



**Cavanaugh Macdonald**  
CONSULTING, LLC

*The experience and dedication you deserve*

**Oklahoma Police  
Pension and  
Retirement System**

**Actuarial Valuation Report  
as of July 1, 2018**





# Cavanaugh Macdonald

CONSULTING, LLC

*The experience and dedication you deserve*

September 12, 2018

Board of Trustees  
Oklahoma Police Pension and Retirement System  
1001 N.W. 63<sup>rd</sup> Street, Suite 305  
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Members of the Board:

In this report are submitted the results of the annual valuation of the assets and liabilities of the Oklahoma Police Pension and Retirement System (OPPRS), 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 calculate the Required State Contribution Rate. While not verifying the data at the source, the actuary performed tests for consistency and reasonability. There have been no changes in plan provisions since the last valuation. However, there was a one-time stipend approved by the Legislature for payment in October, 2018. Additionally, an experience study was performed covering the period from July 1, 2012 through June 30, 2017. As a result, the Board of Trustees adopted all of the recommended actuarial assumptions and methods at their meeting on March 27, 2018.

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 smoothed 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 dollar amount over an open five year period.

We have included some historical information, similar to past financial reporting requirements. Information for reporting under GASB 67 will be prepared separately.

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.



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Future actuarial results may differ significantly from the current results presented in this report due to such factors 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.

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

Respectfully submitted,

A handwritten signature in blue ink that reads 'Brent A. Banister'.

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

A handwritten signature in blue ink that reads 'Bryan K. Hoge'.

Bryan K. Hoge, FSA, EA, FCA, MAAA  
Senior Actuary



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## EXECUTIVE SUMMARY

### OVERVIEW

The Oklahoma Police Pension and Retirement System (OPPRS) provides retirement benefits for police officers employed by any of the approximately 135 contributing entities. OPPRS is administered by its own Board of Trustees.

This report presents the results of the July 1, 2018, actuarial valuation for the System. The primary purposes of performing an actuarial valuation are to:

- Determine the employer contribution rate required to fund the System on an actuarial basis;
- Evaluate the sufficiency of the statutory contribution rate;
- Disclose asset and liability measures as of the valuation date;
- Determine the experience of the System since the last valuation date; and
- Analyze and report on trends in System contributions, assets, and liabilities.

An experience study was performed that analyzed the experience during the period from July 1, 2012 through June 30, 2017. As a result of that study, several changes to the actuarial assumptions and methods were recommended to the Board of Trustees and adopted, effective with the July 1, 2018 actuarial valuation. The assumption changes include:

- Decreasing the price inflation assumption from 3.00% to 2.75%,
- Increasing the interest credit on DOP balances from 7.75% to 11.00%,
- Setting the real wage growth assumption at 0.75%,
- Increasing the COLA basis assumption from 3.00% to 3.50%,
- Adjusting the retirement and termination rates to better reflect observed experience,
- Adjusting the salary scale to better reflect observed experience,
- Increasing expected severity of disability from 25-49% to 50-74%, and
- Amortizing surplus UAAL over an open 30-year period.

The valuation results provide a snapshot view of the System's financial condition on July 1, 2018. The unfunded actuarial accrued liability for the System decreased by nearly \$26 million due to various factors. A detailed analysis of the change in the unfunded actuarial accrued liability from July 1, 2017, to July 1, 2018, is shown on page 5.

The highlights of the valuation are shown below:

\$(millions)	Actuarial Valuation Date	
	July 1, 2018	July 1, 2017
Actuarial Accrued Liability	\$ 2,515.8	\$ 2,403.1
Actuarial Value of Assets	\$ 2,586.1	\$ 2,447.4
Unfunded Actuarial Accrued Liability	(\$70.3)	(\$44.3)
Funded Ratio (Actuarial Value)	102.8%	101.8%
Market Value of Assets	\$ 2,563.4	\$ 2,395.4
Funded Ratio (Market Value)	101.9%	99.7%

There was a liability gain of \$13 million from demographic experience, primarily from salary increases smaller than expected under the assumptions. The estimated net return on the market value of assets was 8.6% for the year ended June 30, 2018. The actuarial value of assets is determined using a method to smooth



## EXECUTIVE SUMMARY

investment gains and losses in order to develop more stable contribution rates. The return on the actuarial value of assets was approximately 7.3% which resulted in an actuarial loss of \$6 million.

