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November 12, 2018

Board of Trustees
Oklahoma Public Employees Retirement System
5400 N Grand Boulevard, Suite 400
P.O. Box 53007
Oklahoma City, OK 73112-5625

Members of the Board:

In this report are submitted the results of the annual valuation of the assets and liabilities of the State of Oklahoma Public Employees Retirement System (OPERS), prepared as of July 1, 2018.

The purpose of this report is to provide a summary of the funded status of the System as of July 1, 2018 and to provide the actuarially determined rate. While not verifying the data at the source, the actuary performed tests for consistency and reasonability. There have been no changes to the actuarial assumptions or methods since the last valuation.

The promised benefits of the System are included in the actuarially calculated contribution rates which are developed using the Entry Age Normal cost method. A five-year market related value of assets is used for actuarial valuation purposes. Gains and losses are reflected in the unfunded actuarial accrued liability (UAAL) that is being amortized by regular annual contributions as a level percentage of payroll, on the assumption that payroll will increase by 3.50% annually.

As in the last valuation, liabilities have been calculated without considering future cost of living adjustments (COLAs) in keeping with House Bill 2132 (2011). In addition, House Bill 2630 (2014) closes the plan to most new employees hired after November 1, 2015.

House Bill 1340 (2018) provides a stipend for members of each system who have been retired for five years as of October 1, 2018. The stipend amount is based on the funding level of the system and will be funded by the system. OPERS members will receive the lesser of 2% of the gross annual retirement amount or \$1,200. The bill also provides a minimum payment of \$350 for members with 20 years of service. The effective date of the stipend is October 1, 2018.

Should funding of future COLAs and/or stipends be provided by the System, the COLAs and/or stipends should be included in the actuarial valuation.

The actuary prepared the following supporting schedules for the Comprehensive Annual Financial Report:

Actuarial Section

Summary of Results
Analysis of Financial Experience
Solvency Test
Summary of Membership Data

This is to certify that the independent consulting actuaries are members of the American Academy of Actuaries and have experience in performing valuations for public retirement systems, that the valuation was prepared in accordance with principles of practice prescribed by the Actuarial Standards Board, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures, based on the current provisions of the retirement system and on actuarial assumptions that are internally consistent and reasonably based on the actual experience of the System.

Future actuarial results may differ significantly from the current results presented in this report due to factors such as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Because the potential impact of such factors is outside the scope of a normal annual actuarial valuation, an analysis of the range of results is not presented herein.

We have also reviewed the supplemental medical benefits provided by the System under Section 401(h) of the Internal Revenue Code and have determined that these benefits are subordinate to the retirement benefits as required.

In our opinion, in order for the System to meet all the benefit obligations of the plan for current active and retired members, contributions equal to at least the actuarially determined rate are necessary for future fiscal years. Assuming these contributions are made to the System, from year to year in the future at the rates recommended on the basis of the successive actuarial valuations, the continued sufficiency of the retirement fund to provide the benefits called for under the System may be safely anticipated. Because the statutory contribution exceeds the actuarially determined rate in this valuation, we recommend the statutory contribution be used to pay the UAAL down faster than under the current schedule and to protect against future investment and experience losses.

The Table of Contents, which immediately follows, outlines the material contained in the report.

