Office of the State Actuary
*"Securing tomorrow's pensions today."*

August 28, 2015

Pension Funding Council
John A. Cherberg Building
PO Box 40466
Olympia, Washington 98504

**SUBJECT: REPORT ON FINANCIAL CONDITION AND ECONOMIC EXPERIENCE STUDY**

Dear Pension Funding Council:

As required under RCW 41.45.030, we completed the 2015 Report on Financial Condition and Economic Experience Study. This communication contains the results of our study.

### *Background and Purpose*

RCW 41.45.030 requires the Office of the State Actuary (OSA) to prepare and submit a report on financial condition and long-term economic experience every two years by September 1. The focus of the Report on Financial Condition is on the health of the pension systems, whereas the Economic Experience Study involves comparing actual economic experience with the assumptions made. Pursuant to statute, the Economic Experience Study also includes a set of recommended long-term economic assumptions made by the state actuary. Both reports are attached to this letter. **Appendix A** contains the Report on Financial Condition. **Appendix B** contains the Economic Experience Study.

The primary purpose of the attached reports is to assist the Pension Funding Council (the Council) in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035. We do not recommend using the attached reports for other purposes.

### *Summary of Report on Financial Condition*

The financial condition (or health) of a pension plan can be assessed using different measures. Key measures we've identified for assessing the health of a pension plan include funding level, adequacy and affordability, and risk. One measure alone will not provide the complete story. Decisions can be made that help improve one measure of plan health yet that same decision can cause another measure to deteriorate. The challenge of keeping a pension plan healthy is striking the right balance for the plan sponsor, employers, plan beneficiaries, and taxpayers.

From a funded status perspective, the financial status of the pensions systems has declined since the *2013 Report on Financial Condition*. Three key changes have occurred that have

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

each contributed to the decline in funded status of the plans which include a lower discount rate assumption, recognition of longer expected life spans, and a different actuarial cost method used for reporting funded status. The open plans and Law Enforcement Officers' and Fire Fighters' (LEOFF) Plan 1 remain at least 90 percent funded based on assumptions used in the *2014 Actuarial Valuation Report*. Two closed plans, Public Employees' Retirement System (PERS) Plan 1 and Teachers' Retirement System (TRS) Plan 1, each have a funded status below 70 percent. PERS 1 and TRS 1 are below other state retirement plans in terms of current funded status, however, the Legislature currently requires additional contributions to help improve the funding levels of these two plans.

We consider contribution rates adequate if they provide full funding based on a reasonable set of long-term assumptions. Recent history has shown a commitment to making the "required contributions" to each plan which suggests a trend of adequate funding. Required contributions represent the contributions necessary to satisfy full funding under current assumptions, methods, and funding policy defined under Chapter 41.45 RCW. The ability to provide adequate funding, also known as affordability, increases if required contributions are more predictable. When there's volatility in contribution rates it's harder to budget the financial resources needed to meet the required funding levels and keep the funded status on track for full funding. To help reduce volatility in contribution rates, we are statutorily obligated to smooth any actual investment returns which are lower than (or higher than) the investment return assumption over up to eight years.

If pension contributions are not deemed affordable by the plan sponsor, there's a risk that the required (or adequate) levels will not be made. If inadequate contributions are made to the plans then the funding levels and plan health are at risk of declining. OSA developed a Risk Assessment model in 2010 that can show how risk measures change if inadequate contributions occur or if there is a change in benefit provisions or assumptions. Understanding how a specific action can stress the system can help in better understanding the health of the underlying plan.

These measures of plan health are predicated on assumptions about future events. One thing we know for certain is that actual experience will differ from what is expected or assumed. The best one can do is set reasonable assumptions and put the plan in the best position to meet all future obligations. It's the role of OSA, the Council, and the Legislature to develop and adopt this set of assumptions. The continued monitoring of the economic environment and actual experience of the plans and adjusting of assumptions will help maintain plan health for the long term.

Please see **Appendix A** for the Report on Financial Condition for further discussion and supporting data.

### *Summary of Economic Experience Study*

According to RCW 41.45.030 (2), the Council may adopt changes to the long-term economic assumptions every two years by October 31. As an example, the assumptions adopted by October 31, 2015, will be effective July 1, 2017, for contribution rate-setting purposes. Any changes adopted by the Council are subject to revision by the Legislature.

Guided by applicable actuarial standards of practice, OSA performed an economic experience study to develop a recommendation for each long-term economic assumption. We developed the recommended assumptions as a consistent set of economic assumptions and it is recommended to review them as a set of assumptions.

We recommend maintaining the current assumptions for total inflation and general salary growth. We recommend an increase in the TRS growth in system membership assumption. Additionally, the state actuary recommends a continuation of the phase-in of the rate of investment return assumption, until 7.5 percent is achieved. The table below summarizes the current and recommended long-term economic assumptions.

| Assumption | Current | Recommended |
|---|---|---|
| **Inflation** | 3.00% | 3.00% |
| **General Salary Growth** | 3.75% | 3.75% |
| **Annual Investment Return*** | 7.80% | 7.50% |
| **Growth in System Membership*** | 0.80% (TRS), 0.95% (Others) | 1.25% (TRS), 0.95% (Others) |

**Excludes LEOFF 2.*

The Legislature passed legislation which included a phase-in of a lower rate of return assumption over three biennia. Current statute requires the rate of return assumption to be lowered by ten basis points each biennium which began with the 2013-15 Biennium and continues until the 2017-19 Biennium. We recommend continuation of the phase-in until 7.5 percent is achieved as shown in the table below.

| Investment Return Phase-In | | |
|---|---|---|
| Biennium | Current Law | Recommended |
| **2013-15** | 7.90% | 7.90% |
| **2015-17** | 7.80% | 7.80% |
| **2017-19** | 7.70% | 7.70% |
| **2019-21** | 7.70% | 7.60% |
| **2021-23** | 7.70% | 7.50% |

Please see **Appendix B** for the Report on Long-Term Economic Assumptions for further discussion and supporting data.

Please let us know if you have any questions or need further information on the study.

Sincerely,

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

Kyle Stineman
Senior Actuarial Analyst

cc: Pension Funding Council Workgroup
Lisa Won, ASA, FCA, MAAA
Deputy State Actuary

*O:\PFC\2015\EES-RFC\2015 EES and RFC Communication.docx*

# APPENDIX A – REPORT ON FINANCIAL CONDITION

As required under RCW 41.45.030, we present this Report on Financial Condition (Report), along with the Economic Experience Study, to assist the Pension Funding Council (the Council) in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035. We do not advise readers of this report to use the information contained herein for other purposes. Please see the **Actuarial Certification Letter** for additional considerations.

The financial condition (or health) of a pension plan can be assessed using different measures. Key measures we've identified for assessing the health of a pension plan include:

- Funding level.
- Adequacy and affordability.
- Risk.

One measure alone will not provide the complete story. Decisions can be made that help improve one measure of plan health yet that same decision can cause another measure to deteriorate. For example, increasing contributions to the plan can improve funding levels but may have a negative effect on affordability if those increased contribution rates are deemed too high for the state budget, members, or employers. The challenge of keeping a pension plan healthy is striking the right balance for the plan sponsor, employers, plan beneficiaries, and taxpayers.

## *Summary*

From a funded status perspective, all the plans are considered on target for full funding except the two closed plans, Public Employees' Retirement System (PERS) Plan 1 and Teachers' Retirement System (TRS) Plan 1. While those plans might not be considered on target for full funding, there is a plan in place to get them back on track. This plan, effective July 1, 2009, amortizes the Unfunded Actuarial Accrued Liability (UAAL) over a rolling ten year period with minimum contribution rates in place to ensure full funding. Current projections, based on the *2013 Actuarial Valuation Report* (AVR), show the plans will be fully funded by 2027 (PERS 1) and 2025 (TRS 1) if all assumptions are realized. Under current funding policy, the plans will be fully funded sooner/later under optimistic/pessimistic outlooks.

Recent history has shown a commitment to making the "required contributions" to each plan which suggests a trend of adequate funding. Required contributions represent the contributions necessary to satisfy full funding under current assumptions, methods, and funding policy defined under Chapter 41.45 RCW. Whether the plans are considered healthy based on affordability, however, is more subjective. Historical contribution rates have experienced more volatility than one might find acceptable from an affordability perspective. When there's volatility in rates it's harder to budget the financial resources needed to meet the required funding levels and keep the funded status on track for full funding. The Great Recession had a large impact on contribution rates. The investment losses were spread out over eight years but the magnitude still provided unexpected increases in required funding

each of those eight years. Most of the impacts of the Great Recession have been recognized so we expect some relief from increasing rates in the future with the removal of this source of increase.

Finally, the Office of the State Actuary (OSA) developed a Risk Assessment (RA) model in 2010 that can show how financial risk measures change with changes in the amount of contributions made or adoption of benefit improvements. Understanding how a specific action can stress the system also helps understand how resilient it is to change which relates to the health of the underlying plan.

These measures of plan health are predicated on assumptions about future events. One thing we know for certain is that actual experience will differ from what is expected or assumed. The best one can do is set reasonable assumptions that err slightly on the conservative side in order to limit the risk of bad outcomes and put the plan in the best position to meet all future obligations. It's the role of OSA, the Council, and the Legislature to develop and adopt this set of assumptions. Then continual monitoring and adjustments as the economic environment and actual experience of the plans change, will help maintain plan health for the long term.

### *Funding Level*

Funding a pension plan involves determining appropriate contribution amounts at specific points in time and determining how to invest the assets of the plan until benefits are paid. The contribution amounts for the State of Washington retirement plans are calculated by OSA based on the funding policy and long-term economic assumptions set in statute (RCW 41.45.060 and 41.45.035), along with the benefit provisions and other assumptions disclosed in the AVR.

The plan's funded ratio (or funded status) is calculated on the valuation (measurement) date by dividing the actuarial assets by today's value of all earned benefits (accrued liability or obligations). If the funded status is 103 percent, for example, then there is $1.03 in actuarial assets for every $1.00 of accrued obligations. The funded ratio will vary depending on the actuarial cost method used to determine the accrued obligations of the plan. Please see the ***Summary of Actuarial Cost Methods*** for a description of the two cost methods, Entry Age Normal (EAN) and Projected Unit Credit (PUC), used by OSA to calculate the funded ratio for the plans.

Based on a national report of State Retirement Plans, published by the Pew Charitable Trusts (Pew) on July 14, 2015, Washington ranked seventh in the nation with a funded status for all plans combined of 88 percent. This combined plan funded status was determined by Pew based on the 2014 Comprehensive Annual Financial Report (CAFR) produced by the Department of Retirement Systems (DRS). Our most recent AVR, June 30, 2014, shows the funded status of all plans combined is 87 percent under the same actuarial cost method, EAN. In response to the changes made by the Governmental Accounting Standards Board (GASB), we will begin presenting the EAN cost method as the baseline for funded status starting with the 2014 AVR. We presented the funded status under the PUC cost method prior to the 2014 AVR.

While it's convenient to compare and report a combined plan funded status, we need to look at each plan independently because one plan's assets cannot be used to pay benefits for another plan. The following chart shows the funded status, by plan, at our most recent measurement date, June 30, 2014.

| Entry Age Normal Funded Status on an Actuarial Value Basis* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *(Dollars in Millions)* | PERS | | TRS | | SERS | PSERS | LEOFF | | WSPRS | Total |
| | Plan 1 | Plans 2/3 | Plan 1 | Plans 2/3 | Plans 2/3 | Plan 2 | Plan 1 | Plan 2 | | |
| EAN Liability | $12,720 | $29,321 | $9,250 | $9,819 | $3,965 | $291 | $4,323 | $8,051 | $1,041 | $78,782 |
| Valuation Assets | $7,761 | $26,386 | $6,353 | $9,193 | $3,624 | $278 | $5,499 | $8,638 | $1,044 | $68,777 |
| Unfunded Liability | $4,959 | $2,935 | $2,897 | $626 | $341 | $13 | ($1,177) | ($587) | ($3) | $10,005 |
| **Funded Ratio** | | | | | | | | | | |
| **2014** | **61%** | **90%** | **69%** | **94%** | **91%** | **96%** | **127%** | **107%** | **100%** | **87%** |

*Note: Totals may not agree due to rounding.*
**Liabilities valued using the EAN cost method at an interest rate of 7.8% (7.5% for LEOFF 2). All assets have been valued under the actuarial asset method.*

All the open plans plus Law Enforcement Officers' and Fire Fighters' (LEOFF) Plan 1 are 90 percent funded or better and considered on target for full funding. The only plans that have a sizable mismatch between the plan's estimated accrued (or earned) obligations and assets are PERS 1 and TRS 1. Both of these plans closed in 1977 and require additional contributions in order to get their funding levels back on track. These additional contributions are made by employers only and are defined in statute under RCW 41.45.060. Not only does the underfunding of these plans require larger future contributions but it also creates a shift in intergenerational equity, which is counter to one of the funding goals for the State plans. Intergenerational equity refers to the costs of public service, including pensions earned by public employees, being paid by those receiving the benefits of those services.

However, the funded status is a point-in-time measurement. While the goal is to reach 100 percent funding, future events are unknown and can impact a plan's funded status at a given point in time. Reviewing the historical funded status provides information on the funding progress of each plan. Since we are just starting to report the EAN funded status we do not have a history for comparison purposes.