### EXPERIENCE: July 1, 2017 to July 1, 2018

In many respects, an actuarial valuation can be thought of as an inventory process. The inventory is taken as of the actuarial valuation date, which for this valuation is July 1, 2018. On that date, the assets available for the payment of benefits are appraised. The assets are compared with the liabilities of the System, which are generally in excess of the assets. The actuarial process leads to a method of determining the contributions needed by members and employers in the future to balance the System assets and liabilities.

Changes in the System’s assets and liabilities impacted the change in the actuarial contribution rates between July 1, 2017, and July 1, 2018. Each component is examined in the following discussion.

### ASSETS

As of July 1, 2018, the System had total funds, when measured on a market value basis, of \$2.56 billion. This was an increase from the \$2.40 billion balance on July 1, 2017. The market value of assets is not used directly in the calculation of the actuarial contribution rate. An asset valuation method, which smooths the effect of market fluctuations, is used to determine the value of assets used in the valuation, called the “actuarial value of assets”. Differences between the actual return on the market value of assets and the assumed return on the actuarial value of assets are phased in over a five-year period. The resulting value must be no less than 80% of the market value and no more than 120% of market value, referred to as “the corridor”. See Table 3 for the detailed development of the actuarial value of assets as of July 1, 2018.

The actuarial value of assets as of July 1, 2018, was \$2.59 billion. The annualized dollar-weighted rate of return for FY 2018, measured on the actuarial value of assets, was approximately 7.3%, which resulted in an actuarial loss. Measured on the market value of assets, the estimated rate of return was 8.6%.

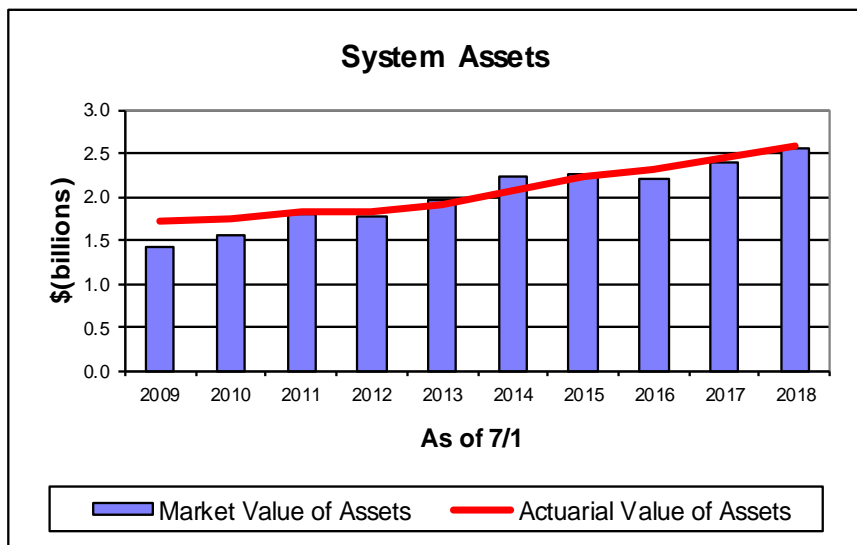
The components of the change in the market and actuarial value of assets for the System are set forth below:

	Market Value \$(millions)	Actuarial Value \$(millions)
Net Assets, July 1, 2017	\$2,395	\$2,447
• Employer and Member Contributions	104	104
• Benefit Payments and Expenses	(141)	(141)
• Investment Income/(Loss)	<u>205</u>	<u>176</u>
Preliminary Value July 1, 2018	\$2,563	\$2,586
Application of Corridor	N/A	N/A
Final Net Assets, July 1, 2018	\$2,563	\$2,586
Estimated Rate of Return	8.6%	7.3%

