33,882	2.21%
1989	866	\$30,552,770	\$35,280	4.13%
1990	897	\$32,971,640	\$36,758	4.19%
1991	993	\$40,108,046	\$40,391	9.88%
1992	1,012	\$41,966,154	\$41,469	2.67%
1993	976	\$41,971,127	\$43,003	3.70%
1994	958	\$42,027,517	\$43,870	2.02%
1995	901	\$41,447,306	\$46,001	4.86%
1996	917	\$44,407,961	\$48,427	5.27%
1997	927	\$48,421,776	\$52,235	7.86%
1998	929	\$50,948,202	\$54,842	4.99%
1999	968	\$55,655,807	\$57,496	4.84%
2000	1,013	\$58,495,331	\$57,745	0.43%
2001	1,027	\$60,215,883	\$58,633	1.54%
2002	1,035	\$62,536,583	\$60,422	3.05%
2003	1,079	\$66,025,472	\$61,191	1.27%
2004	1,057	\$64,507,991	\$61,029	(0.26%)
2005	1,022	\$65,312,340	\$63,906	4.71%
2006	1,022	\$69,127,265	\$67,639	5.84%
2007	1,037	\$71,870,152	\$69,306	2.46%
2008	1,085	\$78,707,738	\$72,542	4.67%
<b>Geometric Averages</b>				
				<b>WSPRS</b>
Total Period				3.51%
Last 20 Years				3.88%
Last 15 Years				3.55%
Last 10 Years				2.84%
Last 5 Years				3.46%

\* % Change in Average Salaries.

<b>Growth in Salaries*</b>				
<b>Year</b>	<b>All Systems - All plans</b>			
	<b>Salaries</b>			<b>%</b>
	<b>Count</b>	<b>Total</b>	<b>Average</b>	<b>Change*</b>
1982	157,407	\$3,279,063,421	\$20,832	
1983	161,185	\$3,434,470,509	\$21,308	2.28%
1984	167,673	\$3,741,391,420	\$22,314	4.72%
1985	173,126	\$4,097,005,153	\$23,665	6.06%
1986	176,493	\$4,325,657,686	\$24,509	3.57%
1987	183,650	\$4,648,127,608	\$25,310	3.27%
1988	192,879	\$5,035,455,845	\$26,107	3.15%
1989	199,986	\$5,430,422,644	\$27,154	4.01%
1990	213,721	\$6,090,347,910	\$28,497	4.94%
1991	230,516	\$7,038,702,501	\$30,535	7.15%
1992	240,214	\$7,572,902,838	\$31,526	3.25%
1993	244,378	\$8,072,603,745	\$33,033	4.78%
1994	248,870	\$8,311,249,951	\$33,396	1.10%
1995	251,962	\$8,639,579,125	\$34,289	2.67%
1996	256,365	\$9,099,403,696	\$35,494	3.51%
1997	261,896	\$9,477,927,953	\$36,190	1.96%
1998	268,463	\$9,936,112,038	\$37,011	2.27%
1999	274,490	\$10,419,902,216	\$37,961	2.57%
2000	279,489	\$11,042,649,774	\$39,510	4.08%
2001	283,430	\$11,467,359,793	\$40,459	2.40%
2002	286,232	\$12,077,510,578	\$42,195	4.29%
2003	286,469	\$12,526,058,722	\$43,726	3.63%
2004	289,403	\$12,893,153,074	\$44,551	1.89%
2005	290,111	\$13,249,608,410	\$45,671	2.51%
2006	292,990	\$13,834,626,461	\$47,219	3.39%
2007	294,190	\$14,342,054,363	\$48,751	3.24%
2008	302,079	\$15,601,688,156	\$51,648	5.94%
<b>Geometric Averages</b>				
				<b>All Systems</b>
Total Period				3.55%
Last 20 Years				3.47%
Last 15 Years				3.02%
Last 10 Years				3.39%
Last 5 Years				3.39%

\* % Change in Average Salaries.