Respectfully submitted,



Alisa Bennett, FSA, EA, FCA, MAAA
Principal and Consulting Actuary



Brent Banister, PhD, FSA, EA, FCA, MAAA
Chief Pension Actuary

Summary of Results

| | 7/1/2018 Valuation | 7/1/2017 Valuation | % Change |
|--|-----------------------|-----------------------|-------------|
| 1. PARTICIPANT DATA | | | |
| Number of: | | | |
| Active Members | 36,329 | 38,873 | (6.5) |
| Retired and Disabled Members and Beneficiaries | 35,260 | 34,579 | 2.0 |
| Inactive Members | 6,024 | 5,951 | 1.2 |
| Total Members | 77,613 | 79,403 | (2.3) |
| Projected Annual Salaries of Active Members | \$ 1,601,074,591 | \$ 1,688,543,856 | (5.2) |
| Annual Retirement Payments for Retired Members and Beneficiaries | \$ 595,301,608 | \$ 576,548,059 | 3.3 |
| 2. ASSETS AND LIABILITIES | | | |
| Total Actuarial Accrued Liability | \$ 9,884,133,615 | \$ 9,781,617,070 | 1.0 |
| Market Value of Assets | \$ 9,702,031,567 | \$ 9,229,499,873 | 5.1 |
| Actuarial Value of Assets | \$ 9,658,126,021 | \$ 9,241,292,469 | 4.5 |
| Unfunded Actuarial Accrued Liability | \$ 226,007,594 | \$ 540,324,601 | (58.2) |
| Funded Ratio | 97.7% | 94.5% | 3.4 |
| 3. EMPLOYER CONTRIBUTION RATES AS A PERCENT OF PAYROLL | | | |
| Normal Cost Rate | 10.27% | 10.24% | |
| Amortization of Unfunded Actuarial Accrued Liability | 1.66% | 3.57% | |
| Budgeted Expenses | 0.43% | 0.40% | |
| Total Actuarially Determined Contribution Rate | 12.36% | 14.21% | |
| Less Estimated Member Contribution Rate | 4.18% | 4.14% | |
| Employer Actuarially Determined Contribution Rate | 8.18% | 10.07% | |
| Less Statutory State Employer Contribution Rate | 16.50% | 16.50% | |
| Contribution Shortfall/(Surplus) | (8.32%) | (6.43%) | |

Analysis of Financial Experience

Gains & Losses in Actuarial Accrued Liability During the Year Ended June 30, 2018 Resulting from Differences Between Assumed Experience & Actual Experience

| Type of Activity | (Gain) or Loss for Year End 2018 |
|--|-------------------------------------|
| 1. Age & Service Retirements. Generally, if members retire at older ages or with smaller benefits than assumed, there is a gain. If they retire at younger ages or have higher average pays, a loss occurs. | \$ (4,100,000) |
| 2. Disability Retirements. If disability claims are less than assumed, there is a gain. If more claims, a loss. | 1,000,000 |
| 3. Deaths. If more deaths occur than assumed, there is a gain. If fewer, there is a loss. | (18,700,000) |
| 4. Withdrawal from Employment. If more liabilities are released by withdrawals than assumed, there is a gain. If smaller releases, a loss. | (11,700,000) |
| 5. Pay Increases. If there are smaller pay increase than assumed, there is a gain. If greater increases, a loss. | (85,400,000) |
| 6. New Entrants. All new entrants to the System create a loss. | 16,400,000 |
| 7. Other. Miscellaneous gains and losses resulting from data adjustments, employee transfers, valuation methods, etc. | (18,400,000) |
| 8. (Gain) or Loss During Year From Financial Experience. | <u>(67,800,000)</u> |
| 9. Composite (Gain) or Loss During Year. | <u>\$ (188,700,000)</u> |

Solvency Test

The OPERS funding objective is to be able to pay long-term benefit promises through contributions that remain approximately level from year to year as a percent of salaries earned by members. In this way, members and employers in each year pay their fair share for retirement service accrued in that year by OPERS members.

If the retirement system follows level contribution rate financing principles, the system will pay all promised benefits when due – the ultimate test of financial soundness.

A short-term solvency test is one means of monitoring OPERS funding progress. In a short-term solvency test, the retirement System’s present valuation assets are compared with: 1) active member contributions on deposit, 2) the liabilities for future benefits to persons who have retired and the liabilities for terminated employees with vested benefits, and 3) the liabilities for service already rendered by active members. In a system that has been following the discipline of level contribution rate financing, the liabilities for member contributions on deposit (liability 1), the liabilities for future benefits to present retirees and the liabilities for future benefits for terminated employees (liability 2) will be fully covered by present assets, except in rare circumstances.