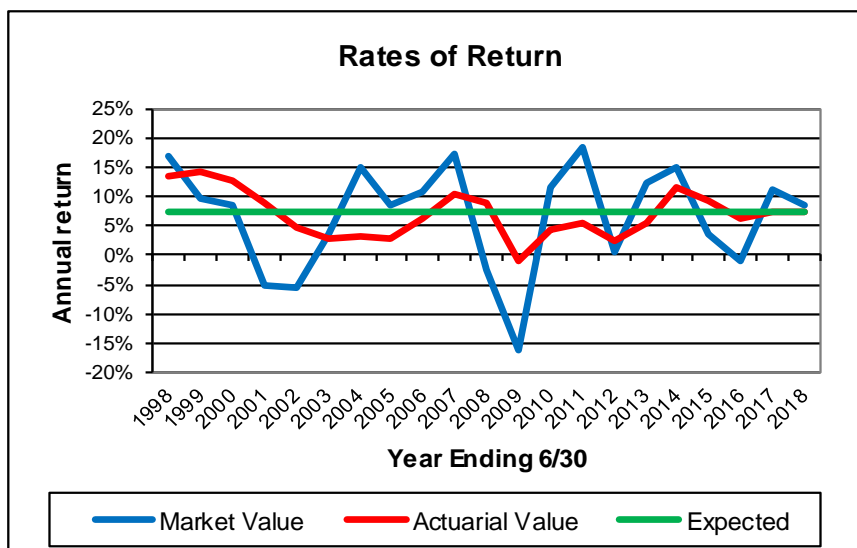


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Due to the use of an asset smoothing method, there is about \$23 million of deferred investment loss that has not yet been recognized. This deferred investment experience will be reflected in the actuarial value of assets over the next four years.



*While the market value of assets was notably lower than actuarial value following the market downturn of 2008 and 2009, a combination of strong returns and systematic recognition of the loss has now resulted in the two numbers being close to each other the last several years.*



*Rates of return on the market value of assets are very volatile. The more stable return on the actuarial value of assets illustrates the advantage of using an asset smoothing method.*



SYSTEM LIABILITIES

The actuarial accrued liability is that portion of the present value of future benefits that will not be paid by future normal costs. The difference between actuarial accrued liability and the asset value at the same date is referred to as the unfunded actuarial accrued liability (UAAL). The UAAL will be reduced if the employer’s contributions exceed the employer’s normal cost for the year, after allowing for interest on the previous years’ unfunded actuarial accrued liability. Benefit improvements, experience gains/losses, and changes in the actuarial assumptions and methods will also impact the total actuarial accrued liability and the unfunded portion thereof.

The unfunded actuarial accrued liability as of July 1, 2018 is:

Actuarial Accrued Liability	\$2,515,811,000
Actuarial Value of Assets	<u>2,586,061,000</u>
Unfunded Actuarial Accrued Liability	\$ (70,250,000)

See Table 5 for the detailed development of the Actuarial Accrued Liability and Table 7 for the calculation of the Unfunded Actuarial Accrued Liability.

Other factors influencing the UAAL from year to year include actual experience versus expected based on the actuarial assumptions (both asset and liability), changes in the actuarial assumptions, procedures or methods and changes in benefit provisions. The actual experience measured in this valuation is that which occurred during the plan year ending June 30, 2018. There was an experience gain on liabilities of approximately \$13.2 million, and an experience loss on assets of approximately \$6.1 million. Including the state contributions in excess of the actuarial required contribution, the UAAL decreased by almost \$26 million from July 1, 2017, resulting in the UAAL currently being negative.