<b>Growth in Salaries*</b>				
<b>All Systems except LEOFF - All plans</b>				
<b>Salaries</b>				
<b>Year</b>	<b>Count</b>	<b>Total</b>	<b>Average</b>	<b>% Change*</b>
1982	154,654	\$3,214,952,212	\$20,788	
1983	157,931	\$3,352,551,322	\$21,228	2.12%
1984	164,019	\$3,643,038,597	\$22,211	4.63%
1985	169,023	\$3,980,613,166	\$23,551	6.03%
1986	171,984	\$4,189,536,920	\$24,360	3.44%
1987	178,708	\$4,494,538,331	\$25,150	3.24%
1988	187,288	\$4,851,492,502	\$25,904	3.00%
1989	193,828	\$5,220,895,816	\$26,936	3.98%
1990	206,824	\$5,837,498,115	\$28,224	4.78%
1991	222,842	\$6,744,134,001	\$30,264	7.23%
1992	232,020	\$7,237,596,173	\$31,194	3.07%
1993	235,599	\$7,691,265,828	\$32,646	4.65%
1994	239,330	\$7,876,655,802	\$32,911	0.81%
1995	241,763	\$8,154,162,230	\$33,728	2.48%
1996	245,538	\$8,561,237,438	\$34,867	3.38%
1997	250,495	\$8,886,832,302	\$35,477	1.75%
1998	256,593	\$9,286,827,854	\$36,193	2.02%
1999	261,777	\$9,694,870,528	\$37,035	2.33%
2000	266,356	\$10,262,412,249	\$38,529	4.03%
2001	269,845	\$10,636,782,868	\$39,418	2.31%
2002	272,221	\$11,175,945,329	\$41,055	4.15%
2003	271,909	\$11,559,445,436	\$42,512	3.55%
2004	274,649	\$11,873,687,999	\$43,232	1.69%
2005	274,943	\$12,157,280,062	\$44,217	2.28%
2006	277,272	\$12,662,663,156	\$45,669	3.28%
2007	278,091	\$13,108,355,357	\$47,137	3.21%
2008	285,453	\$14,256,835,454	\$49,945	5.96%
<b>Geometric Averages:</b>				
				<b>All Systems Except LEOFF</b>
Total Period				3.43%
Last 20 Years				3.34%
Last 15 Years				2.88%
Last 10 Years				3.27%
Last 5 Years				3.27%

\* % Change in Average Salaries.

<b>Growth in Salaries*</b>				
<b>PERS, SERS, PSERS - All plans</b>				
<b>Salaries</b>				
<b>Year</b>	<b>Count</b>	<b>Total</b>	<b>Average</b>	<b>% Change*</b>
1982	103,284	\$1,922,009,071	\$18,609	
1983	107,777	\$2,083,987,099	\$19,336	3.91%
1984	112,740	\$2,263,886,046	\$20,081	3.85%
1985	117,112	\$2,523,732,620	\$21,550	7.32%
1986	119,469	\$2,668,215,867	\$22,334	3.64%
1987	125,581	\$2,930,318,938	\$23,334	4.48%
1988	133,210	\$3,184,848,016	\$23,908	2.46%
1989	139,146	\$3,453,163,306	\$24,817	3.80%
1990	150,241	\$3,910,916,032	\$26,031	4.89%
1991	165,008	\$4,597,812,925	\$27,864	7.04%
1992	171,947	\$4,905,538,244	\$28,529	2.39%
1993	174,576	\$5,196,025,639	\$29,764	4.33%
1994	177,456	\$5,327,554,117	\$30,022	0.87%
1995	178,833	\$5,525,275,211	\$30,896	2.91%
1996	182,603	\$5,817,349,997	\$31,858	3.11%
1997	186,440	\$6,078,153,763	\$32,601	2.33%
1998	191,850	\$6,364,569,143	\$33,175	1.76%
1999	196,382	\$6,730,408,684	\$34,272	3.31%
2000	199,986	\$7,108,482,413	\$35,545	3.71%
2001	201,283	\$7,337,627,466	\$36,454	2.56%
2002	203,976	\$7,769,607,526	\$38,091	4.49%
2003	203,764	\$8,006,750,733	\$39,294	3.16%
2004	206,110	\$8,251,419,149	\$40,034	1.88%
2005	205,928	\$8,431,911,678	\$40,946	2.28%
2006	207,918	\$8,841,961,037	\$42,526	3.86%
2007	211,602	\$9,249,927,601	\$43,714	2.79%
2008	217,423	\$10,087,202,113	\$46,394	6.13%
<b>Geometric Averages</b>				<b>PERS, SERS, &amp; PSERS</b>
Total Period				3.58%
Last 20 Years				3.37%
Last 15 Years				3.00%
Last 10 Years				3.41%
Last 5 Years				3.38%

\* % Change in Average Salaries.