Below we show the PUC funded status history for the past ten years. A longer history is available in the AVR on our website.

| Projected Unit Credit Funded Status on an Actuarial Value Basis* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *(Dollars in Millions)* | PERS | | TRS | | SERS | PSERS | LEOFF | | WSPRS | Total |
| | Plan 1 | Plans 2/3 | Plan 1 | Plans 2/3 | Plans 2/3 | Plan 2 | Plan 1 | Plan 2 | | |
| PUC Liability | $12,727 | $26,172 | $9,266 | $8,843 | $3,598 | $225 | $4,323 | $7,618 | $1,010 | $73,781 |
| Valuation Assets | $7,761 | $26,386 | $6,353 | $9,193 | $3,624 | $278 | $5,499 | $8,638 | $1,044 | $68,777 |
| Unfunded Liability | $4,965 | ($214) | $2,913 | ($350) | ($26) | ($54) | ($1,176) | ($1,020) | ($34) | $5,004 |
| **Funded Ratio** | | | | | | | | | | |
| **2014** | **61%** | **101%** | **69%** | **104%** | **101%** | **124%** | **127%** | **113%** | 103% | 93% |
| **2013 | 63% | 102% | 71% | 105% | 102% | 124% | 125% | 115% | 105% | 94% |
| 2012 | 69% | 111% | 79% | 114% | 110% | 134% | 135% | 119% | 114% | 101% |
| **2011 | 71% | 112% | 81% | 113% | 110% | 132% | 135% | 119% | 115% | 101% |
| ***2010 | 74% | 113% | 84% | 116% | 113% | 129% | 127% | 119% | 118% | 102% |
| **2009 | 70% | 116% | 75% | 118% | 116% | 128% | 125% | 128% | 119% | 99% |
| **2008 | 71% | 119% | 77% | 125% | 121% | 127% | 128% | 133% | 121% | 100% |
| **2007 | 71% | 120% | 76% | 130% | 126% | 120% | 123% | 129% | 118% | 99% |
| **2006 | 74% | 121% | 80% | 133% | 125% | 99% | 117% | 116% | 114% | 100% |
| **2005 | 74% | 127% | 80% | 134% | 122% | N/A | 114% | 114% | 113% | 99% |

*Note: Totals may not agree due to rounding.*
**Liabilities valued using the PUC cost method at an interest rate of 7.8% (7.5% for LEOFF 2). All assets have been valued under the actuarial asset method.*
***Assumptions changed.*
****LEOFF 2 values for 2010 were updated after the 2010 AVR was published.*

A comparison between the 2014 EAN funded status and 2014 PUC funded status will demonstrate how the funded status of the plans are different under the two different cost methods, independent of any other changes that occurred since the 2013 AVR. For example, the closed plans 1 show no change in funded status between the two cost methods which is typical for a mature plan. The open plans, however, show a lower funded status under the EAN cost method compared to PUC.

It's helpful to note that some volatility in the historical funded status presented above is related to assumption changes. For example, a decrease in the funded status occurs from the 2012 AVR to the 2013 AVR. The main source of the decrease in funded status from 2012 to 2013 was due to adoption of the *2007-2012 Demographic Experience Study* assumptions. While assumption changes can create changes in the health measures, the ultimate goal is to fund all future obligations of the plan. In order to put the plan in the best position to meet that goal, reviewing and updating assumptions so they remain current and reasonable is key.

Please see the **Changes Since the Last Report on Financial Condition** section for information regarding the recent drop in funded status.

### *Adequacy and Affordability*

We consider contribution rates adequate if they provide full funding based on a reasonable set of long-term assumptions and reasonable actuarial methods. Long-term assumptions are recommended by OSA based on our analysis of past experience and our professional judgment of future expectations. These assumptions are disclosed in the experience study

reports available on OSA's website and include economic assumptions that are part of this combined report.

The health of the plan is improved with funding of the "required contributions" of the plan. Required contributions represent the contributions necessary to satisfy full funding under current assumptions, methods, and funding policy defined under Chapter 41.45 RCW. The ability to provide adequate funding, also known as affordability, increases if required contributions are more predictable in the short-term (the budget cycle). When there's volatility in contribution rates it becomes harder to budget the financial resources needed to meet the required funding levels and keep the funded status on track for full funding. If contribution requirements increase beyond a reasonable tolerance level, it can be difficult to fund the additional amount. The legislature adopted an asset smoothing method in 2003 to help limit volatility in contribution rates.

The asset smoothing method in statute helps to limit some of the volatility in contribution rates by smoothing the annual gains and losses on investments. When the actual investment return for the fiscal year is more than one percent different than the assumed long-term investment rate of return, a portion of those gains or losses will be deferred for up to eight years. This smooths the inherent volatility in the market value of assets which in turn provides more stable contribution rates.

Affordability is more subjective and determined by the party required to make a financial investment. It is therefore not defined at a set level and can change over time. It can also be impacted by other responsibilities that increase or limit total financial resources available. For example, one-time or unexpected demands on the state budget from another source could create affordability pressure for pension budget allotments. As another example, if health care premiums increase this impacts a plan member's take-home pay which can create affordability concerns for their pension plan contributions.

Affordability is also impacted if intergenerational equity doesn't exist or is compromised. If costs for one generation are pushed forward beyond that generation's working life, then the next generation will presumably be paying for the benefits of two generations.

One way to measure the affordability of a pension plan is to review the growth in contribution rates, as a percent of pay, over time. If future rates, particularly in the short term, are predictable based on historical trends, then budget writers, employers, and plan members can plan and prepare for the financial resources needed. Affordability naturally improves when one can predict and plan for the expense.

Historical contribution rates are maintained by DRS on their website while projected contribution rates are available on OSA's website. The next table shows the rates adopted for the 2015-17 Biennium compared to our projected 2017-19 rates.

| Contribution Rates | | | |
|---|---|---|---|
| System | | Adopted 2015-17 | Projected[1] 2017-19 |
| PERS | Member[2] | 6.12% | 7.23% |
| | Employer | 11.00% | 12.29% |
| TRS | Member[2] | 5.95% | 7.00% |
| | Employer | 12.95% | 14.69% |
| SERS | Member[2] | 5.63% | 6.94% |
| | Employer | 11.40% | 12.52% |
| PSERS | Member | 6.59% | 6.80% |
| | Employer | 11.36% | 11.75% |
| LEOFF[3] | Member | 8.41% | 8.85% |
| | Employer | 8.41% | 8.85% |
| WSPRS | Member | 6.69% | 7.19% |
| | Employer | 8.01% | 12.45% |

*[1]Rates shown for 2017-19 are expected projections based on the 2013 Actuarial Valuation.*
*[2]Plan 1 members' contribution rate is statutorily set at 6.0%. Members in Plan 3 do not make contributions to their defined benefit.*
*[3]No member or employer contributions are required for LEOFF Plan 1 when the plan is fully funded.*

For simplicity, we've presented the 2017-19 expected rates only while our website includes optimistic and pessimistic projections developed under our stochastic modeling which is described in detail on our website. The projected contribution rates use assumptions disclosed in the AVR as well as future demographic/economic assumptions found here.

Another way to measure affordability, particularly for the plan sponsor, is the growth in pension contributions as a percent of the General Fund-State (GF-S) budget. A trend showing consistent increases in the percent of GF-S budget might suggest the plans are becoming unaffordable. Based on information from Office of Financial Management's (OFM's) CAFR and Economic and Revenue Forecast Council's (ERFC's) annual forecast report, we've prepared a historical comparison of GF-S pension costs using our estimated contribution splits and actual contributions made.

| Estimated Pension Contributions as a Percent of GF-S Budget | | | | |
|---|---|---|---|---|
| *(Dollars in Millions)* | **2000** | **2005** | **2010** | **2014** |
| Est GF-S Contributions* | $265 | $81 | $384 | $597 |
| GF-S Budget** | $11,068 | $13,036 | $13,571 | $16,383 |
| % of GF-S Budget | 2.4% | 0.6% | 2.8% | 3.6% |

**Actual total employer contributions were found in the 2005, 2009, and 2014 OFM CAFRs. The estimated GF-S contributions is the product of actual employer contributions and assumed GF-S fund splits.*
***GF-S Budget found in 2015 ERFC Annual Forecast.*

If pension contributions are not deemed affordable by the plan sponsor, there's a risk that the required (or adequate) levels will not be made. If inadequate contributions are made to the plans then the funding levels and plan health are at risk of declining.

If pension contributions are not deemed affordable by plan members, there's a risk that human resource issues, such as attracting and retaining qualified employees, could be impacted. While this doesn't directly impact the health of the pension plan, it can create pressure to improve benefits as a reaction to the attraction/retention issue.

Adopting a set of reasonable assumptions that represent our best estimate of future expectations will improve the adequacy of the required contributions for full funding. In addition, using an asset smoothing method and making reasonable adjustments to assumptions from one experience study to the next will help with the stability of the contribution rates. We believe that adequate and affordable funding will improve the health of the plans.

### *Risk*

The health of a pension plan can also be measured by the risks inherent in that plan. These risks include experience being different than assumed, inadequate funding, and benefit improvements for past service, to name a few. If the risks of those events occurring are high, the health status of a plan might decline. For example, if an overly optimistic investment return assumption was used, that would increase the risk that actual plan experience won't achieve the assumption over the long-term. Since a high (or overly optimistic) investment return assumption would lower the assumed value of the plan obligations, it also lowers the required funding which then lowers the chance the plan will have enough assets to meet actual future obligations.

The RA model OSA developed in 2010 uses stochastic projections to measure funded status, affordability, and chance of pay-go under two sets of assumptions – *Current Law* and *Past Practices*. *Current Law* assumes current plan provisions continue in the future and all future contribution requirements will be made. *Past Practices* assumes future benefit improvements will occur and only a percent of future required contributions are made; both assumptions developed based on historical experience. As such, past practices provides stress testing for risks associated with future experience being different than current assumptions. Understanding how the risk measures change under this scenario provides a measure for the

health of the plan and how it can withstand certain stresses that, based on past experience, have a reasonable chance of recurring.

| Pension Score Card | | | | | | |
|---|---|---|---|---|---|---|
| **Category** *(Dollars in Billions)* | **Current Law** | | | **Past Practices** | | |
| **Affordability** | **Value** | **Year** | **Score** | **Value** | **Year** | **Score** |
| Chance Pensions will Consume More than 8% of GF-S[1] | 4.1% | 2024 | 85 | 3.7% | 2024 | 87 |
| 5% Chance GF-S[1] Consumption will Exceed | 7.7% | 2024 | 66 | 7.5% | 2024 | 68 |
| 5% Chance Employer Contribution Rate will Exceed | 15.6% | 2032 | 61 | 16.9% | 2034 | 56 |
| **Risk** | | | | | | |
| Chance of PERS 1, TRS 1 in Pay-Go[2] | 9.8% | 2035 | 50 | 18.4% | 2036 | 42 |
| Chance of Open Plan in Pay-Go[2] | 1.3% | 2049 | 59 | 5.5% | 2062 | 55 |
| 5% Chance Annual Pay-Go Cost[3] in PERS 1, TRS 1 Exceed | $1.1 | 2024 | 44 | $1.3 | 2021 | 42 |
| 5% Chance Annual Pay-Go Cost[3] in Open Plans Exceed | $4.6 | 2062 | 5 | $12.5 | 2062 | 0 |
| Chance of Total Funded Status Below 60% | 11.0% | 2041 | 60 | 24.7% | 2062 | 39 |
| **Total Weighted Score** | | | **58** | | | **54** |

*[1]Approximately 3% of current GF-S budget; does not include higher education.*
*[2]When today's value of annual cost exceeds $25 million.*
*[3]Pay-Go costs on top of normal pension costs.*

The RA model can also be used to measure how proposed changes to current benefit provisions impact the underlying risks. Understanding how the risk measures change also helps determine how the proposed changes might improve or weaken the health of the plan.

Please see the RA page of our website for additional information on the assumptions and metrics used in the RA model.

## Changes Since The Last Report On Financial Condition

Litigation regarding the gain-sharing provisions and Plan 1 Uniform Cost of Living Adjustment (UCOLA) has concluded in favor of the state. As such, we have removed any analysis in this report on those provisions. Since prior actuarial valuation measures excluded these provisions while they were under litigation, we did not need to adjust any results when showing historical comparisons.

Since the last actuarial valuation, three key changes have occurred that have each contributed to a short-term drop in the funded status of the plans:

- Lower discount rate (investment return) assumption (except LEOFF 2).
- Recognition of longer expected life spans.
- Different actuarial cost method used for reporting funded status.

In 2012, the Legislature adopted a three-biennia schedule to reduce the long-term investment return assumption from 8 percent to 7.7 percent. The 2014 AVR includes the second biennial decrease which reduces the assumption from 7.9 percent to 7.8 percent. Decreasing the investment return assumption increases the present value (today's value) of the plan obligations. Since the plan assets do not change with this assumption change, the increased value of the plan obligations results in a decrease to the funded status measure. While the funded status dropped with the decrease in the investment return assumption, ultimately the plan will be in a better position and have a higher funded status in the future if assumptions are closer to actual experience. Since our best-estimate assumption of future experience is 7.5 percent, moving closer to that assumption will result in better funding now and a higher funded status in the future.

In 2014, the PFC reviewed and adopted OSA's recommendations for updating demographic assumptions. Most updates had small impacts on the actuarial funding of the plans except the changes to mortality. The mortality assumption was updated to recognize increasing improvements in mortality, or longer expected life spans. This change increased the obligations of the plans which reduced the funded status and increased contribution requirements. While this change had a short-term negative effect on the health of the plans for funding levels and affordability, recognizing and pre-funding increased life spans will improve the long-term risk to the plan of members outliving the benefits that have been earned. In other words, the risk of not enough assets to pay all the obligations of the plan.