Between July 1, 2017 and July 1, 2018 the change in the unfunded actuarial accrued liability for the System was as follows:

	\$(millions)
Unfunded Actuarial Accrued Liability, July 1, 2017	(\$44.3)
· expected decrease due to amortization method	7.6
· contributions above required	(47.8)
· investment experience	6.1
· liability experience <sup>1</sup>	(13.2)
· assumption changes	25.3
· benefit change (stipend)	2.2
· other experience	<u>(6.2)</u>
Unfunded Actuarial Accrued Liability, July 1, 2018	(\$70.3)

<sup>1</sup> Liability gain is about 0.5% of total expected actuarial accrued liability

An evaluation of the unfunded actuarial accrued liability on a pure dollar basis may not provide a complete analysis because only the difference between the assets and liabilities (which are both very large numbers) is reflected. Another way to evaluate the unfunded actuarial accrued liability and the progress made in its funding is to track the funded status, which is the ratio of the actuarial value of assets to the actuarial accrued liability. The funded ratio does not indicate whether or the fund could settle all of its liabilities, nor is it



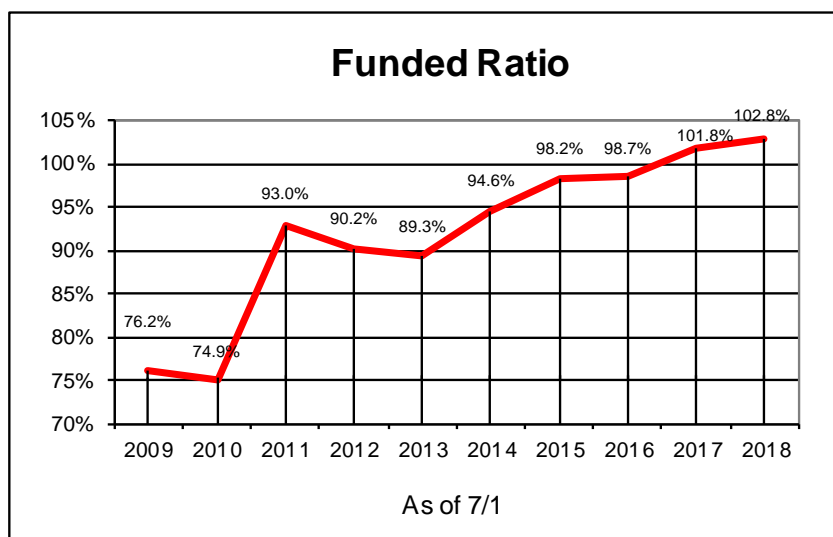


## EXECUTIVE SUMMARY

sufficient by itself to indicate the future funding requirements of the plan. The funded ratio does, however, provide one indication of the funding progress made to this point in time.

The funded status information, on both an actuarial and market value basis, is shown in the following table in \$(millions).

	7/1/13	7/1/14	7/1/15	7/1/16	7/1/17	7/1/18
<b>Using Actuarial Value of Assets:</b>						
Funded Ratio	89.3%	94.6%	98.2%	98.7%	101.8%	102.8%
Unfunded Actuarial Accrued Liability (UAAL)	\$229	\$119	\$40	\$31	(\$44)	(\$70)
<b>Using Market Value of Assets:</b>						
Funded Ratio	92.8%	101.5%	99.8%	93.6%	99.7%	101.9%
Unfunded Actuarial Accrued Liability (UAAL)	\$154	(\$34)	\$4	\$150	\$8	(\$48)



*With the market downturn in 2008 and 2009, the funded ratio declined significantly. Since 2010, the funded ratio has steadily improved, reaching its highest level in many years.*

## CONTRIBUTION RATES

The funding objective of the System is for contributions to be at least sufficient to pay the normal cost rate plus an amount that will pay off the unfunded actuarial accrued liability over a rolling five-year period.

Under the Entry Age Normal cost method, the actuarial contribution rate consists of:

- A “normal cost” for the portion of projected liabilities allocated by the actuarial cost method to service of members during the year following the valuation date;
- An “unfunded actuarial accrued liability contribution” for the excess of the portion of projected liabilities allocated to service to date over the actuarial value of assets.