In addition, the liabilities for service already rendered by members (liability 3) will be partially covered by the remainder of present assets. Generally, if the system has been using level contribution rate financing, the funded portion of liability 3 will increase over time; however, a decrease generally occurs in those years when substantial benefit improvements are granted by the Legislature. It is unusual for liability 3 to be fully funded. The funded ratio of the System based on total actuarial accrued liabilities (1 + 2 + 3) provides an indication of how well the System is funded.

The schedule below illustrates the progress of funding the actuarial accrued liabilities of OPERS.

| Date | Actuarial Accrued Liability and Valuation Assets (in thousands) | | | | | Portion of Actuarial Accrued Liability Covered by Reported Assets | | | |
|--------------|---|---|---|-----------------------------|------------------------------|---|------|-------|---|
| | Active Member Contributions (Liability 1) | Retirees, Beneficiaries and Terminated Vested Members (Liability 2) | Employer Financed Portion of Active Members (Liability 3) | Total Liability (1 + 2 + 3) | Reported Assets ¹ | (1) | (2) | (3) | Funded Ratio of Total Accrued Actuarial Liability |
| July 1, 2009 | \$466,880 | \$4,913,032 | \$3,911,546 | \$9,291,458 | \$6,208,245 | 100% | 100% | 21.2% | 66.8% |
| July 1, 2010 | 487,980 | 5,252,862 | 3,881,786 | 9,622,628 | 6,348,416 | 100 | 100 | 15.8 | 66.0 |
| July 1, 2011 | 488,418 | 4,677,760 | 3,013,590 | 8,179,768 | 6,598,628 | 100 | 100 | 47.5 | 80.7 |
| July 1, 2012 | 505,373 | 4,832,068 | 2,997,197 | 8,334,638 | 6,682,200 | 100 | 100 | 44.9 | 80.2 |
| July 1, 2013 | 517,653 | 5,032,769 | 3,005,700 | 8,556,122 | 6,978,873 | 100 | 100 | 47.5 | 81.6 |
| July 1, 2014 | 534,081 | 5,184,818 | 3,034,770 | 8,753,669 | 7,759,258 | 100 | 100 | 67.2 | 88.6 |
| July 1, 2015 | 537,046 | 5,417,604 | 3,041,476 | 8,996,126 | 8,420,307 | 100 | 100 | 81.1 | 93.6 |
| July 1, 2016 | 545,020 | 5,757,019 | 3,125,771 | 9,427,810 | 8,790,886 | 100 | 100 | 79.6 | 93.2 |
| July 1, 2017 | 549,211 | 6,131,997 | 3,100,409 | 9,781,617 | 9,241,292 | 100 | 100 | 82.6 | 94.5 |
| July 1, 2018 | 550,806 | 6,312,792 | 3,020,536 | 9,884,134 | 9,658,126 | 100 | 100 | 92.5 | 97.7 |

¹Actuarial value of assets based on the smoothing technique adopted by Board.

Schedule of Active Member Valuation Data

| Valuation Date | Number | Annual Payroll | Annual Average Pay | % Increase in Average Pay |
|----------------|--------|-----------------|--------------------|---------------------------|
| July 1, 2018 | 36,329 | \$1,601,074,591 | \$44,072 | 1.46 |
| July 1, 2017 | 38,873 | 1,688,543,856 | 43,437 | 1.40 |
| July 1, 2016 | 41,806 | 1,790,809,603 | 42,836 | 3.82 |
| July 1, 2015 | 43,843 | 1,808,972,785 | 41,260 | 3.97 |
| July 1, 2014 | 43,947 | 1,744,041,536 | 39,685 | 1.29 |
| July 1, 2013 | 43,273 | 1,695,347,809 | 39,178 | 2.08 |
| July 1, 2012 | 42,569 | 1,633,837,374 | 38,381 | (0.90) |
| July 1, 2011 | 40,551 | 1,570,500,148 | 38,729 | 1.06 |
| July 1, 2010 | 43,934 | 1,683,697,139 | 38,323 | 1.01 |
| July 1, 2009 | 45,683 | 1,732,975,532 | 37,935 | 1.72 |
| July 1, 2008 | 45,120 | 1,682,663,413 | 37,293 | 2.50 |