In response to the new GASB standards which require financial reporting of a plan's funded status under the EAN method, we now report this measure for the 2014 AVR. Although GASB's new standards explicitly apply to financial reporting and have made a clear separation between financial reporting and funding methods for a plan, we felt moving to an EAN funded status measure was prudent since it eliminates another set of numbers being reported. Prior funded status measures were based on the PUC actuarial cost method. Moving from PUC to EAN dropped the funded status measure because the accrued (earned) liabilities are generally higher under EAN compared to PUC in the early years of a plan lifecycle. Typically that relationship changes as the plan matures. While the Aggregate actuarial cost method is used for the funding of all open plans this method does not provide a useful funded status measure. The Aggregate methodology allocates all unfunded liabilities to future time periods (and future payroll for today's workers) so it would always provide a funded status of 100 percent. Please see the **Summary of Actuarial Cost Methods** for additional information on the actuarial cost methods described here.

**Summary of Actuarial Cost Methods**

An actuarial cost method is used to allocate the costs (or benefits) of the plan to different time periods. Costs are allocated using two components:

- Normal Cost (NC) represents costs for the future. These are typically costs for benefits (or service) that have not yet been earned and will be spread over the future working lives of current members.
- Unfunded Actuarial Accrued Liability (UAAL) represents costs for the past. These are past benefit costs (already earned or allocated under the actuarial cost method) that are not covered by enough plan assets. The shortfall, the UAAL, must be amortized over a set period of time.

Actuarial cost methods differ in how they allocate costs to the time periods. In the end, after all service has been earned, each cost method produces the same result and allocates the same cost of benefits.

*Entry Age Normal* cost method has both a NC and UAAL. The NC is determined on an individual basis from a member's age at plan entry and is designed to be a level percent of pay throughout a member's career. The UAAL represents all projected benefits not covered by current plan assets and future expected NC payments.

*Projected Unit Credit* cost method has both a NC and UAAL. The NC is the next year's pension cost based on projected salary. The UAAL is the excess of the accrued liabilities, calculated under PUC, over the current plan assets. The PUC accrued liabilities equal the projected benefits multiplied by accrued (earned) service divided by total projected service. In other words, the service prorated share of future benefits that have been earned to date.

The *Aggregate* cost method, as discussed earlier, allocates all costs to the future. It therefore does not have a UAAL. All costs are spread over future salaries or the future working lives of current members. Based on this definition, the Aggregate cost method satisfies the goal of Intergeneration Equity. Also, since it allocates everything to the future, any amortization of past losses or benefit improvements are typically shorter than most UAAL amortization schedules which are often in the range of 25-30 years. As such, the Aggregate cost method will generally get the plan to its funding goal faster than other cost methods.

# Actuarial Certification
# Report on Financial Condition

August 31, 2015

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. We understand the report may be used for other purposes, including an identification of 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 result of a more recent assessment becomes available.

Please see the *2014 Actuarial Valuation Report* (AVR) for the data, assumptions, and methods used in determining the actuarial valuation results for this report. Please see the Actuarial Certification in the 2014 AVR for additional information concerning the development, purpose, and use of the 2014 AVR. Participant data reflects retirement system census data through June 30, 2014.

The Department of Retirement Systems provided 2014 member and beneficiary data to us. We checked the data for reasonableness as appropriate based on the purpose of this report. An audit of the participant data was not performed. We relied on all the information provided as complete and accurate. In our opinion, this information is adequate and substantially complete for purposes of this assessment.

This report involves the interpretation of many factors and the application of professional judgment. We believe that the data, assumptions, and methods used in the underlying report 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 or decide to use different assumptions and methods.

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

Sincerely,

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

Lisa Won, ASA, FCA, MAAA
Deputy State Actuary

# APPENDIX B – ECONOMIC EXPERIENCE STUDY

## *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 the assumption;
- Evaluate relevant data;
- Consider factors specific to the measurement;
- Consider other general factors; and
- Select a reasonable assumption.

With the exception of the annual growth in system membership assumption, we used the "building block" method to develop each assumption in the 2015 Economic Experience Study (EES). The building block method is one acceptable method for setting economic assumptions identified in ASOP 27. Using this method, the actuary determines the individual components for each economic assumption. Then the actuary may combine estimates for each applicable component to arrive at a best estimate for the given economic assumptions.

## *Experience Study and Recommended Assumptions*

We will identify the following for each assumption we studied:

- How the assumption is used for funding in our model.
- The single best estimate.
- The data we studied and how we analyzed the data.
- How we developed each assumption.

## TOTAL INFLATION ASSUMPTION

For funding purposes, we primarily use total inflation to model post-retirement Cost-Of-Living-Adjustments (COLAs). Retired members[1] who currently receive a pension from the Washington State retirement systems receive a COLA based on changes in the Consumer Price Index (CPI). The CPI used is the Seattle, Tacoma, Bremerton (STB) CPI for Urban Wage Earners and Clerical Workers (CPI-W). We also use total inflation and components of total inflation in the development of the general salary growth and investment return assumptions.

In developing this assumption, we relied on historical inflation data from the Bureau of Labor Statistics (BLS). We also considered estimates on future inflation from third party sources. Additionally, we consulted with the Washington State Investment Board (WSIB) and the Economic and Revenue Forecast Council (ERFC).

We have observed lower inflation rates over the past five years than the current inflation assumption, which may be a result of the Federal Reserve's targeted inflation rate. However, we believe this monetary policy will not continue since the Federal Reserve ended "Quantitative Easing (QE)" in October 2014. Finally, because we use the inflation assumption to project post-retirement COLAs over long-term periods, we put more weight on long-term historical inflation and long-term projections rather than short-term experience or short-term projections.

We studied future National CPI projections from the ERFC, Global Insight (GI), the Social Security Administration (SSA), and the Congressional Budget Office (CBO). These four entities had varying opinions on future inflation as well as varying lengths of inflation projections. ERFC and CBO provided inflation projections for the next five to ten years and both entities projected lower inflation than our best estimate for the National CPI-W assumption. GI and SSA provided inflation assumptions for the next thirty years. Our best estimate for the National CPI-W assumption is greater than the GI long-term projection and equal to the ultimate SSA intermediate long-term projection for National CPI (Please see the **National CPI Projections** table for more details).

We are recommending no change in the total inflation assumption from the current assumption that was adopted by the Pension Funding Council in 2011.

### Recommendation

Total Inflation
3.00 percent*

*Current Assumption*

Total Inflation
3.00 percent

[1] *Includes Plans 2/3, Public Employees' Retirement System (PERS 1), Teachers' Retirement System (TRS 1), and Washington State Patrol Retirement System (WSPRS) (available for members that elected the optional COLA payment form at retirement), and Law Enforcement Officers' and Fire Fighters' Plan 2 Retirement System (LEOFF).*

**Includes 2.70 National CPI-W and 0.30 percent regional price inflation differential.*

*Data*

Historical Inflation Data
National CPI Projections

### *Methodology*

We use the building block method to develop our total inflation assumption which requires the actuary to determine the components of each assumption and make an estimate for each component. The estimated components for each assumption are then combined to arrive at a best estimate for the assumption.

For the total inflation assumption we used two building block components to create our assumption: (1) National CPI-W and (2) STB CPI-W adjustment (regional price inflation differential). The combination of the two components will be referred to as total inflation in this report. We made a recommendation on total inflation only; however, we studied each inflation component individually and how they compare to each other (Please see **Analysis** section for a detailed discussion).

In addition to using the building block method to develop our total inflation assumption, we also used it to develop our investment return and our general salary growth assumptions. Investment return and general salary growth both use total inflation or components of total inflation as one of their building block components.

Note: We made a minor change in methods since our last study. At the recommendation of the ERFC, we replaced the gross domestic product deflator with the national CPI-W. This method also matches the method used by the WSIB in setting their current Capital Market Assumptions (CMAs).

### *Analysis*

### ***National CPI-W***

*Assumption*

2.70 percent

The base for our total inflation assumption is the Urban Wage Earners and Clerical Workers CPI for the average U.S. cities (National CPI-W). CPI measures the change in price for a fixed basket of goods and is a measurement of price inflation. The BLS produced the historical CPI that we studied. BLS produces different CPIs based on different baskets of goods and for different regions of the country.

Our annual investment return assumption uses the National CPI-W as one of its two building block components. Please see the **Investment Return** section for additional details.

We studied the historical National CPI-W produced by the BLS as well as projections from the ERFC, WSIB, GI, SSA, and the CBO. Our best estimate for the National CPI-W assumption,

2.70 percent per year, is approximately ten basis points higher than the average National CPI-W over the past 25 years (Please see the **Historical Inflation Data** table for more details). Our best estimate for the National CPI-W assumption is equal to SSA's ultimate National CPI-W assumption under intermediate-cost projections. SSA expects their intermediate-cost National CPI-W to reach an ultimate rate of 2.70 percent in 2020. Our best estimate for the National CPI-W assumption is greater than GI's inflation assumption in 2045 which is approximately 2.50 percent. Our best estimate for the National CPI-W assumption is greater than the projections from the CBO (2.40 percent in 2025), WSIB (2.20 percent), and ERFC (2.06 percent in 2019). However, these forecasts focus on a projection period no more than ten years. The measurement period for this assumption in our actuarial modeling extends well beyond ten years.

## ***Regional Price Inflation Differential***

*Assumption*

0.30 percent

We based the regional price inflation differential on the average difference between STB CPI-W and National CPI-W over a range of historical time periods. The average difference between STB CPI-W and National CPI-W varied from 0.15 percent over the last ten years to 0.38 percent over the last 25 years. We selected a 0.30 percent STB CPI-W price differential which is approximately in the middle of the range of differences over the past 25 years.

STB CPI-W has been larger, on average, than the National CPI-W since 1950. However, STB CPI-W may not always be larger than the National CPI-W. For instance, National CPI-W was larger than the STB CPI-W over the last five years. We will continue to monitor this and consider adjusting or potentially removing our STB regional price differential if the historical STB regional price differential begins to narrow considerably over longer-term experience periods.

## ***Total Inflation***

We built our total inflation assumption by adding our best estimate for the regional price inflation differential to our best estimate for the National CPI-W assumption. The best estimate single-point assumption for total inflation, 3.00 percent per year, is one basis point higher than the average STB CPI-W over the last 25 years.

The average STB CPI-W has decreased from 6.99 percent during 1970-1979, to 4.85 percent during 1980-1989, to 3.78 percent during 1990-1999, to 2.75 percent during 2000-2009, and was 1.93 percent during 2010-2014. This may be due to a strict United States monetary policy designed to keep inflation low. The Federal Reserve has been attempting to keep inflation low. However, we believe this monetary policy will not continue since the Federal Reserve ended QE in October 2014.

We will continue to monitor actual inflation experience and revisit the inflation assumption again in two years. If inflation experience and projected inflation from other sources continue to stay below our current assumption then we will consider a decrease in our long-term inflation assumption.

Our total inflation assumption will be used in the general salary growth section to help determine "productivity growth". Productivity growth represents the difference between our general salary growth and total inflation. Please see the **General Salary Growth** section for additional detail.

## Recommendation

For the reasons stated above, we recommend no change in the total inflation assumption from the currently assumed total inflation assumption of 3.00 percent.

| Historical Inflation Data | | | | |
|---|---|---|---|---|
| | | | Annual % Change | |
| Year | STB CPI-W | National CPI-W | STB CPI-W | National CPI-W |
| 1983 | 293.2 | 297.4 | (0.27%) | 3.05% |
| 1984 | 302.8 | 307.6 | 3.27% | 3.43% |
| 1985 | 309.1 | 318.5 | 2.08% | 3.54% |
| 1986 | 311.3 | 323.4 | 0.71% | 1.54% |
| 1987 | 318.6 | 335.0 | 2.35% | 3.59% |
| 1988 | 329.1 | 348.4 | 3.30% | 4.00% |
| 1989 | 344.5 | 365.2 | 4.68% | 4.82% |
| 1990 | 369.0 | 384.4 | 7.11% | 5.26% |
| 1991 | 389.4 | 399.9 | 5.53% | 4.03% |
| 1992 | 403.2 | 411.5 | 3.54% | 2.90% |
| 1993 | 415.2 | 423.1 | 2.98% | 2.82% |
| 1994 | 430.4 | 433.8 | 3.66% | 2.53% |
| 1995 | 442.9 | 446.1 | 2.90% | 2.84% |
| 1996 | 457.5 | 459.1 | 3.30% | 2.91% |
| 1997 | 471.7 | 469.3 | 3.10% | 2.22% |
| 1998 | 484.1 | 475.6 | 2.63% | 1.34% |
| 1999 | 499.1 | 486.2 | 3.10% | 2.23% |
| 2000 | 517.8 | 503.1 | 3.75% | 3.48% |
| 2001 | 536.2 | 516.8 | 3.55% | 2.72% |
| 2002 | 545.9 | 523.9 | 1.81% | 1.37% |
| 2003 | 553.6 | 535.6 | 1.41% | 2.23% |
| 2004 | 562.3 | 549.5 | 1.57% | 2.60% |
| 2005 | 579.3 | 568.9 | 3.02% | 3.53% |
| 2006 | 600.9 | 587.2 | 3.73% | 3.22% |
| 2007 | 623.7 | 604.0 | 3.79% | 2.86% |
| 2008 | 651.6 | 628.7 | 4.48% | 4.09% |
| 2009 | 654.5 | 624.4 | 0.44% | (0.67%) |
| 2010 | 659.6 | 637.3 | 0.78% | 2.07% |
| 2011 | 680.5 | 660.0 | 3.17% | 3.56% |
| 2012 | 697.8 | 673.9 | 2.54% | 2.10% |
| 2013 | 706.3 | 683.1 | 1.22% | 1.37% |
| 2014 | 719.9 | 693.4 | 1.93% | 1.50% |

| Geometric Averages | | |
|---|---|---|
| | 2015 EES | |
| | STB CPI-W | National CPI-W |
| **1950-2014** | 3.70% | 3.60% |
| **Last 30 years** | 2.93% | 2.75% |
| **Last 25 years** | 2.99% | 2.60% |
| **Last 20 years** | 2.61% | 2.37% |
| **Last 10 years** | 2.50% | 2.35% |
| **Last 5 Years** | 1.93% | 2.12% |