Contributions to the System are made by the members and their employers. Members not in Deferred Option Plan (DOP) pay 8.00% of compensation. The employer rate is currently 13.00% of pay for actives members and 6.50% of pay for members in the DOP. The remainder of the Total Contribution rate is the



## EXECUTIVE SUMMARY

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required State contribution rate, which are 14% of the total state insurance premium tax revenue. Currently, the total contributions are sufficient to meet the System's funding needs.

### COMMENTS

As the graph on page 4 shows, investment experience continues to be extremely volatile, which creates significant challenges when funding retirement systems. The rate of return on the market value of assets for FY 2018 was about 8.6%. The market value of assets lags the actuarial value of assets (calculated using the asset smoothing method). This deferred loss will be recognized over the next five years, creating losses even if the assumed 7.5% return on the market value of assets is earned.

Primarily as a result of low salary increases granted by employers and strong investment returns, the System is currently just over 100% funded on both an actuarial value of assets and market value of assets basis.

While reaching 100% is a target of many pension funds, part of the reason the funded status improved this year resulted from an investment return that was 1.1% above expected and low salary increases granted by most employers. If next year's return is 1.1% low (for a net return of 6.4%) and employers grant somewhat larger than normal pay raises to catch up, the favorable experience this year could be completely reversed.



## SECTION 1 – SUMMARY OF RESULTS

For convenience of reference, the principal results of the valuation and a comparison with the preceding year's results are summarized below.

### COMPARISON OF PRINCIPAL VALUATION RESULTS

	7/1/2018 Valuation	7/1/2017 Valuation	% Change
<b>1. PARTICIPANT DATA</b>			
Number of:			
Active Members - Not vested	2,286	2,249	1.6
Active Members - Vested	2,505	2,446	2.4
Active Members Total	4,791	4,695	2.0
Retired and Disabled Members and Beneficiaries	3,720	3,658	1.7
Deferred Option Plan (DOP) Members	11	14	(21.4)
Inactive Members	926	853	8.6
Total members	9,448	9,220	2.5
Projected Annual Salaries of Active Members	\$ 323,111,811	\$ 313,087,696	3.2
Annual Retirement Payments for Retired Members, Disabled Members, and Beneficiaries	\$ 115,653,858	\$ 112,345,052	2.9
<b>2. ASSETS AND LIABILITIES</b>			
Total Actuarial Accrued Liability	\$ 2,515,811,000	\$ 2,403,073,000	4.7
Market Value of Assets	\$ 2,563,446,000	\$ 2,395,381,000	7.0
Actuarial Value of Assets	\$ 2,586,061,000	\$ 2,447,351,000	5.7
Unfunded Actuarial Accrued Liability	\$ (70,250,000)	\$ (44,278,000)	58.7
Funded Ratio (Actuarial Assets)	102.8%	101.8%	1.0
<b>3. EMPLOYER CONTRIBUTION RATES AS A PERCENT OF PAYROLL</b>			
Normal Cost Rate	20.4%	21.1%	(3.3)
Amortization of Unfunded Actuarial Accrued Liability	(1.8%)	(3.4%)	(47.1)
Budgeted Expenses	0.7%	0.7%	0.0
Total Actuarial Required Contribution Rate	19.3%	18.4%	4.9
Less Member Contribution Rate	(8.0%)	(8.0%)	0.0
Less Estimated Employer Contribution Rate	(13.0%)	(13.0%)	0.0
Required State Contribution Rate	0.0%	0.0%	0.0
Required State Contribution Amount	\$ 0	\$ 0	0.0



## Oklahoma Police Pension and Retirement System

### Market Value of Assets

The current market value represents the "snapshot" or "cash-out" value of System assets as of the valuation date. In addition, market values of assets provide a basis for measuring investment performance from time to time. At July 1, 2018, the market value of assets for the System was \$2.563 million. Table 1 is a comparison, at market values, of System assets as of June 30, 2018 and June 30, 2017 in total and by investment category. Table 2 summarizes the change in the market value of assets from July 1, 2017 to June 30, 2018.