## Appendix D

System Specific General Salary Growth*	
System	General Salary Growth
PERS	4.01%
TRS	3.75%
SERS	3.76%
LEOFF	3.98%
WSPRS	4.54%

*Note: Not enough data for PSERS.*

*\*Produced using method used to develop the Merit Scales,  
includes only members who earn full-time service credit.*

**Appendix E**

<b>Historical Plan Performance</b>		
<b>Fiscal Year Ending June 30</b>	<b>Investment Return</b>	
1982	2.50%	
1983	47.30%	
1984	(0.03%)	
1985	29.80%	
1986	26.90%	
1987	16.90%	
1988	4.20%	
1989	13.50%	
1990	8.30%	
1991	9.50%	
1992	8.20%	
1993	13.07%	
1994	2.10%	
1995	16.24%	
1996	16.49%	
1997	20.18%	
1998	17.12%	
1999	11.76%	
2000	13.56%	
2001	(6.75%)	
2002	(5.15%)	
2003	3.02%	
2004	16.72%	
2005	13.05%	
2006	16.70%	
2007	21.33%	
2008	(1.22%)	
2009	(22.84%)	
<b>Geometric Averages</b>	<b>2007</b>	<b>2009</b>
Total Period	12.42%	10.40%
Last 20 Years	10.38%	7.99%
Last 10 Years	9.73%	3.95%

*Source: Washington State Investment Board Returns restated for 1993 and beyond.*

## Appendix F

Historical Investment Data							
Year	Investment Return	Year	Investment Return	Year	Investment Return	Year	Investment Return
1926	7.25%	1947	1.40%	1968	13.52%	1989	13.50%
1927	22.51%	1948	2.94%	1969	(11.91%)	1990	8.30%
1928	26.62%	1949	13.74%	1970	2.92%	1991	9.50%
1929	(14.68%)	1950	21.83%	1971	14.03%	1992	8.20%
1930	(16.35%)	1951	9.58%	1972	10.59%	1993	13.07%
1931	(29.83%)	1952	8.44%	1973	(13.14%)	1994	2.10%
1932	0.88%	1953	(0.65%)	1974	(14.54%)	1995	16.24%
1933	57.65%	1954	37.00%	1975	31.50%	1996	16.49%
1934	10.06%	1955	16.63%	1976	29.89%	1997	20.18%
1935	30.46%	1956	1.14%	1977	3.88%	1998	17.12%
1936	31.46%	1957	(4.56%)	1978	8.05%	1999	11.76%
1937	(26.90%)	1958	30.69%	1979	16.66%	2000	13.56%
1938	21.93%	1959	7.91%	1980	20.69%	2001	(6.75%)
1939	1.82%	1960	3.69%	1981	1.77%	2002	(5.15%)
1940	(3.11%)	1961	19.07%	1982	2.50%	2003	3.02%
1941	(5.84%)	1962	(3.39%)	1983	47.30%	2004	16.72%
1942	19.76%	1963	14.97%	1984	(0.03%)	2005	13.05%
1943	32.61%	1964	13.55%	1985	29.80%	2006	16.70%
1944	22.17%	1965	15.09%	1986	26.90%	2007	21.33%
1945	34.70%	1966	(4.74%)	1987	16.90%	2008	(1.22%)
1946	(5.59%)	1967	27.08%	1988	4.20%	2009	(22.84%)

Actual investment return for fiscal years ending June 30, 1982, and thereafter. Returns restated for 1993 and beyond. Estimated investment return prior to 1982.

Geometric Averages		
	2007	2009
Total Period	9.66%	9.29%
Last 60 years	10.51%	9.89%
Last 50 years	10.50%	9.46%
Last 40 years	10.36%	9.81%
Last 30 years	12.13%	10.43%

Rolling 30-year Averages*	
Minimum	7.85%
Maximum	12.69%
Average	10.28%

\* Starting in 1926. Last period ending 2009.