*Data sources: Department of Labor, Bureau of Labor Statistics.*

| National CPI Projections | | | | | | |
|---|---|---|---|---|---|---|
| | CBO | ERFC | GI | SSA Int* | SSA Low* | SSA High* |
| 2015 | 1.10% | 0.23% | (0.19%) | 1.95% | 1.57% | 2.82% |
| 2016 | 2.20% | 2.08% | 1.95% | 2.10% | 1.65% | 2.97% |
| 2017 | 2.30% | 2.20% | 2.45% | 2.25% | 1.74% | 3.11% |
| 2018 | 2.40% | 2.15% | 2.60% | 2.40% | 1.83% | 3.26% |
| 2019 | 2.40% | 2.06% | 2.49% | 2.55% | 1.91% | 3.40% |
| 2020 | 2.40% | | 1.91% | 2.70% | 2.00% | 3.40% |
| 2021 | 2.40% | | 2.23% | 2.70% | 2.00% | 3.40% |
| 2022 | 2.40% | | 2.55% | 2.70% | 2.00% | 3.40% |
| 2023 | 2.40% | | 2.68% | 2.70% | 2.00% | 3.40% |
| 2024 | 2.40% | | 2.52% | 2.70% | 2.00% | 3.40% |
| 2025 | 2.40% | | 2.32% | 2.70% | 2.00% | 3.40% |
| 2026 | | | 2.26% | 2.70% | 2.00% | 3.40% |
| 2027 | | | 2.25% | 2.70% | 2.00% | 3.40% |
| 2028 | | | 2.27% | 2.70% | 2.00% | 3.40% |
| 2029 | | | 2.25% | 2.70% | 2.00% | 3.40% |
| 2030 | | | 2.24% | 2.70% | 2.00% | 3.40% |
| 2031 | | | 2.33% | 2.70% | 2.00% | 3.40% |
| 2032 | | | 2.30% | 2.70% | 2.00% | 3.40% |
| 2033 | | | 2.33% | 2.70% | 2.00% | 3.40% |
| 2034 | | | 2.36% | 2.70% | 2.00% | 3.40% |
| 2035 | | | 2.34% | 2.70% | 2.00% | 3.40% |
| 2036 | | | 2.33% | 2.70% | 2.00% | 3.40% |
| 2037 | | | 2.36% | 2.70% | 2.00% | 3.40% |
| 2038 | | | 2.39% | 2.70% | 2.00% | 3.40% |
| 2039 | | | 2.44% | 2.70% | 2.00% | 3.40% |
| 2040 | | | 2.43% | 2.70% | 2.00% | 3.40% |
| 2041 | | | 2.43% | 2.70% | 2.00% | 3.40% |
| 2042 | | | 2.44% | 2.70% | 2.00% | 3.40% |
| 2043 | | | 2.46% | 2.70% | 2.00% | 3.40% |
| 2044 | | | 2.47% | 2.70% | 2.00% | 3.40% |
| 2045 | | | 2.47% | 2.70% | 2.00% | 3.40% |

**SSA did not provide an annual national forecast. We linearly interpolated the years between 2015 and the ultimate rate year when the annual rate change was not provided.*

The National SSA forecasts are produced using a different basket of goods from the CBO, ERFC, and GI national projections. SSA uses Urban Wage Earners and Clerical Workers while the other forecasts use All Urban Consumers. However, we do not believe an adjustment is required given the minor differences in the averages over the last 25 years (two basis point difference).

## 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 contributions to the Plan 1 Unfunded Actuarial Accrued Liability (UAAL) for PERS and TRS 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, service based salary (or longevity) increases, and promotional increases.

In developing this assumption, we relied on data from the BLS for historical inflation. We also reviewed historical salary data from the Department of Retirement Systems (DRS).

We considered different time periods to develop our recommendation including 1984-2014 (All Years), 1984-2009 (Exclude 2010-2014), as well as 1984-2009 and 2013-2014 (Exclude 2010-2012). We observed lower than expected salary growth from 2010 through 2013 which is a result of temporary salary practices that occurred during the 2009-11 and 2011-13 Biennia. We believe these temporary salary practices do not reflect future long-term salary experience so our general salary growth recommendations were developed using historical salary growth data from 1984-2009.

We based our recommendation on data from 1984-2009 which is consistent with data used during the *2013 Economic Experience Study*. The observed general salary growth remains consistent with the prior experience study. We continue to expect lower future economic growth than what we observed in the past.

We study general salary growth and service based salary (or longevity) increases separately. Total inflation and productivity are the two key building block components of the general salary growth assumption. We formed our best estimate for total inflation in the **Inflation** section of this report. We calculated the productivity such that the cumulative observed service based salary increases approximately equals cumulative assumed service based salary increases. Please see the **Analysis** section for details on how we developed our best estimate for productivity.

For the reasons stated above, we are recommending no change in the general salary growth assumption from the current assumption that was adopted by the Council in 2011.

### Recommendation

3.75 percent*

*Current Assumption*

3.75 percent

**Includes 3.00 percent total inflation and 0.75 percent productivity.*

*Data*

We began with 31 years of experience study records, from 1984-2014. For each valuation year, we studied the active members who worked full time for at least two consecutive years. We considered a member as active if they had a full valuation year of service.

We performed two sets of adjustments to the counting method of our data.

- TRS/School Employees' Retirement System (SERS): We adjusted the counting method for valuation years 2008-2014. We observed lower than expected headcounts in the first year of service under our current counting method. TRS/SERS members begin their first year at the beginning of the school year (late August or early September), but the valuation cut-off date is June 30. As a result, we found that the full time members in their first year of employment appeared to receive less than a full valuation year of service. We adjusted our counting method to include these members as full time.

- WSPRS: We adjusted our counting method to include the WSPRS members during the 1984-1991. Based on our data, all WSPRS members during that period received half-length valuation years of service, even though they should have been granted a full-year of service. However, we found that their total amount of service credit and salary for those years was accurate.

No special data was added for this assumption, but some data was removed.

**Methodology**

Our actuarial model assumes two separate sources of salary increases: general salary growth and service based salary (or longevity) increases. We study the general salary growth and service based salary (or longevity) increases separately because we apply the assumptions in different ways. 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." Inflation is defined as "price changes over the whole of the economy." Service based salary (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 service based salary (or longevity) increases apply to specific groups and individuals.

We review general salary growth as part of the economic experience study when we look at broad trends. We typically study service based salary (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.

We used the building block method to model general salary growth. Total inflation and productivity growth are general salary growth's two building block components. The total inflation assumption was developed in the **Inflation** section. To develop our productivity growth, we reviewed growth in salaries for active members employed for two consecutive years.

**Analysis**

We took the following steps to develop our best estimate recommendation:

1. **Chose the time period for studying general salary growth.**

   We began our analysis by adding two additional years of salary data to our experience study (1984-2014).

   We observed lower than expected total salary growth during the 2009-11 and 2011-13 Biennia. This reflects temporary salary practices that we do not believe are representative of future long-term salary experience. Some examples of these temporary salary practices that occurred during the 2009-11 and 2011-13 Biennia include salary reductions and salary freezes. The temporary salary practices primarily impacted state employees, although local employees may have been impacted as well. The salary reductions during the 2011-13 Biennium for state employees were restored during the 2013-15 Biennium.

   We observed a "bounce back" in total salary growth during 2014. We did not include this bounce back because we don't believe a full cycle of salary growth has occurred. A full cycle of salary growth would reflect a period of lower than expected salary growth followed by a period of higher than expected salary growth. We don't intend on including this data until the cycle has concluded because any partial cycle could skew or bias the salary experience data and any associated recommendation.

   We elected to study the general salary growth assumption during the 1984 through 2009 time period because the current salary growth cycle has not completed. However, we provided the calculated productivity, for each system, when we include all years of data. Please see **Step 4** for more information.

2. **Assembled historical system salary growth by years of service from 1984 through 2009.**

   We display this data in **Growth in Salaries for Members Active for Two Consecutive Years** tables. It represents total salary growth, by years of service, for active members consecutively employed for two or more years during the period 1984 through 2009. For example, for all PERS active members who were employed at least two consecutive years during 1984 through 2009, the average increase in total salary from their first to second year of service was 8.81 percent.

3. **Identified the portion of historical salary growth attributable to inflation and productivity.**

   Since the data in Step 2 represents total salary growth by year of service, we then determined the portion attributable to general salary growth. Under our building block method, that means salary increases attributable to inflation and productivity.

   We input the average increase for the STB CPI-W for the period 1984 through 2009, 3.14 percent, and solved for the observed productivity increase so the cumulative observed service based salary increases equaled the cumulative

assumed service based salary increases over the period of assumed service based salary increases.

Under this method, the productivity increase represents the change in total salary increase not attributable to inflation and observed service based salary (or longevity) increases. For example, if all active PERS members who were employed for at least two consecutive years during 1984 through 2009 experienced an average 8.81 percent increase in total salary from their first to second year of service, then about 0.90 percent is attributable to productivity since average inflation was 3.14 percent over the experience study period and the observed service based salary (or longevity) increase was 4.60 percent.

4. **Reviewed the observed productivity for reasonableness.**

Overall, we found the results, based on 1984-2009 data (Recommended Study Period), reasonable for each system with observed productivity increases ranging from 0.57 percent for SERS to 0.90, 0.97, and 0.97 percent for PERS, WSPRS, and TRS respectively. We would expect an observed productivity between 0.00 and 1.00 percent and less credible results for smaller systems like SERS and WSPRS.

As we mentioned in Step 1, we elected to omit data from 2010 through 2014 because it does not include a full cycle of salary experience. However, for your reference, we provide a comparison of observed productivity rates using data from 1984-2009 (Recommended Study Period) to observed productivity rates using data from 1984-2014 (All Years) in the table below.

| Comparison of Productivity Rates | | | | | |
|---|---|---|---|---|---|
| | Data Time Period | PERS | TRS | SERS | WSPRS |
| **2013 EES** | 1984-2009 | 0.89% | 0.97% | 0.57% | 0.92% |
| **2015 EES** | | | | | |
| **All Years** | 1984-2014 | 0.53% | 0.46% | (0.02%) | 0.53% |
| **Recommended Study Period** | 1984-2009 | 0.90% | 0.97% | 0.57% | 0.97% |

The 2013 EES and 2015 EES both develop the productivity best estimate during the same time period, but the resulting productivity rates are not the same for two reasons. (1) We assumed an observed inflation of 3.14 percent during the 2015 EES (3.13 percent during the 2013 EES. (2) The 2015 EES service based salary increases were updated to reflect the 2007-12 Demographic Experience Study.

As discussed above, the inclusion of an incomplete salary growth cycle reduces the observed productivity under the building block approach we used for setting this assumption. Under this approach, inflation and service based salary increases remain constant during the study so any reduction in salary growth due to short-term salary practices is entirely attributed to decreases in observed productivity. That is why we decided to exclude 2010-14 from the development of our best estimate.

5. **Selected our best estimate.**

With the results from Step 4, we now have observed general salary growth rates (total inflation plus productivity) by system for the period 1984 to 2009. Next, we considered expectations for the future. The observed inflation during the study

period for general salary growth, 3.14 percent, is consistent with our best estimate recommendation for total inflation of 3.00 percent. The average observed productivity came in around 0.90 percent for the larger (and more credible) systems. The economic forecasts we reviewed for our total inflation assumption, and the capital market assumptions from WSIB, suggest lower economic growth over the next fifteen to twenty years than what occurred in the past. With that in mind, we selected a best estimate productivity assumption of 0.75 percent (0.15 percent below the productivity observed from 1984 to 2009). We will continue to monitor this assumption and may recommend lowering the assumption further when we have additional historical data to support the reduction (or if short-term salary practices continue for extended time periods).

We considered but did not recommend an increase in the TRS assumed productivity rate to reflect any changes in general salary growth in response to Substitute House Bill (SHB) 2776 (2010 Legislative Session) and McCleary v. State (173 Wn.2d 477). The 2015-17 budget includes a provision to resume Initiative 732 which provides cost-of-living-adjustments to teachers but we believe this is comparable to the underlying inflation assumption in general salary growth. The 2015-17 budget also includes a provision for a one-time funding increase in salary, however, general salary growth is meant to capture on-going experience trends in the data. The one-time funding increase in salary will be valued as either a short-term experience gain (or loss) in our valuation.

We did not separately study general salary growth in PSERS due to insufficient data. We also did not separately study general salary increases in TRS from bonuses paid for national board certification due to insufficient historical data. However, we plan to monitor and separately study this form of salary growth in future studies.