Schedule of Retirants, Disabled Retirants, and Beneficiaries Added to and Removed from Rolls

| Year Ended | Added to Rolls | | Removed from Rolls | | Rolls – End of Year | | % Increase in Annual Allowances | Average Annual Allowances |
|---------------|----------------|-------------------|--------------------|-------------------|---------------------|-------------------|---------------------------------|---------------------------|
| | Number | Annual Allowances | Number | Annual Allowances | Number | Annual Allowances | | |
| June 30, 2018 | 1,692 | \$31,763,873 | 1,011 | \$ 13,010,324 | 35,260 | \$ 595,301,608 | 3.25 | \$16,883 |
| June 30, 2017 | 1,846 | 35,653,217 | 1,016 | 12,736,245 | 34,579 | 576,548,059 | 4.14 | 16,673 |
| June 30, 2016 | 1,986 | 37,356,248 | 991 | 12,505,069 | 33,749 | 553,631,087 | 4.70 | 16,404 |
| June 30, 2015 | 1,898 | 35,731,879 | 977 | 11,895,298 | 32,754 | 528,779,908 | 4.72 | 16,144 |
| June 30, 2014 | 1,667 | 28,477,713 | 969 | 11,707,809 | 31,833 | 504,943,327 | 3.44 | 15,862 |
| June 30, 2013 | 1,767 | 31,633,122 | 895 | 10,184,240 | 31,135 | 488,173,423 | 4.60 | 15,679 |
| June 30, 2012 | 1,703 | 29,234,998 | 858 | 10,430,214 | 30,263 | 466,724,541 | 4.20 | 15,422 |
| June 30, 2011 | 2,232 | 40,890,700 | 823 | 9,670,100 | 29,418 | 447,919,757 | 7.49 | 15,226 |
| June 30, 2010 | 1,867 | 32,394,848 | 807 | 9,942,962 | 28,009 | 416,699,157 | 5.69 | 14,877 |
| June 30, 2009 | 1,595 | 27,216,987 | 679 | 9,117,210 | 26,949 | 394,247,271 | 4.81 | 14,629 |

Summary of System Provisions

Effective Date: The System became effective January 1, 1964. The fiscal year is July 1 to June 30.

Employees Included: All permanent employees of the State of Oklahoma, and any other employer such as a county, county hospital, city or town, conservation districts, circuit engineering districts, and any trust in which a county, city, or town participates and is the primary beneficiary, are eligible to join if:

- the employee is not eligible for or participating in another retirement system authorized under Oklahoma law, is covered by Social Security and not participating in the U.S. Civil Service Retirement System,
- the employee is scheduled for 1,000 hours per year and salary is not less than the hourly rate of the monthly minimum wage for State employees (for employees of local government employers, not less than the hourly rate of the monthly minimum wage for such employees).

Membership is mandatory for new eligible employees on the first of the month following employment. Beginning November 1, 2015, most new state employees are excluded from participating in the defined benefit plan.

Employee and Employer Contributions: 3.5% of pay for most State employees and 16.5% for employers. Local employees, elected officials, members covered by the Department of Corrections Hazardous Duty provisions, and members who elect the step up provision contribute at varying rates.

Final Average Compensation: Generally the highest annual average of any thirty-six months within the last ten years of participating service. For members hired on or after July 1, 2013, the highest annual average of any sixty months within the last ten years of participating service.

Retirement Date:
Normal: Age 62 (age 60 for elected officials), 80 age/service points if hired before July 1, 1992, 90 age/service points if hired on or after July 1, 1992.