Assumptions*	Allocation		Return
	2007	2009	
Asset Class			
U.S. Equity	23%	37%**	S&P 500.
Non-U.S. Equity	23%	0%	S&P 500.
Fixed Income	25%	25%	Average of long-term corporate and government bond index.
Private Equity	17%	25%	U.S. small cap stock index.
Real Estate	12%	13%	Average of long-term corporate and government bond index.

\* Constant asset allocation from 1926 through 1981. Based on Washington State Investment Board's asset allocation for the given year.

\*\* Global Equity.

## Appendix G

Historical Investment Data							
Year	Investment Return	Year	Investment Return	Year	Investment Return	Year	Investment Return
1926	10.00%	1947	2.43%	1968	7.10%	1989	13.50%
1927	25.77%	1948	4.81%	1969	(7.73%)	1990	8.30%
1928	26.75%	1949	13.23%	1970	8.50%	1991	9.50%
1929	(3.71%)	1950	19.46%	1971	13.43%	1992	8.20%
1930	(12.41%)	1951	13.09%	1972	13.98%	1993	13.07%
1931	(27.44%)	1952	11.96%	1973	(8.79%)	1994	2.10%
1932	0.62%	1953	0.82%	1974	(15.62%)	1995	16.24%
1933	34.46%	1954	34.09%	1975	27.09%	1996	16.49%
1934	3.91%	1955	18.77%	1976	21.38%	1997	20.18%
1935	31.52%	1956	1.46%	1977	(4.10%)	1998	17.12%
1936	23.20%	1957	(3.23%)	1978	3.69%	1999	11.76%
1937	(20.42%)	1958	24.35%	1979	9.98%	2000	13.56%
1938	21.00%	1959	6.53%	1980	18.11%	2001	(6.75%)
1939	1.74%	1960	4.85%	1981	(2.82%)	2002	(5.15%)
1940	(3.97%)	1961	17.29%	1982	2.50%	2003	3.02%
1941	(6.22%)	1962	(2.27%)	1983	47.30%	2004	16.72%
1942	13.37%	1963	14.36%	1984	(0.03%)	2005	13.05%
1943	16.52%	1964	11.54%	1985	29.80%	2006	16.70%
1944	13.36%	1965	7.52%	1986	26.90%	2007	21.33%
1945	24.83%	1966	(5.27%)	1987	16.90%	2008	(1.22%)
1946	(4.52%)	1967	11.56%	1988	4.20%	2009	(22.84%)

Actual investment return for fiscal years ending June 30, 1982 and thereafter. Returns restated for 1993 and beyond. Estimated investment return prior to 1982.

Geometric Averages		
	2007	2009
Total Period	8.93%	8.36%
Last 60 years	9.86%	9.06%
Last 50 years	9.65%	8.44%
Last 40 years	9.88%	9.17%
Last 30 years	11.67%	10.18%

Rolling 30-Year Averages*:	
Minimum	7.04%
Maximum	11.67%
Average	8.95%

\* Starting in 1926. Last period ending 2009.

Assumptions*		
Asset Class	Allocation	Return
Equity	60%	S&P 500
Fixed Income	40%	Average of long-term corporate and government bond index

\*Constant asset allocation from 1926 through 1981. Based on Washington State Investment Board's 2004 asset allocation.