## Recommendation

For the reasons stated above, we recommend no change in the general salary increase assumption from the currently assumed general salary increase assumption of 3.75 percent.

| Growth in Salaries for Members Active for Two Consecutive Years | | | | | | | |
|---|---|---|---|---|---|---|---|
| PERS - 1984 to 2009 | | | | | | | |
| Year of Service | Average Increase in Salary | Average Observed Inflation* | Average Observed Productivity | Average Observed Service Based Salary Increase | Currently Assumed Service Based Salary Increase | Cumulative Observed Service Based Salary Increase | Cumulative Assumed Service Based Salary Increase |
| 0 | | | | | | | |
| 1 | 10.27% | 3.14% | 0.90% | 6.00% | 6.00% | 106.00% | 106.00% |
| 2 | 8.81% | 3.14% | 0.90% | 4.60% | 4.70% | 110.87% | 110.98% |
| 3 | 7.73% | 3.14% | 0.90% | 3.56% | 3.60% | 114.81% | 114.98% |
| 4 | 6.98% | 3.14% | 0.90% | 2.83% | 2.90% | 118.06% | 118.31% |
| 5 | 6.32% | 3.14% | 0.90% | 2.20% | 2.20% | 120.66% | 120.91% |
| 6 | 5.65% | 3.14% | 0.90% | 1.56% | 1.50% | 122.54% | 122.73% |
| 7 | 5.27% | 3.14% | 0.90% | 1.19% | 1.20% | 123.99% | 124.20% |
| 8 | 5.04% | 3.14% | 0.90% | 0.97% | 0.90% | 125.19% | 125.32% |
| 9 | 4.81% | 3.14% | 0.90% | 0.75% | 0.70% | 126.13% | 126.20% |
| 10 | 4.61% | 3.14% | 0.90% | 0.55% | 0.50% | 126.83% | 126.83% |
| 11 | 4.51% | 3.14% | 0.90% | 0.46% | 0.40% | 127.41% | 127.33% |
| 12 | 4.41% | 3.14% | 0.90% | 0.37% | 0.30% | 127.88% | 127.72% |
| 13 | 4.27% | 3.14% | 0.90% | 0.23% | 0.30% | 128.17% | 128.10% |
| 14 | 4.23% | 3.14% | 0.90% | 0.19% | 0.20% | 128.42% | 128.36% |
| 15 | 4.24% | 3.14% | 0.90% | 0.19% | 0.20% | 128.67% | 128.61% |
| 16 | 4.22% | 3.14% | 0.90% | 0.18% | 0.20% | 128.90% | 128.87% |
| 17 | 4.12% | 3.14% | 0.90% | 0.08% | 0.10% | 129.00% | 129.00% |

**Average change in the CPI-W, Seattle, Tacoma, Bremerton, from 1984 to 2009.*
*Increase in Salary = (1 + observed inflation + observed productivity) * (1 + observed service based salary increase) - 1*

| Growth in Salaries for Members Active for Two Consecutive Years | | | | | | | |
|---|---|---|---|---|---|---|---|
| TRS - 1984 to 2009 | | | | | | | |
| Year of Service | Average Increase in Salary | Average Observed Inflation* | Average Observed Productivity | Average Observed Service Based Salary Increase | Currently Assumed Service Based Salary Increase | Cumulative Observed Service Based Salary Increase | Cumulative Assumed Service Based Salary Increase |
| 0 | | | | | | | |
| 1 | 9.40% | 3.14% | 0.97% | 5.09% | 5.10% | 105.09% | 105.10% |
| 2 | 8.01% | 3.14% | 0.97% | 3.75% | 3.90% | 109.04% | 109.20% |
| 3 | 7.95% | 3.14% | 0.97% | 3.69% | 3.90% | 113.06% | 113.46% |
| 4 | 7.64% | 3.14% | 0.97% | 3.40% | 3.50% | 116.91% | 117.43% |
| 5 | 7.19% | 3.14% | 0.97% | 2.96% | 3.00% | 120.37% | 120.95% |
| 6 | 6.99% | 3.14% | 0.97% | 2.77% | 2.70% | 123.70% | 124.22% |
| 7 | 6.94% | 3.14% | 0.97% | 2.72% | 2.70% | 127.07% | 127.57% |
| 8 | 6.89% | 3.14% | 0.97% | 2.67% | 2.60% | 130.46% | 130.89% |
| 9 | 6.65% | 3.14% | 0.97% | 2.44% | 2.40% | 133.65% | 134.03% |
| 10 | 6.46% | 3.14% | 0.97% | 2.26% | 2.20% | 136.67% | 136.98% |
| 11 | 6.25% | 3.14% | 0.97% | 2.06% | 2.00% | 139.48% | 139.72% |
| 12 | 6.02% | 3.14% | 0.97% | 1.84% | 1.80% | 142.05% | 142.23% |
| 13 | 5.71% | 3.14% | 0.97% | 1.54% | 1.50% | 144.23% | 144.37% |
| 14 | 5.24% | 3.14% | 0.97% | 1.09% | 1.20% | 145.80% | 146.10% |
| 15 | 5.04% | 3.14% | 0.97% | 0.90% | 0.90% | 147.11% | 147.41% |
| 16 | 4.68% | 3.14% | 0.97% | 0.55% | 0.50% | 147.92% | 148.15% |
| 17 | 4.35% | 3.14% | 0.97% | 0.24% | 0.20% | 148.27% | 148.45% |
| 18 | 4.24% | 3.14% | 0.97% | 0.13% | 0.10% | 148.46% | 148.59% |
| 19 | 4.22% | 3.14% | 0.97% | 0.11% | 0.10% | 148.63% | 148.74% |
| 20 | 4.20% | 3.14% | 0.97% | 0.09% | 0.10% | 148.76% | 148.89% |
| 21 | 4.17% | 3.14% | 0.97% | 0.06% | 0.10% | 148.86% | 149.04% |
| 22 | 4.20% | 3.14% | 0.97% | 0.09% | 0.10% | 149.00% | 149.19% |
| 23 | 4.31% | 3.14% | 0.97% | 0.20% | 0.10% | 149.29% | 149.34% |
| 24 | 4.35% | 3.14% | 0.97% | 0.24% | 0.10% | 149.64% | 149.49% |
| 25 | 4.11% | 3.14% | 0.97% | 0.00% | 0.10% | 149.65% | 149.64% |

**Average change in the CPI-W, Seattle, Tacoma, Bremerton, from 1984 to 2009.*
*Increase in Salary = (1 + observed inflation + observed productivity) * (1 + observed service based salary increase) - 1*

| Growth in Salaries for Members Active for Two Consecutive Years | | | | | | | |
|---|---|---|---|---|---|---|---|
| SERS - 1984 to 2009 | | | | | | | |
| Year of Service | Average Increase in Salary | Average Observed Inflation* | Average Observed Productivity | Average Observed Merit Increase | Currently Assumed Merit Increase | Cumulative Observed Merit Increase | Cumulative Assumed Merit Increase |
| 0 | | | | | | | |
| 1 | 10.28% | 3.14% | 0.57% | 6.34% | 6.60% | 106.34% | 106.60% |
| 2 | 7.65% | 3.14% | 0.57% | 3.80% | 3.90% | 110.38% | 110.76% |
| 3 | 6.54% | 3.14% | 0.57% | 2.73% | 2.80% | 113.40% | 113.86% |
| 4 | 5.99% | 3.14% | 0.57% | 2.21% | 2.30% | 115.91% | 116.48% |
| 5 | 5.73% | 3.14% | 0.57% | 1.95% | 2.10% | 118.17% | 118.92% |
| 6 | 5.32% | 3.14% | 0.57% | 1.56% | 1.60% | 120.01% | 120.83% |
| 7 | 4.98% | 3.14% | 0.57% | 1.23% | 1.20% | 121.49% | 122.28% |
| 8 | 5.01% | 3.14% | 0.57% | 1.25% | 1.20% | 123.01% | 123.74% |
| 9 | 4.69% | 3.14% | 0.57% | 0.95% | 0.90% | 124.18% | 124.86% |
| 10 | 4.64% | 3.14% | 0.57% | 0.90% | 0.90% | 125.31% | 125.98% |
| 11 | 4.42% | 3.14% | 0.57% | 0.69% | 0.70% | 126.17% | 126.86% |
| 12 | 4.22% | 3.14% | 0.57% | 0.49% | 0.50% | 126.80% | 127.50% |
| 13 | 4.09% | 3.14% | 0.57% | 0.37% | 0.40% | 127.27% | 128.01% |
| 14 | 4.08% | 3.14% | 0.57% | 0.36% | 0.30% | 127.73% | 128.39% |
| 15 | 4.08% | 3.14% | 0.57% | 0.36% | 0.20% | 128.18% | 128.65% |
| 16 | 3.80% | 3.14% | 0.57% | 0.09% | 0.20% | 128.29% | 128.91% |
| 17 | 4.01% | 3.14% | 0.57% | 0.30% | 0.20% | 128.67% | 129.16% |
| 18 | 3.94% | 3.14% | 0.57% | 0.23% | 0.20% | 128.97% | 129.42% |
| 19 | 4.13% | 3.14% | 0.57% | 0.41% | 0.10% | 129.50% | 129.55% |
| 20 | 3.89% | 3.14% | 0.57% | 0.18% | 0.10% | 129.73% | 129.68% |

**Average change in the CPI-W, Seattle, Tacoma, Bremerton, from 1984 to 2009.*
*Increase in Salary = (1 + observed inflation + observed productivity) * (1 + observed service based salary increase) -1*

| Growth in Salaries for Members Active for Two Consecutive Years | | | | | | | |
|---|---|---|---|---|---|---|---|
| WSPRS - 1984 to 2009 | | | | | | | |
| Year of Service | Average Increase in Salary | Average Observed Inflation* | Average Observed Productivity | Average Observed Merit Increase | Currently Assumed Merit Increase | Cumulative Observed Merit Increase | Cumulative Assumed Merit Increase |
| 0 | | | | | | | |
| 1 | 13.57% | 3.14% | 0.97% | 9.09% | 8.50% | 109.09% | 108.50% |
| 2 | 10.72% | 3.14% | 0.97% | 6.35% | 6.00% | 116.02% | 115.01% |
| 3 | 9.54% | 3.14% | 0.97% | 5.22% | 5.00% | 122.07% | 120.76% |
| 4 | 9.01% | 3.14% | 0.97% | 4.71% | 5.00% | 127.82% | 126.80% |
| 5 | 8.91% | 3.14% | 0.97% | 4.61% | 5.00% | 133.72% | 133.14% |
| 6 | 7.31% | 3.14% | 0.97% | 3.08% | 3.50% | 137.84% | 137.80% |
| 7 | 5.17% | 3.14% | 0.97% | 1.02% | 0.60% | 139.25% | 138.63% |
| 8 | 4.11% | 3.14% | 0.97% | 0.01% | 0.60% | 139.26% | 139.46% |
| 9 | 4.28% | 3.14% | 0.97% | 0.17% | 0.60% | 139.49% | 140.29% |
| 10 | 5.13% | 3.14% | 0.97% | 0.98% | 0.60% | 140.86% | 141.14% |
| 11 | 4.64% | 3.14% | 0.97% | 0.51% | 0.60% | 141.58% | 141.98% |
| 12 | 4.20% | 3.14% | 0.97% | 0.09% | 0.40% | 141.71% | 142.55% |
| 13 | 4.21% | 3.14% | 0.97% | 0.10% | 0.40% | 141.84% | 143.12% |
| 14 | 3.60% | 3.14% | 0.97% | (0.48%) | 0.40% | 141.16% | 143.69% |
| 15 | 4.44% | 3.14% | 0.97% | 0.32% | 0.40% | 141.62% | 144.27% |
| 16 | 5.02% | 3.14% | 0.97% | 0.87% | 0.40% | 142.86% | 144.84% |
| 17 | 4.16% | 3.14% | 0.97% | 0.05% | 0.40% | 142.93% | 145.42% |
| 18 | 4.15% | 3.14% | 0.97% | 0.05% | 0.40% | 143.00% | 146.01% |
| 19 | 4.44% | 3.14% | 0.97% | 0.32% | 0.40% | 143.46% | 146.59% |
| 20 | 4.94% | 3.14% | 0.97% | 0.80% | 0.40% | 144.62% | 147.18% |
| 21 | 4.78% | 3.14% | 0.97% | 0.65% | 0.40% | 145.56% | 147.76% |
| 22 | 5.30% | 3.14% | 0.97% | 1.15% | 0.40% | 147.23% | 148.36% |
| 23 | 4.64% | 3.14% | 0.97% | 0.51% | 0.40% | 147.99% | 148.95% |
| 24 | 4.96% | 3.14% | 0.97% | 0.82% | 0.40% | 149.19% | 149.55% |
| 25 | 4.68% | 3.14% | 0.97% | 0.55% | 0.40% | 150.01% | 150.14% |
| 26 | 4.75% | 3.14% | 0.97% | 0.62% | 0.40% | 150.94% | 150.74% |
| 27 | 4.45% | 3.14% | 0.97% | 0.33% | 0.40% | 151.44% | 151.35% |

**Average change in the CPI-W, Seattle, Tacoma, Bremerton, from 1984 to 2009.*
*Increase in Salary = (1 + observed inflation + observed productivity) * (1 + observed service based salary increase) - 1*

## ANNUAL RATE OF INVESTMENT RETURN

The annual rate of investment return assumption is a key input for determining contribution rates for the ongoing retirement systems. Generally speaking, we calculate contribution rates by comparing today's value of future benefit payments to the assets we have on hand at the same point in time and dividing this by the present value of future salary. We determine today's value of future benefit payments and salaries using an assumed rate of future investment returns. In developing this assumption, we consulted with and relied on data provided by the WSIB.

We are recommending a decrease in the annual rate of investment return assumption from the assumption currently in statute. To develop our recommendation, we considered past investment returns and whether the historical conditions that produced the strong investment markets over the past twenty to thirty years will continue in the future. We also took into consideration WSIB's expectations for future investment returns.

The recommended rate of investment return assumption represents a single rate that applies to all plans invested in the Commingled Trust Fund (CTF). 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.