For non-elected employees hired on or after November 1, 2011, the retirement age is age 65 or 90 age/service points if at least 60. For elected officials hired on or after November 1, 2011, age 65 with 8 years of service or 62 with 10 years of service.

Summary of System Provisions (continued)

| | |
|--|---|
| | 20 years of service for certain members covered by the Department of Corrections Hazardous Duty provisions and certain Oklahoma Military Department Firefighters. |
| <i>Early:</i> | Age 55 with 10 years of service. |
| <i>Normal Retirement Benefit:</i> | General formula is 2% of final average compensation multiplied by years of credited service. |
| <i>Disability Benefit:</i> | After eight years of service, provided the member qualifies for disability benefits as certified either by the Social Security Administration or the Railroad Retirement Board. Benefit is determined by the normal retirement formula based on service and salary history at date of disability. The benefit is payable immediately without actuarial reduction. |
| <i>In-service Death Benefit:</i> | <p>If the deceased member was vested, the benefit that would have been paid the member had he retired and elected the joint and 100% survivor option (Option B).</p> <p>For elected officials, it is 50% of the benefit that would have been paid the member had he retired.</p> |
| <i>Postretirement Death Benefit:</i> | \$5,000 lump-sum. |
| <i>Forms of Payment:</i> | Life annuity, joint and 50% survivor, joint and 100% survivor annuity, life annuity with a minimum of 120 monthly payments, and Medicare Gap Benefit option. |
| <i>Supplemental Medical Insurance Premium:</i> | The System will contribute the lesser of \$105 per month or the Medicare Supplement Premium to the Office of Management and Enterprise Services, Employees Group Insurance Division (or other eligible employer health plans) for members receiving retirement benefits. |

Summary of Actuarial Assumptions and Methods

1. The investment return rate used in the valuation was 7.00 percent per year, net of investment expenses, compounded annually. This rate of return is not the assumed real rate of return. The real rate of return is the rate of return in excess of the inflation rate. Considering other financial assumptions, the 7.00 percent investment return rate translates to an assumed real rate of return of 4.25 percent.
2. The RP-2014 Mortality Table projected to 2025 using Scale MP-2016 with male rates multiplied by 95% under age 70 and 105% over age 70, while female rates are multiplied by 90% and 115%.
3. The probabilities of withdrawal from service, together with individual pay increase assumptions, are shown in Schedule 1.
4. The probabilities of retirement with an age and service allowance are shown in Schedules 2A, 2B and 2C.
5. Because of the passage of House Bill 2132, benefits are not assumed to increase due to future ad hoc cost-of-living increases.
6. The individual entry-age normal actuarial cost method of valuation was used in determining actuarial accrued liability and normal cost. Actuarial gains and losses reduce or increase the unfunded actuarial accrued liability and are amortized over the remaining amortization period (nine years as of July 1, 2018).
7. The actuarial value of assets is based on a five-year moving average of expected actuarial values and market values. A preliminary expected value is determined equal to the prior year's actuarial value of assets plus net cash flow for the year ending on the valuation date, assuming the valuation investment return. The expected actuarial asset value is equal to the preliminary expected actuarial value plus the unrecognized investment gains and losses as of the beginning of the previous fiscal year. Twenty percent (20%) of the gain/loss as measured by the difference between the expected actuarial value and the market value at the valuation date is added to the preliminary expected actuarial value plus twenty percent (20%) of the unrecognized gains or losses for the four preceding fiscal years. The final result is constrained to a value no less than 80% and no more than 120% of the market value at the valuation date.
8. The actuarial assumptions and methods used in the valuation were adopted by the Board based on System experience from July 1, 2013 through June 30, 2016.