## Appendix H

<b>WSIB Simulated Future Returns</b>			
<b>Portfolio Statistics &amp; Capital Market Assumptions</b>			
<b>2009 Asset Class</b>	<b>Target Allocation</b>	<b>Expected 1-Year Return</b>	<b>Standard Deviation</b>
Global Equity	37%	8.50%	16.90%
U.S. Equity	0%	8.50%	17.00%
Non-U.S. Equity	0%	8.50%	19.00%
Tangible Assets	5%	6.50%	8.00%
Fixed Income	20%	5.25%	4.75%
Private Equity	25%	11.50%	29.00%
Real Estate	13%	8.00%	15.00%
Cash	0%	3.50%	1.50%
<b>Total 2009 Target CTF</b>	<b>100%</b>		
<b>2007</b>			
U.S. Equity	23%	8.50%	17.00%
Non-U.S. Equity	23%	8.50%	18.25%
Fixed Income	25%	5.25%	5.00%
Private Equity	17%	12.50%	31.00%
Real Estate	12%	8.50%	14.50%
Cash	0%	3.75%	1.50%
<b>Total 2007 Target CTF</b>	<b>100%</b>		
<b>Simulated Future Returns</b>			
<b>2009</b>	<b>Measurement Period</b>		
	<b>20 Years</b>	<b>50 Years</b>	
75th percentile	9.65%	8.87%	
60th percentile	8.34%	8.05%	
55th percentile	7.94%	7.80%	
<b>Expected Return</b>	<b>7.60%</b>	<b>7.57%</b>	
45th percentile	7.17%	7.31%	
40th percentile	6.78%	7.07%	
25th percentile	5.51%	6.25%	
<b>2007</b>	<b>Measurement Period</b>		
	<b>20 Years</b>	<b>50 Years</b>	
75th percentile	9.56%	8.83%	
60th percentile	8.32%	8.05%	
55th percentile	7.95%	7.81%	
<b>Expected Return</b>	<b>7.62%</b>	<b>7.60%</b>	
45th percentile	7.22%	7.35%	
40th percentile	6.85%	7.12%	
25th percentile	5.64%	6.35%	

Source: Washington State Investment Board.

## Appendix I

Growth in System Membership Data				
	LEOFF		PERS	
Year	# of Active Members	Annual Growth	# of Active Members	Annual Growth
1980	8,813		110,744	
1981	8,912	1.12%	106,125	(4.17%)
1982	8,975	0.71%	103,284	(2.68%)
1983	9,187	2.36%	107,777	4.35%
1984	9,374	2.04%	112,740	4.60%
1985	9,599	2.40%	117,112	3.88%
1986	9,720	1.26%	119,469	2.01%
1987	10,015	3.03%	125,581	5.12%
1988	10,454	4.38%	133,210	6.07%
1989	10,785	3.17%	139,146	4.46%
1990	11,260	4.40%	150,241	7.97%
1991	11,736	4.23%	165,008	9.83%
1992	11,979	2.07%	171,947	4.21%
1993	12,255	2.30%	174,576	1.53%
1994	12,725	3.84%	177,456	1.65%
1995	13,125	3.14%	178,833	0.78%
1996	13,420	2.25%	182,603	2.11%
1997	13,714	2.19%	186,440	2.10%
1998	13,856	1.04%	191,850	2.90%
1999	14,456	4.33%	196,382	2.36%
2000	14,632	1.22%	152,261	(22.47%)*
2001	14,900	1.83%	152,936	0.44%
2002	15,158	1.73%	154,185	0.82%
2003	15,551	2.59%	154,550	0.24%
2004	15,602	0.33%	156,256	1.10%
2005	15,891	1.85%	155,578	(0.43%)
2006	16,314	2.66%	155,027	(0.35%)*
2007	16,612	1.83%	158,022	1.93%
2008	17,047	2.62%	161,668	2.31%
Geometric Averages				
	All Years			2.38%
	Since 1982			2.50%
	Last 20 Years			2.48%
	Last 15 Years			2.22%
	Last 10 Years			2.09%
	Last 5 Years			1.85%

\* New System created.

<b>Growth in System Membership Data</b>				
	<b>SERS</b>		<b>PSERS</b>	
<b>Year</b>	<b># of Active Members</b>	<b>Annual Growth</b>	<b># of Active Members</b>	<b>Annual Growth</b>
2000	47,725			
2001	48,347	1.30%		
2002	49,791	2.99%		
2003	49,214	(1.16%)		
2004	49,854	1.30%		
2005	50,350	0.99%		
2006	50,818	0.93%	2,073	
2007	50,825	0.01%	2,755	32.90%
2008	51,774	1.87%	3,981	44.50%