### Recommendation

7.50 percent

*Current Assumption*

7.80 percent during the 2015-17 Biennium
7.70 percent beginning in the 2017-19 Biennium

*Data*

Historical Plan Performance
Historical Investment Data - Current Allocations
Historical Investment Data - Alternate Allocations
WSIB Simulated Future Investment Returns

### *Methodology*

The annual rate of investment return assumption reflects anticipated returns on the retirement plan's current and future assets, net of expenses. To develop the annual rate of investment return assumption we used the "building block" method which is described in the **General Approach to Setting Economic Assumptions** section of this report.

Another reasonable method for setting the annual rate of investment return assumption is "cash-flow matching". Under this method, we project the expected benefit and expense disbursements for all plans invested in the CTF. We then identify a highly diversified U.S. bond portfolio with interest and principal payments, which approximately match our expected benefit payments in the CTF. However, due to the asset allocation of the CTF, this option is not a reasonable method for setting the annual rate of investment return assumption under current funding policy.

In addition to the items discussed in the **General Approach to Setting Economic Assumptions** section, 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 or asset allocation policy.

We intend to use this assumption to determine the contribution requirements for the ongoing retirement systems. A different measurement (i.e., plan termination or settlement liability) would require use of a different annual investment return assumption.

The recommended rate of investment return assumption represents a single rate that applies to all plans invested in the CTF. We base that rate on the average future measurement period—referred to as duration—for all plans combined. However, not all plans have the same duration. Plan 1 liabilities have a shorter duration than the liabilities of the Plans 2/3. This occurs because the Plans 1 for all systems, except WSPRS, have been closed to new entrants since 1977 (WSPRS plan 1 closed in 2002), while the Plans 2/3 are still open to new entrants. This means that all Plan 1 benefits will be paid well before the last Plans 2/3 benefits are paid—hence the shorter future measurement period or duration for the Plans 1.

Ideally, the rate of investment return assumption would be coordinated with the WSIB's current asset allocation policy, or targets, for the CTF. We based the recommendation on WSIB's current asset allocation policy. Future changes to the CTF asset allocation policy may require a new recommendation for the rate of investment return assumption.

### *Analysis*

To make our recommendation we reviewed the historical experience data, considered the historical conditions that produced past annual investment returns, and considered CMAs and simulated expected investment returns provided by the WSIB.

Often, the starting point for creating an assumption about the future would be to use historical data. We summarized historical investment returns since 1926 in the **Historical Investment Data – Current Allocation** and **Historical Investment Data – Alternate Allocations**. The difference between the two tables is the investment returns prior to 1982. WSIB was created in 1981 so for fiscal years prior to 1982 we estimated the annual returns

based on asset allocation and estimated return during each year. The historical investment returns since inception of the WSIB can be found in the **Historical Plan Performance** table.

The historical returns will vary based on the observed time period. For example, the average annual investment return was approximately 7.8 percent over the last ten years. The average annual investment return since inception of WSIB has been approximately 10.6 percent.

The implicit assumption being made when relying on historical data is that conditions, or in this case the structure of the economy, are the same now as they were in the past. When historical investment return data is used in setting a forward-looking assumption, extra attention is required to determine whether past conditions are likely to repeat in the future.

The following list demonstrates how conditions have changed and their potential impact on future returns:

- **Higher than normal growth is no longer expected.**
  Economies generally move from agricultural, to industrial, to service based. As a country moves along this progression they experience higher than normal growth and innovation. Many developed countries have progressed to the point where higher than normal growth is no longer expected.
- **Stock market returns will likely revert back to the historical average.**
  Price to Earnings (P/E) ratios state the price of stocks relative to their earnings. We looked at the Standard & Poor's 500 (S&P 500) historical P/E ratios. We noticed that S&P 500's P/E ratios grew substantially from 1980-2010, meaning investors were willing to pay more for a stock given an equal amount of earnings. When P/E ratios increase, this creates extra return for stocks (without actual business growth). No one knows where P/E ratios will go from here, but they are likely to revert back to the historical average. We do not expect to see another 30-year period of increase as seen from 1980 to 2010.
- **We will likely see lower future dividend yields.**
  Similar to P/E ratios, decreasing or increasing dividend yields add or subtract from investment returns. We looked at the S&P 500 dividend yields and observed that since the early 1980s, dividend yields have steadily decreased from about 5.50 percent to around 2 percent in 2015. Lower future dividend yields will mean lower future investment returns.

- **Increasing debt will likely not continue in perpetuity.**
  The level of debt of a private company or the government also affects returns. When debt is taken on, returns generally are better. In the United States, for example, government and private debt has generally increased over the historical period we reviewed. However, increasing debt is not likely to occur forever. As the debt burden stabilizes or gets paid down, it takes away from productivity increases, and therefore negatively impacts returns. The United States has approximately a 100 percent debt to Gross Domestic Product (GDP) ratio, which has been shown to negatively impact GDP.
- **Inflation could be lower in the future.**
  Under the building block approach, the total investment return is composed of inflation and the real rate of return. Inflation could be lower in the future than over the historical period we reviewed. Given a constant real rate of return and lower inflation, we would expect lower investment returns in the future.

A number of other theories exist as well. The list above is not exhaustive, but rather is meant to illustrate how conditions are different now compared to what has been true in the past and how those different conditions could produce lower future returns.

We also considered the WSIB's CMAs and simulated future returns to help develop our annual rate of investment return recommendation. The CMAs include three pieces of information for each class of assets the WSIB might choose to invest in:

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

WSIB uses the CMAs and their target asset allocation to simulate future investment returns (Please see the **WSIB Simulated Future Investment Returns** table for more details). WSIB provided us with simulated expected investment returns over short and long time horizons ranging from one year to 50 years. However, it is important to note that WSIB sets and applies their CMAs over a ten-fifteen year period only.

Because WSIB sets and applies their CMAs over shorter-term periods (shorter than the 50-plus year period we use for pension funding), we note they tend to reflect short-term adjustments including mean-reversion adjustments. Those adjustments are appropriate for WSIB's purposes, but tend to introduce the perception of volatility in the long-term projections that may not exist.

The following table displays the expected annual return from 50-year simulated returns for the current economic experience study and the previous three studies. These returns are based on WSIB's CMAs for the given study.

| 50-Year Simulated Future Investment Returns | | | | | |
|---|---|---|---|---|---|
| | 2015 | 2013 | 2011 | 2009 | Average |
| **75th Percentile** | 8.86% | 8.62% | 8.95% | 8.87% | **8.83%** |
| **60th Percentile** | 8.18% | 7.86% | 8.04% | 8.05% | **8.03%** |
| **55th Percentile** | 7.94% | 7.63% | 7.76% | 7.80% | **7.78%** |
| **Expected Return** | 7.74% | 7.40% | 7.49% | 7.57% | **7.55%** |
| **45th Percentile** | 7.54% | 7.17% | 7.22% | 7.31% | **7.31%** |
| **40th Percentile** | 7.31% | 6.93% | 6.94% | 7.07% | **7.06%** |
| **25th Percentile** | 6.56% | 6.13% | 6.03% | 6.25% | **6.24%** |

The simulated future investment returns for the given year are calculated assuming the target asset allocation and CMAs will remain constant throughout the projection period. We observed consistency in the target asset allocation and CMA assumptions between the current experience study and the prior three experience studies. Please see the table below for more details.

| Portfolio Statistics & Capital Market Assumptions | | | | |
|---|---|---|---|---|
| Target Asset Allocation | | | | |
| | 2015 | 2013 | 2011 | 2009 |
| **Global Equity** | 37% | 37% | 37% | 37% |
| **Tangible Assets** | 5% | 5% | 5% | 5% |
| **Fixed Income** | 20% | 20% | 20% | 20% |
| **Private Equity** | 23% | 25% | 25% | 25% |
| **Real Estate** | 15% | 13% | 13% | 13% |
| **Cash** | 0% | 0% | 0% | 0% |
| Expected 1-Year Returns | | | | |
| | 2015 | 2013 | 2011 | 2009 |
| **Global Equity** | 8.80% | 8.75% | 8.65% | 8.50% |
| **Tangible Assets** | 6.60% | 6.80% | 6.50% | 6.50% |
| **Fixed Income** | 3.90% | 3.50% | 4.25% | 5.25% |
| **Private Equity** | 11.80% | 11.75% | 11.50% | 11.50% |
| **Real Estate** | 8.00% | 8.00% | 8.00% | 8.00% |
| **Cash** | 2.30% | 2.50% | 3.00% | 3.50% |
| Standard Deviation on 1-Year Returns | | | | |
| | 2015 | 2013 | 2011 | 2009 |
| **Global Equity** | 18.85% | 18.50% | 17.62% | 16.90% |
| **Tangible Assets** | 8.60% | 7.30% | 8.00% | 8.00% |
| **Fixed Income** | 5.25% | 5.75% | 5.00% | 4.75% |
| **Private Equity** | 25.00% | 28.00% | 27.00% | 29.00% |
| **Real Estate** | 15.70% | 15.50% | 15.00% | 15.00% |
| **Cash** | 2.00% | 2.00% | 2.00% | 1.50% |

The simulated returns above come from an investment return model or distribution. Models are helpful to inform decision making, including the selection of a long-term return assumption, but do not replace decision making and professional judgment. Models also reflect simplifying assumptions that don't always match the real world. Two model

simplifications that can understate or overstate future returns include (1) constant correlations and (2) constant liquidity or adequate cash flow.

As an example, during the Great Recession, the correlations between nearly all asset classes in the CTF approached one. In this situation, the CTF did not benefit from the assumed diversification of asset classes. The simulated returns would assume constant correlations and the benefits of diversification over the entire 50-year period.

Additionally, some asset classes in the CTF are not very liquid (i.e., private equity and real estate). If the cash flow for the CTF is inadequate, and this is combined with an economic downturn, the CTF could be required to sell illiquid assets at a loss and also pay any early withdrawal penalties that may apply. The simulated returns assume constant liquidity and adequate cash low over the entire 50-year period.

For the reasons noted above, our recommendation considers but does not completely rely on the 50-year simulated returns. We recommend 7.50 percent for the annual rate of investment return. Our recommendation falls between the 50-year expected return from the prior study (7.40 percent) and the most current 50-year expected return (7.74 percent). Our recommendation also falls just below the average 50-year expected return from the last four studies (7.55 percent).

The annual rate of investment return assumption uses National CPI-W as its base building block. Since our best estimate for the National CPI-W assumption equals 2.70 percent, the remaining building block, the assumed real rate of investment return, equals 4.8 percent.

## Recommendation

For the reasons stated above, we recommend lowering the annual rate of investment return assumption from 7.80 to 7.50 percent.

However, the current legislatively prescribed annual rate of investment return assumptions of 7.80 percent for the 2015-17 Biennium, and 7.70 percent beginning in the 2017-19 Biennium are reasonable.

| Historical Plan Performance | |
|---|---|
| Fiscal Year Ending June 30 | Investment Return |
| 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 | 16.69% |
| 2007 | 21.33% |
| 2008 | (1.24%) |
| 2009 | (22.84%) |
| 2010 | 13.22% |
| 2011 | 21.14% |
| 2012 | 1.40% |
| 2013 | 12.36% |
| *2014 | 18.89% |
| **2015 | 5.47% |

**Restated. WSIB displays a FY 2014 investment return of 17.06%, however, this investment return was restated in the first quarter following the FYE.*
***July 1, 2014 through May 31, 2015.*

| Geometric Averages | 2013 | 2015 |
|---|---|---|
| Total Period | 10.47% | 10.56% |
| Last 20 Years | 8.39% | 8.68% |
| Last 10 Years | 8.32% | 7.77% |

*Source: WSIB. Returns restated for 1993 and beyond.*

| Historical Investment Data - Current Allocations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Investment Return | Year | Investment Return | Year | Investment Return | Year | Investment Return | Year | Investment Return |
| 1926 | 7.01% | 1947 | 1.46% | 1968 | 12.77% | 1989 | 13.50% | 2010 | 13.22% |
| 1927 | 21.82% | 1948 | 2.87% | 1969 | (11.21%) | 1990 | 8.30% | 2011 | 21.14% |
| 1928 | 25.78% | 1949 | 13.21% | 1970 | 2.81% | 1991 | 9.50% | 2012 | 1.40% |
| 1929 | (13.76%) | 1950 | 21.03% | 1971 | 13.34% | 1992 | 8.20% | 2013 | 12.36% |
| 1930 | (15.78%) | 1951 | 9.52% | 1972 | 10.31% | 1993 | 13.07% | *2014 | 18.89% |
| 1931 | (28.73%) | 1952 | 8.31% | 1973 | (12.52%) | 1994 | 2.10% | **2015 | 5.47% |
| 1932 | 0.57% | 1953 | (0.62%) | 1974 | (14.15%) | 1995 | 16.24% | | |
| 1933 | 54.64% | 1954 | 35.61% | 1975 | 30.09% | 1996 | 16.49% | | |
| 1934 | 9.22% | 1955 | 16.24% | 1976 | 28.22% | 1997 | 20.18% | | |
| 1935 | 29.44% | 1956 | 1.24% | 1977 | 3.37% | 1998 | 17.12% | | |
| 1936 | 29.95% | 1957 | (4.51%) | 1978 | 7.61% | 1999 | 11.76% | | |
| 1937 | (25.78%) | 1958 | 29.52% | 1979 | 15.88% | 2000 | 13.56% | | |
| 1938 | 21.10% | 1959 | 7.63% | 1980 | 20.00% | 2001 | (6.75%) | | |
| 1939 | 1.67% | 1960 | 3.42% | 1981 | 1.49% | 2002 | (5.15%) | | |
| 1940 | (3.14%) | 1961 | 18.35% | 1982 | 2.50% | 2003 | 3.02% | | |
| 1941 | (5.71%) | 1962 | (3.37%) | 1983 | 47.30% | 2004 | 16.72% | | |
| 1942 | 18.78% | 1963 | 14.45% | 1984 | (0.03%) | 2005 | 13.05% | | |
| 1943 | 30.77% | 1964 | 12.96% | 1985 | 29.80% | 2006 | 16.69% | | |
| 1944 | 20.99% | 1965 | 14.26% | 1986 | 26.90% | 2007 | 21.33% | | |
| 1945 | 33.01% | 1966 | (4.66%) | 1987 | 16.90% | 2008 | (1.24%) | | |
| 1946 | (5.37%) | 1967 | 25.62% | 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.*
**Restated. WSIB displays a FY 2014 investment return of 17.06%, however, this investment return was restated in the first quarter following the FYE.*
***July 1, 2014 through May 31, 2015.*

| Geometric Averages | 2013 | 2015 |
|---|---|---|
| **Total Period** | 9.30% | 9.24% |
| **Last 60 years** | 9.98% | 9.43% |
| **Last 50 years** | 9.70% | 9.53% |
| **Last 40 years** | 10.69% | 10.91% |
| **Last 30 years** | 9.80% | 9.68% |

| Rolling 30-year Averages* | |
|---|---|
| **Minimum** | 7.57% |
| **Maximum** | 12.51% |
| **Average** | 10.01% |