Summary of Actuarial Assumptions and Methods (continued)

Schedule 1

Withdrawal From Active Employment Before Age & Service Retirement and Individual Pay Increase Assumptions

| Sample Service Values | Withdrawal | Sample Ages | Percent Increase in Individual's Pay During Next Year |
|-----------------------|------------|-------------|---|
| 1 | 22.00% | 25 | 7.80% |
| 5 | 10.50 | 30 | 6.30 |
| 10 | 6.00 | 35 | 5.50 |
| 15 | 4.25 | 40 | 5.20 |
| 20 | 3.00 | 45 | 4.80 |
| 25 | 1.75 | 50 | 4.50 |
| | | 55 | 4.30 |

Schedule 2A

Percent of Eligible Regular Non-Elected Active Members Retiring Within Next Year

Those Eligible for Unreduced Retirement and Hired Before November 1, 2011

| Retirement Ages | Percent | Retirement Ages | Percent |
|-----------------|---------|-----------------|---------|
| 50 | 15% | 61 | 20% |
| 51 | 15% | 62 | 25% |
| 52 | 15% | 63 | 15% |
| 53 | 15% | 64 | 15% |
| 54 | 15% | 65 | 30% |
| 55 | 10% | 66 | 25% |
| 56 | 10% | 67 | 25% |
| 57 | 11% | 68 | 25% |
| 58 | 12% | 69 | 25% |
| 59 | 13% | 70 | 100% |
| 60 | 14% | | |

Summary of Actuarial Assumptions and Methods (continued)

Those Eligible for Unreduced Retirement and Hired on or after November 1, 2011

| Retirement | |
|------------|---------|
| Ages | Percent |
| 60 | * |
| 61 | * |
| 62 | * |
| 63 | * |
| 64 | * |
| 65 | * |
| 66 | 20% |
| 67 | 20% |
| 68 | 20% |
| 69 | 25% |
| 70 | 100% |

*30% when first eligible and 15% thereafter.

Schedule 2B

Percent of Eligible Non-Elected Active Members Retiring Within Next Year

Those Not Eligible for Unreduced Retirement or Department of Corrections Members With Less Than 20 Years of Service, hired before November 1, 2011

| Regular Employees | | Department of Corrections | | | |
|-------------------|---------|---------------------------|---------|------------|---------|
| Retirement | | Retirement | | Retirement | |
| Ages | Percent | Ages | Percent | Ages | Percent |
| 55 | 3% | 55 | 4% | 63 | 22% |
| 56 | 4% | 56 | 5% | 64 | 25% |
| 57 | 4% | 57 | 5% | 65 | 40% |
| 58 | 5% | 58 | 5% | 66 | 25% |
| 59 | 6% | 59 | 5% | 67 | 25% |
| 60 | 6% | 60 | 5% | 68 | 25% |
| 61 | 15% | 61 | 20% | 69 | 25% |
| | | 62 | 40% | 70 | 100% |

Summary of Actuarial Assumptions and Methods (continued)

Those Not Eligible for Unreduced Retirement and hired on or after November 1, 2011

| Regular Employees | | Department of Corrections | | | |
|--------------------------|----------------|----------------------------------|----------------|-------------------|----------------|
| Retirement | | Retirement | | Retirement | |
| Ages | Percent | Ages | Percent | Ages | Percent |
| 60 | 7% | 60 | 7% | 66 | 25% |
| 61 | 7% | 61 | 20% | 67 | 23% |
| 62 | 20% | 62 | 20% | 68 | 22% |
| 63 | 15% | 63 | 20% | 69 | 21% |
| 64 | 15% | 64 | 20% | 70 | 100% |
| | | 65 | 40% | | |

Schedule 2C

Percent of Eligible Active Members Retiring Within Next Year

Department of Corrections Members With More Than 20 Years of Service

| Service | Percent |
|----------------|----------------|
| 20 | 25% |
| 21 | 25% |
| 22 | 20% |
| 23 - 24 | 15% |
| 25 - 29 | 23% |
| 30 - 34 | 25% |
| 35 | 100% |