<b>Growth in System Membership Data</b>				
	<b>PERS+SERS+PSERS</b>		<b>TRS</b>	
<b>Year</b>	<b># of Active Members</b>	<b>Annual Growth</b>	<b># of Active Members</b>	<b>Annual Growth</b>
1980	110,744		46,247	
1981	106,125	(4.17%)	46,197	(0.11%)
1982	103,284	(2.68%)	44,408	(3.87%)
1983	107,777	4.35%	43,449	(2.16%)
1984	112,740	4.60%	44,817	3.15%
1985	117,112	3.88%	45,687	1.94%
1986	119,469	2.01%	46,489	1.76%
1987	125,581	5.12%	47,210	1.55%
1988	133,210	6.07%	48,355	2.43%
1989	139,146	4.46%	49,189	1.72%
1990	150,241	7.97%	51,323	4.34%
1991	165,008	9.83%	52,779	2.84%
1992	171,947	4.21%	55,276	4.73%
1993	174,576	1.53%	56,571	2.34%
1994	177,456	1.65%	57,731	2.05%
1995	178,833	0.78%	59,103	2.38%
1996	182,603	2.11%	59,425	0.54%
1997	186,440	2.10%	60,815	2.34%
1998	191,850	2.90%	61,828	1.67%
1999	196,382	2.36%	62,684	1.38%
2000	199,986	1.84%	63,858	1.87%
2001	201,283	0.65%	66,220	3.70%
2002	203,976	1.34%	66,063	(0.24%)
2003	203,764	(0.10%)	66,075	0.02%
2004	206,110	1.15%	66,634	0.85%
2005	205,928	(0.09%)	67,270	0.95%
2006	207,918	0.97%	67,736	0.69%
2007	211,602	1.77%	64,939	(4.13%)
2008	217,423	2.75%	66,524	2.44%
<b>Geometric Averages</b>				
All Years		2.44%		1.31%
Since 1982		2.90%		1.57%
Last 20 Years		2.48%		1.61%
Last 15 Years		1.47%		1.09%
Last 10 Years		1.26%		0.73%
Last 5 Years		1.31%		0.14%

## Appendix J

Growth in Washington State Population - Historical and Projected*								
Historical Growth			Projected Growth					
Year	Count	Annual Growth	Year	Count	Annual Growth	Geometric Averages	2007	2009
1980	4,132,156		2010	6,776,595	1.32%	All years	1.49%	1.46%
1981	4,229,278	2.35%	2011	6,870,767	1.39%	Last 25 years	1.66%	1.73%
1982	4,276,549	1.12%	2012	6,971,766	1.47%	Last 20 years	1.80%	1.75%
1983	4,307,247	0.72%	2013	7,073,088	1.45%	Last 15 years		1.48%
1984	4,354,067	1.09%	2014	7,173,618	1.42%	Last 10 years	1.36%	1.38%
1985	4,415,785	1.42%	2015	7,270,329	1.35%	Last 5 years	1.31%	1.63%
1986	4,462,212	1.05%	2016	7,362,889	1.27%	Next 5 years	1.81%	1.41%
1987	4,527,098	1.45%	2017	7,453,679	1.23%	Next 10 years	1.58%	1.33%
1988	4,616,886	1.98%	2018	7,543,650	1.21%	Next 15 years		1.26%
1989	4,728,077	2.41%	2019	7,633,082	1.19%	Next 20 years	1.34%	1.19%
1990	4,866,692	2.93%	2020	7,721,792	1.16%	Next 21 years		1.17%
1991	5,021,335	3.18%	2021	7,809,512	1.14%			
1992	5,141,177	2.39%	2022	7,896,168	1.11%			
1993	5,265,688	2.42%	2023	7,981,701	1.08%			
1994	5,364,338	1.87%	2024	8,066,064	1.06%			
1995	5,470,104	1.97%	2025	8,149,189	1.03%			
1996	5,567,764	1.79%	2026	8,230,930	1.00%			
1997	5,663,763	1.72%	2027	8,311,360	0.98%			
1998	5,750,033	1.52%	2028	8,390,547	0.95%			
1999	5,830,835	1.41%	2029	8,468,520	0.93%			
2000	5,894,121	1.09%	2030	8,545,391	0.91%			
2001	5,974,910	1.37%						
2002	6,041,710	1.12%						
2003	6,098,300	0.94%						
2004	6,167,800	1.14%						
2005	6,256,400	1.44%						
2006	6,375,600	1.91%						
2007	6,488,000	1.76%						
2008	6,587,600	1.54%						
2009	6,688,300	1.53%						

\*Source: Office of Financial Management. Additional computations have been performed to summarize data.