**Starting in 1926. Last period ending May 2015.*

| Assumptions for Investment Returns Prior to 1982* | | | |
|---|---|---|---|
| | Allocation | | Return |
| Asset Class | 2013 | 2015 | |
| **Global Equity** | 37% | 37% | S&P 500 |
| **Fixed Income** | 20% | 20% | Average of long-term corporate and government bond index. |
| **Private Equity** | 25% | 23% | U.S. small cap stock index. |
| **Real Estate** | 13% | 15% | Average of long-term corporate and government bond index. |
| **Tangible** | 5% | 5% | CPI + 200 basis points. |

**Constant asset allocation from 1926 through 1981. Based on WSIB's asset allocation for the given year. For the 2015 EES, we used WSIB's 2014 target asset allocation.*

| Historical Investment Data - Alternate Allocations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Investment Return | Year | Investment Return | Year | Investment Return | Year | Investment Return | Year | Investment Return |
| 1926 | 10.00% | 1947 | 2.43% | 1968 | 7.10% | 1989 | 13.50% | 2010 | 13.22% |
| 1927 | 25.77% | 1948 | 4.81% | 1969 | (7.73%) | 1990 | 8.30% | 2011 | 21.14% |
| 1928 | 26.75% | 1949 | 13.23% | 1970 | 8.50% | 1991 | 9.50% | 2012 | 1.40% |
| 1929 | (3.71%) | 1950 | 19.46% | 1971 | 13.43% | 1992 | 8.20% | 2013 | 12.36% |
| 1930 | (12.41%) | 1951 | 13.09% | 1972 | 13.98% | 1993 | 13.07% | *2014 | 18.89% |
| 1931 | (27.44%) | 1952 | 11.96% | 1973 | (8.79%) | 1994 | 2.10% | **2015 | 5.47% |
| 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 | 16.69% | | |
| 1944 | 13.36% | 1965 | 7.52% | 1986 | 26.90% | 2007 | 21.33% | | |
| 1945 | 24.83% | 1966 | (5.27%) | 1987 | 16.90% | 2008 | (1.24%) | | |
| 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.*
**Restated. WSIB displays a FY 2014 investment return of 17.06%, however, this investment return was restated in the first quarter following the FYE.*
***July 1, 2014 through May 31, 2015.*

| Geometric Averages | 2013 | 2015 |
|---|---|---|
| **Total Period** | 8.51% | 8.59% |
| **Last 60 years** | 9.10% | 8.67% |
| **Last 50 years** | 8.72% | 8.82% |
| **Last 40 years** | 9.71% | 10.14% |
| **Last 30 years** | 9.80% | 9.68% |

| Rolling 30-year Averages* | |
|---|---|
| **Minimum** | 7.04% |
| **Maximum** | 11.67% |
| **Average** | 9.08% |

**Starting in 1926. Last period ending May 2015.*

| Assumptions for Investment Returns Prior to 1982* | | |
|---|---|---|
| **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 WSIB's 2004 asset allocation.*

| WSIB Simulated Future Investment Returns | | | |
|---|---|---|---|
| Portfolio Statistics and Capital Market Assumptions | | | |
| 2015 Asset Class | Target Allocation | Expected 1-Year Return | Standard Deviation |
| Global Equity | 37% | 8.80% | 18.85% |
| Tangible Assets | 5% | 6.60% | 8.60% |
| Fixed Income | 20% | 3.90% | 5.25% |
| Private Equity | 23% | 11.80% | 25.00% |
| Real Estate | 15% | 8.00% | 15.70% |
| Cash | 0% | 2.30% | 2.00% |
| Total 2015 Target CTF | 100% | | |
| 2013 Asset Class | | | |
| Global Equity | 37% | 8.75% | 18.50% |
| Tangible Assets | 5% | 6.80% | 7.30% |
| Fixed Income | 20% | 3.50% | 5.75% |
| Private Equity | 25% | 11.75% | 28.00% |
| Real Estate | 13% | 8.00% | 15.50% |
| Cash | 0% | 2.50% | 2.00% |
| Total 2013 Target CTF | 100% | | |

| Simulated Future Investment Returns* | | |
|---|---|---|
| | Measurement Period | |
| 2015 | 15 Years | 50 Years |
| 75th Percentile | 9.78% | 8.86% |
| 60th Percentile | 8.55% | 8.18% |
| 55th Percentile | 8.16% | 7.94% |
| Expected Return | 7.82% | 7.74% |
| 45th Percentile | 7.48% | 7.54% |
| 40th Percentile | 7.10% | 7.31% |
| 25th Percentile | 5.86% | 6.56% |
| | Measurement Period | |
| 2013 | 15 Years | 50 Years |
| 75th Percentile | 9.65% | 8.62% |
| 60th Percentile | 8.31% | 7.86% |
| 55th Percentile | 7.90% | 7.63% |
| Expected Return | 7.49% | 7.40% |
| 45th Percentile | 7.08% | 7.17% |
| 40th Percentile | 6.67% | 6.93% |
| 25th Percentile | 5.27% | 6.13% |

**Source: WSIB.*

The expected investment returns are simulated using a “log stable” distribution. The log stable distribution approximates future returns based on actual historical data as opposed to assuming a normal distribution or “bell-shaped” curve. Using actual historical data incorporates “fat tails” into the distribution profile. Such fat tails contribute to positive and negative skews (a measure of the extent to which a distribution is distorted from a symmetrical bell-shaped curve), both of which are taken into account under the log stable distribution methodology. WSIB prefers the log stable modeling because it more accurately reflects actual returns. However, the log stable model relies on historical relationships and will not provide accurate estimates of future investment returns if actual future investment returns are vastly different from historical investment returns.

## GROWTH IN SYSTEM MEMBERSHIP

The growth in system membership assumption impacts the amortization of the Plan 1 UAAL. Under current law, the UAAL in PERS Plan 1 and TRS Plan 1 must be amortized over a rolling ten-year period, as a percentage of projected payrolls. We use the growth in system membership assumption to estimate the payroll over the next ten years. In developing this assumption, we relied upon system membership data from DRS and Washington State population data and forecasts from the Office of Financial Management (OFM).

The projected payroll for the PERS Plan 1 UAAL includes pay from current PERS, SERS, and Public Safety Employees' Retirement System (PSERS) members as well as projected payroll from future members of PERS Plans 2/3, SERS, and PSERS. Hereafter, for the discussion of Plan 1 UAAL system growth rate, we will use the term "PERS" to apply to the combined system growth of PERS, SERS, and PSERS. The projected payroll for the TRS Plan 1 UAAL includes pay from current TRS members as well as projected payroll from future TRS Plans 2/3 members.

We observed system growth rates during fiscal years 2013 and 2014 to be larger than the average system growth over the last ten years for each system. OFM projects Washington State population growth rates to moderately increase over the next ten years (Please see the **Growth in Washington State Population - Historical and Projected** table for more details). We developed a magnitude factor that represents the historical relationship between system growth and Washington State population growth (see Analysis section below). Applying the magnitude factor to OFM's projected population growth, we arrive at the recommended PERS and TRS Plan 1 UAAL system growth rate assumptions shown below.

We are recommending no change in the PERS Plan 1 UAAL system growth rates assumption from the current assumption that was adopted by the Pension Funding Council in 2011.

We are recommending an increase in the TRS Plan 1 UAAL system growth rate assumptions from the current assumptions that were adopted by the Pension Funding Council in 2011. We anticipate larger growth rates in TRS in light of increased state funding for basic education in response to SHB 2776 which was passed during the 2010 Legislative Session. The McCleary v. State (173 Wn.2d 477) also requires state compliance to fully fund K-12 public education by 2018.

### Recommendation

0.95 percent for PERS
1.25 percent for TRS

*Current Assumption*

0.95 percent for PERS
0.80 percent for TRS

*Data*

Growth in Washington State Population - Historical and Projected
Historical System Growth
Annual Magnitude of System Growth Relative to State Population Growth

***Analysis***

We took the following steps to develop our best estimate recommendation:

1. **Examined the correlation between system growth and state population data.**

   We assumed the PERS system growth would be representative of the Washington State population growth. We assumed the TRS system growth would be representative of the Washington State ages 5-17 population growth because less (or more) teachers would be needed as a result of the number of potential students. We examined the correlation between PERS system growth and Washington State population growth as well as TRS system growth and Washington State ages 5-17 population growth.

   We studied two different time periods in development of the PERS and TRS Plan 1 UAAL system growth rates. We chose to study the 1993-2009 time period for PERS because we observed higher than expected system growth during 1990-1992 and lower than expected system growth rates during 2010-2013. We believe the omitted years do not represent typical PERS growth. Furthermore, we expect the average future PERS growth will not exceed the average future Washington State population growth so the 1990-2014 time period does not reflect our expectations. For TRS, we considered different time periods but ultimately chose to study the 1990-2014 time period which is a continuation of our selected approach from the prior experience study and consistent with our expectations for the future.

   During 1993-2009, we found a weak correlation between same-year retirement system growth and population growth for PERS. PERS had a 0.26 correlation to same-year Washington State population growth. During 1990-2014, we found a stronger correlation between same-year retirement system growth and population growth for TRS. TRS had a 0.53 correlation to same-year Washington State ages 5-17 population growth (please see the **Historical System Growth** table for more details). Our correlations were based on annual growth rates.

   Correlation is a statistical technique that allows us to calculate how a pair of data sets moves in proportion to each other. A correlation will range from -1 to 1 where each reflects a strong negative correlation and strong positive correlation, respectively. In general, a strong relationship, whether positive or negative, tells us that the two data sets we are studying are moving in the same direction for each database year and move proportionately with each other. Based on the observed correlations, we felt confident setting our system growth assumption as a function of population growth in a year.

2. **Reviewed the annual magnitude of system growth relative to state population growth.**

   Using historical data we calculated system growth as a percent of population growth. The system growth as a percent of population growth represents our magnitude factor over a designated time period. In this approach the magnitude factor tells us how the system growth moves in relation to the population growth. We divided the average system growth for PERS and TRS by the applicable average population growth for the studied time period. PERS grew at an annual rate of 87.5 percent of general Washington State population growth. TRS grew at an annual rate of 108.6 percent of Washington State ages 5-17 population growth. Please see the **Annual Magnitude of System Growth Relative to State Population Growth** table for more details.

3. **Used OFM's population projections to determine future system growth by year.**

   We relied on OFM's state population forecasts for our assumed 2015-2024 population growth. Our method for calculating our projected annual system growth is as follows: We used OFM's 2015-2024 projected population growth by year and multiplied it by our assumed long-term ratio of system growth as a percent of state population growth (Step 2). We used general Washington State population growth (for PERS) and Washington State ages 5-17 population growth (for TRS).

4. **Took the average annual system growth from 2015 to 2024 to determine our best estimate.**

   We now had projected system growth through 2024 based on the long-term magnitude of system growth relative to state population growth. We decided to create a single assumption that applies in each year of our valuation rather than creating an assumption that varies by year.

   For our best estimate assumption for PERS, we discontinued the short-term adjustment for the lingering effects of the Great Recession from the prior experience study. With the selection of a new historical period for the magnitude factor for PERS, and the resulting lower magnitude factor, we believe the short-term adjustment is no longer needed.

   In light of increased state funding for basic education in response to SHB 2776 (2010 Legislative Session) and McCleary v. State (173 Wn.2d 477), we expect system growth in TRS to be higher than our projected system growth. We increased the 2015-2017 annual projected system growth to reflect the employment of additional teachers. We selected a 325 percent increase in the projected TRS growth during the 2015-17 Biennium. This equates to approximately 2,200 TRS members hired during each year.

   Lastly, we took the average of the 2015-2024 best estimate system growth path to develop our annual best estimate assumption.

   We provide tables below to display how we developed our best estimate for PERS and TRS.

| Year | WA Population Growth | Projected PERS System Growth* | PERS Best Estimate System Growth |
|---|---|---|---|
| **2015** | 1.24% | 1.09% | 1.09% |
| **2016** | 1.24% | 1.08% | 1.08% |
| **2017** | 1.19% | 1.05% | 1.05% |
| **2018** | 1.13% | 0.98% | 0.98% |
| **2019** | 1.02% | 0.89% | 0.89% |
| **2020** | 1.00% | 0.87% | 0.87% |
| **2021** | 0.99% | 0.87% | 0.87% |
| **2022** | 0.99% | 0.87% | 0.87% |
| **2023** | 0.98% | 0.86% | 0.86% |
| **2024** | 0.98% | 0.86% | 0.86% |
| | | **2015-2024 Average** | **0.94%** |

**Projected PERS system growth equals projected general WA state population growth multiplied by long-term PERS growth magnitude factor of 87.5%.*

| Year | WA Population Growth Ages 5- 17 | Projected TRS System Growth* | TRS Best Estimate System Growth** |
|---|---|---|---|
| **2015** | 0.87% | 0.94% | 0.94% |
| **2016** | 0.80% | 0.86% | 2.81% |
| **2017** | 0.83% | 0.90% | 2.91% |
| **2018** | 0.68% | 0.74% | 0.74% |
| **2019** | 0.66% | 0.71% | 0.71% |
| **2020** | 0.82% | 0.89% | 0.89% |
| **2021** | 0.84% | 0.92% | 0.92% |
| **2022** | 0.76% | 0.82% | 0.82% |
| **2023** | 0.78% | 0.84% | 0.84% |
| **2024** | 0.78% | 0.84% | 0.84% |
| | | **2015-2024 Average** | **1.24%** |

**Projected TRS system growth equals projected general WA state population growth multiplied by long-term TRS growth magnitude factor of 108.6%.*
***The TRS best estimate system growth was increased by 325% for 2016 and 2017.*

## Recommendation

We recommend no change in the growth in system membership assumption for PERS. For TRS, we recommend a 1.25 percent growth in system membership assumption. The recommended system membership assumption is approximately equal to our average best estimate growth for each system over the next ten years.

**Growth in Washington State Population - Historical and Projected***

| Historical Growth | | | Projected Growth | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Count | Annual Growth | Year | Count | Annual Growth | Geometric Averages | 2013 | 2015 |
| 1984 | 4,354,067 | | 2015 | 7,054,780 | 1.24% | Last 25 Years | 1.65% | 1.56% |
| 1985 | 4,415,785 | 1.42% | 2016 | 7,142,203 | 1.24% | Last 20 Years | 1.42% | 1.32% |
| 1986 | 4,462,212 | 1.05% | 2017 | 7,227,526 | 1.19% | Last 15 Years | 1.24% | 1.20% |
| 1987 | 4,527,098 | 1.45% | 2018 | 7,308,872 | 1.13% | Last 10 Years | 1.19% | 1.16% |
| 1988 | 4,616,886 | 1.98% | 2019 | 7,383,456 | 1.02% | Last 5 Years | 0.88% | 0.87% |
| 1989 | 4,728,077 | 2.41% | 2020 | 7,457,082 | 1.00% | Next 5 Years | 1.05% | 1.16% |
| 1990 | 4,866,692 | 2.93% | 2021 | 7,531,004 | 0.99% | Next 10 Years | 1.05% | 1.08% |
| 1991 | 5,021,339 | 3.18% | 2022 | 7,605,540 | 0.99% | Next 15 Years | 1.03% | 1.03% |
| 1992 | 5,141,178 | 2.39% | 2023 | 7,680,136 | 0.98% | Next 20 Years | 0.99% | 0.98% |
| 1993 | 5,265,691 | 2.42% | 2024 | 7,755,222 | 0.98% | | | |
| 1994 | 5,364,342 | 1.87% | 2025 | 7,830,696 | 0.97% | | | |
| 1995 | 5,470,108 | 1.97% | 2026 | 7,905,921 | 0.96% | | | |
| 1996 | 5,567,764 | 1.79% | 2027 | 7,979,896 | 0.94% | | | |
| 1997 | 5,663,763 | 1.72% | 2028 | 8,052,623 | 0.91% | | | |
| 1998 | 5,750,030 | 1.52% | 2029 | 8,123,960 | 0.89% | | | |
| 1999 | 5,830,833 | 1.41% | 2030 | 8,193,937 | 0.86% | | | |
| 2000 | 5,894,143 | 1.09% | 2031 | 8,262,618 | 0.84% | | | |
| 2001 | 5,970,330 | 1.29% | 2032 | 8,330,194 | 0.82% | | | |
| 2002 | 6,059,316 | 1.49% | 2033 | 8,396,252 | 0.79% | | | |
| 2003 | 6,126,885 | 1.12% | 2034 | 8,460,977 | 0.77% | | | |
| 2004 | 6,208,515 | 1.33% | | | | | | |
| 2005 | 6,298,816 | 1.45% | | | | | | |
| 2006 | 6,420,258 | 1.93% | | | | | | |
| 2007 | 6,525,086 | 1.63% | | | | | | |
| 2008 | 6,608,245 | 1.27% | | | | | | |
| 2009 | 6,672,159 | 0.97% | | | | | | |
| 2010 | 6,724,540 | 0.79% | | | | | | |
| 2011 | 6,767,900 | 0.64% | | | | | | |
| 2012 | 6,817,770 | 0.74% | | | | | | |
| 2013 | 6,882,400 | 0.95% | | | | | | |
| 2014 | 6,968,170 | 1.25% | | | | | | |

**Source: OFM. Additional computations have been performed to summarize data.*

| Historical System Growth* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | PERS | | WA Population | | TRS | | WA Population Ages 5-17 | |
| Year | # of Active Members | Annual Growth | # of People | Annual Growth | # of Active Members | Annual Growth | # of People | Annual Growth |
| **1990** | 150,241 | 7.97% | 4,866,692 | 2.93% | 51,323 | 4.34% | 893,252 | 3.54% |
| **1991** | 165,008 | 9.83% | 5,021,339 | 3.18% | 52,779 | 2.84% | 930,866 | 4.21% |
| **1992** | 171,947 | 4.21% | 5,141,178 | 2.39% | 55,276 | 4.73% | 960,367 | 3.17% |
| **1993** | 174,576 | 1.53% | 5,265,691 | 2.42% | 56,571 | 2.34% | 992,179 | 3.31% |
| **1994** | 177,456 | 1.65% | 5,364,342 | 1.87% | 57,731 | 2.05% | 1,020,268 | 2.83% |
| **1995** | 178,833 | 0.78% | 5,470,108 | 1.97% | 59,103 | 2.38% | 1,050,730 | 2.99% |
| **1996** | 182,603 | 2.11% | 5,567,764 | 1.79% | 59,425 | 0.54% | 1,077,440 | 2.54% |
| **1997** | 186,440 | 2.10% | 5,663,763 | 1.72% | 60,815 | 2.34% | 1,101,252 | 2.21% |
| **1998** | 191,850 | 2.90% | 5,750,030 | 1.52% | 61,828 | 1.67% | 1,113,531 | 1.12% |
| **1999** | 196,382 | 2.36% | 5,830,833 | 1.41% | 62,684 | 1.38% | 1,119,908 | 0.57% |
| **2000** | 199,986 | 1.84% | 5,894,143 | 1.09% | 63,858 | 1.87% | 1,119,533 | (0.03%) |
| **2001** | 201,283 | 0.65% | 5,970,330 | 1.29% | 66,220 | 3.70% | 1,121,086 | 0.14% |
| **2002** | 203,976 | 1.34% | 6,059,316 | 1.49% | 66,063 | (0.24%) | 1,125,692 | 0.41% |
| **2003** | 203,764 | (0.10%) | 6,126,885 | 1.12% | 66,075 | 0.02% | 1,125,535 | (0.01%) |
| **2004** | 206,110 | 1.15% | 6,208,515 | 1.33% | 66,634 | 0.85% | 1,127,775 | 0.20% |
| **2005** | 205,928 | (0.09%) | 6,298,816 | 1.45% | 67,270 | 0.95% | 1,132,190 | 0.39% |
| **2006** | 207,918 | 0.97% | 6,420,258 | 1.93% | 67,736 | 0.69% | 1,143,545 | 1.00% |
| **2007** | 211,602 | 1.77% | 6,525,086 | 1.63% | 64,939 | (4.13%) | 1,148,590 | 0.44% |
| **2008** | 217,423 | 2.75% | 6,608,245 | 1.27% | 66,524 | 2.44% | 1,145,629 | (0.26%) |
| **2009** | 216,049 | (0.63%) | 6,672,159 | 0.97% | 67,388 | 1.30% | 1,140,370 | (0.46%) |
| **2010** | 213,075 | (1.38%) | 6,724,540 | 0.79% | 66,325 | (1.58%) | 1,141,697 | 0.12% |
| **2011** | 208,936 | (1.94%) | 6,767,900 | 0.64% | 66,203 | (0.18%) | 1,135,372 | (0.55%) |
| **2012** | 206,398 | (1.21%) | 6,817,770 | 0.74% | 65,357 | (1.28%) | 1,135,839 | 0.04% |
| **2013** | 207,514 | 0.54% | 6,882,400 | 0.95% | 65,935 | 0.88% | 1,141,729 | 0.52% |
| **2014** | 211,063 | 1.71% | 6,968,170 | 1.25% | 67,293 | 2.06% | 1,151,591 | 0.86% |
| **Geometric Averages** | | | | | | | | |
| **1990-2014** | | 1.68% | | 1.56% | | 1.26% | | 1.16% |
| **1993-2009** | | 1.35% | | 1.55% | | 1.17% | | 1.02% |
| **1995-2014** | | 0.87% | | 1.32% | | 0.77% | | 0.61% |
| **2005-2014** | | 0.24% | | 1.16% | | 0.10% | | 0.21% |
| **2010-2014** | | (0.47%) | | 0.87% | | (0.03%) | | 0.20% |

**Source: Department of Retirement Systems and Office of Financial Management. Additional computations have been performed to summarize data.*

| PERS to WA Population | | |
|---|---|---|
| | Magnitude Ratio | Correlation |
| **1990-2014** | 107.5% | 85.0% |
| **1993-2009** | 87.5% | 25.9% |
| **1995-2014** | 66.2% | 64.9% |
| **2005-2014** | 20.5% | 68.9% |
| **2010-2014** | (53.4%) | 97.5% |

| TRS to WA Population Ages 5-17 | | |
|---|---|---|
| | Magnitude Ratio | Correlation |
| **1990-2014** | 108.6% | 53.5% |
| **1993-2009** | 115.4% | 23.0% |
| **1995-2014** | 126.7% | 23.3% |
| **2005-2014** | 47.1% | (1.3%) |
| **2010-2014** | (14.4%) | 65.5% |

| Annual Magnitude of System Growth Relative to State Population Growth | | | | |
|---|---|---|---|---|
| | PERS System Growth | WA Population Growth | TRS System Growth | WA 5-17 Population Growth |
| **1990** | N/A | N/A | 4.34% | 3.54% |
| **1991** | N/A | N/A | 2.84% | 4.21% |
| **1992** | N/A | N/A | 4.73% | 3.17% |
| **1993** | 1.53% | 2.42% | 2.34% | 3.31% |
| **1994** | 1.65% | 1.87% | 2.05% | 2.83% |
| **1995** | 0.78% | 1.97% | 2.38% | 2.99% |
| **1996** | 2.11% | 1.79% | 0.54% | 2.54% |
| **1997** | 2.10% | 1.72% | 2.34% | 2.21% |
| **1998** | 2.90% | 1.52% | 1.67% | 1.12% |
| **1999** | 2.36% | 1.41% | 1.38% | 0.57% |
| **2000** | 1.84% | 1.09% | 1.87% | (0.03%) |
| **2001** | 0.65% | 1.29% | 3.70% | 0.14% |
| **2002** | 1.34% | 1.49% | (0.24%) | 0.41% |
| **2003** | (0.10%) | 1.12% | 0.02% | (0.01%) |
| **2004** | 1.15% | 1.33% | 0.85% | 0.20% |
| **2005** | (0.09%) | 1.45% | 0.95% | 0.39% |
| **2006** | 0.97% | 1.93% | 0.69% | 1.00% |
| **2007** | 1.77% | 1.63% | (4.13%) | 0.44% |
| **2008** | 2.75% | 1.27% | 2.44% | (0.26%) |
| **2009** | (0.63%) | 0.97% | 1.30% | (0.46%) |
| **2010** | N/A | N/A | (1.58%) | 0.12% |
| **2011** | N/A | N/A | (0.18%) | (0.55%) |
| **2012** | N/A | N/A | (1.28%) | 0.04% |
| **2013** | N/A | N/A | 0.88% | 0.52% |
| **2014** | N/A | N/A | 2.06% | 0.86% |
| **Geometric Average** | 1.35% | 1.55% | 1.26% | 1.16% |
| **Magnitude Factor** | | **87.51% = 1.35% / 1.55%** | | **108.56% = 1.26% / 1.16%** |

# Actuarial Certification Letter
# Report on Long-Term Economic Experience Study

August 31, 2015

This report documents the results of an economic experience study 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 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. Participant data reflects retirement system census data through June 30, 2014. Asset data reflects returns through May 31, 2015.

The Department of Retirement Systems provided 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 asset information as of May 31, 2015. An audit of the financial and participant data was not performed. We relied on all the information provided as complete and accurate. In our 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 help formulate expectations for future rates of annual investment return. We reviewed the CMAs for reasonableness as appropriate based on the purpose of this experience study.

The recommendations in this experience study involve the interpretation of many factors and the application of professional judgment. We 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 our 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, meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. While this report is intended to be complete, we are available to offer extra advice and explanation as needed.

Sincerely,

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

Lisa A. Won, ASA, FCA, MAAA
Deputy State Actuary

*O:\PFC\2015\EES-RFC\2015 EES and RFC Communication.docx*