**Appendix K**

<b>Historical Economic Assumptions for Washington State Pension Systems</b>				
<b>Valuation Years</b>	<b>Investment Return</b>	<b>General Salary Growth</b>	<b>Inflation</b>	<b>System Growth</b>
1974 - 1978	9% in 1975 grading to 6.5% in 1980	7% in 1975 grading to 5% in 1980	7% in 1975 grading to 3.5% in 1980	0% TRS, 1% PERS
1979 - 1984	10% in 1980 grading to 6.5% in 1990	10% in 1980 grading to 5% in 1990	10% in 1980 grading to 5% in 1990	0% TRS, 0% PERS
1985 - 1988	10% in 1985 grading to 7.0% in 1990	5.25%	4.00%	1% TRS, 1% PERS
1989 - 1994	7.50%	5.50%	5.00%	0.75% TRS, 1.25% PERS
1995 - 1997	7.50%	5.00%	4.25%	0.9% TRS, 1.25% all Others
1998 - 1999	7.50%	4.00%	3.50%	0.9% TRS, 1.25% all Others
2000 - 2008	8.00%	4.50%	3.50%	0.9% TRS, 1.25% all Others
2009 - Present	8.00%	4.00%	3.50%	0.9% TRS, 1.25% all Others

## **Appendix L**

### **How We Developed and Varied Our Projections**

To produce the projections used in this report, we relied on the preliminary results of the 2008 Actuarial Valuation Report (AVR). We also relied on the Washington State Investment Board (WSIB) capital market assumptions (CMAs) and reported returns through June 30, 2009.

“Our projections” refers to the projections we produce by taking the most recent AVR and projecting it forward 50 years. For each future year, we look at the data, assets, and liabilities as though we were producing a new AVR in that year. The data reflects the current population and includes new entrants. From the group of members currently active, we expect some to remain active, some to retire, some to quit and terminate service, etc. When members leave the active workforce, we replace them with new entrants. We assume future new entrants will have the same demographics as recent new entrants. Over time those new entrants also leave active status, and the cycle continues for each projected year. The result is a 50 year projection of valuation results that we use to generate future contribution rates.

Aside from the characteristics of new entrants, we made other assumptions to produce our projections. We assume no new benefit improvements throughout the projection. We assume all required member and employer contributions get made, regardless of their amounts. We assume no changes in WSIB asset allocation or CMAs.

Since the future is uncertain and rates of return cause most of the variation we see in contribution rates, we vary the rate of return earned on plan assets in each year of our projections. This gives us a good idea of the range of results we can expect based on the current asset allocation. We adjusted WSIB’s CMAs for the time horizon of the pension systems (see the Report On Long-Term Economic Assumptions for more detail about how we adjusted the CMAs). Using these assumptions we produced a distribution of annual asset returns that could arise given the asset allocation targets of the current WSIB CTF portfolio.

When we vary the annual rates of return earned by the plan, our projections produce different contribution rates. We generated and compared the results of over ten thousand scenarios. In theory each simulation has an equally likely chance of occurring. We relied on this fact to sort and compare the results.

For each scenario we randomly selected a rate of return for each year of the projection. Since each scenario used 50 random returns, we saw some scenarios with very high returns and some with very low returns. Since we looked at a very large number of scenarios, we feel confident that the spectrum of results represents the possible futures. We looked at the 25th, 50th, and 75th percentile of possible future scenarios. The 50th percentile represents the expected future. In this report, we based all projected contribution rates and associated contribution dollars labeled “Expected” on the 50th percentile of the distribution of scenarios. Similarly, we based all projected results labeled Pessimistic and Optimistic on the 25<sup>th</sup> and 75<sup>th</sup> percentiles respectively, of the distribution

Unless otherwise stated in the report, all other data, methods, and assumptions are consistent with the AVR. Plan provisions reflect all changes through the 2008 Legislative Session. We did not include the supplemental rates from the 2009 Legislative Session. We will not publish the final AVR until later this year. As a result we expect the results of this report to be slightly different than if we'd used the final results of the AVR. However, we expect these differences would not be material and would not change our findings and recommendations.

*O:\PFC\2009\9-11-2009\_revised\4.Appendix\_Revised.docx*