### Actuarial Value of Assets

Neither the market value of assets, representing a "cash-out" value of System assets, nor the book value of assets, representing the cost of investments, may be the best measure of the System's ongoing ability to meet its obligations.

To arrive at a suitable value for the actuarial valuation, a technique for determining the actuarial value of assets is used, which dampens swings in the market value while still indirectly recognizing market values.

The actuarial value of assets is based on a five-year moving average of expected and actual market values determined as follows:

- the expected market asset value is calculated as the sum of the previous year's market value increased with a year's interest at the System's valuation rate plus net cash flow adjusted for interest (at the same rate) to the end of the previous fiscal year;
- the difference between the expected market value and the actual market value is the investment gain or loss for the previous fiscal year;
- each year, 20% the initial gain or loss for the past five fiscal years is recognized;
- the actuarial asset value is the market value less the unrecognized investment gains and losses for each of the five previous fiscal years, but neither more than 120% of the market value nor less than 80% of the market value.

Table 3 shows the development of the actuarial value of assets (AVA) as of the valuation date.



## Oklahoma Police Pension and Retirement System

**Table 1**

### Analysis of Net Assets at Market Value

	June 30, 2018		June 30, 2017	
	Amount \$(millions)	% of Total	Amount \$(millions)	% of Total
Cash & Short-term Investments	\$ 38.4	1.5%	\$ 32.7	1.4%
Receivables	14.7	0.6%	15.4	0.6%
U.S. Government Bonds	20.7	0.8%	23.5	1.0%
Corporate Bonds	365.7	14.2%	357.3	14.9%
Domestic Stock	649.0	25.4%	602.2	25.1%
International Stock	378.1	14.7%	356.2	14.8%
Private Equity	237.3	9.2%	199.6	8.3%
Hedge Funds	557.4	21.7%	522.4	21.8%
Real Estate	221.8	8.6%	214.2	8.9%
Commodities	84.9	3.3%	76.9	3.2%
Subtotal	\$ 2,568.0	100.0%	\$ 2,400.4	100.0%
Net Receivables/(Payables)	(4.6)		(5.0)	
Net Assets	\$ 2,563.4		\$ 2,395.4	



## Oklahoma Police Pension and Retirement System

**Table 2**

### Statement of Changes in Net Assets

	Fiscal Year Ended June 30	
	2018	2017
1. Market Value of Net Assets at Beginning of Year	\$ 2,395,381,000	\$ 2,201,671,000
2. Contributions		
a. Members	\$ 24,747,000	\$ 23,916,000
b. Participating employers	40,135,000	38,887,000
c. Insurance premium tax	39,028,000	34,283,000
d. Total contributions	<u>\$ 103,910,000</u>	<u>\$ 97,086,000</u>
3. Net Investment Income		
a. Interest and dividends	\$ 14,751,000	\$ 14,571,000
b. Realized gain and unrealized appreciation	205,758,000	241,989,000
c. Other	566,000	310,000
d. Total	<u>221,075,000</u>	<u>256,870,000</u>
e. Investment expenses	<u>(15,636,000)</u>	<u>(14,455,000)</u>
f. Net investment income	<u>\$ 205,439,000</u>	<u>\$ 242,415,000</u>
4. Total additions/(subtractions) (2d) + (3f)	\$ 309,349,000	\$ 339,501,000
5. Deductions		
a. Retirement benefits	\$ 137,914,000	\$ 142,140,000
b. Refunds of contributions	1,649,000	1,952,000
c. Administrative expenses	1,721,000	1,699,000
d. Total deductions	<u>\$ 141,284,000</u>	<u>\$ 145,791,000</u>
6. Net Change in Assets (4) - (5d)	168,065,000	193,710,000
7. Market Value of Net Assets at End of Year (1) + (6)	\$ 2,563,446,000	\$ 2,395,381,000



## Oklahoma Police Pension and Retirement System

### Table 3

#### Determination of Actuarial Value of Assets

1. Market Value as of July 1, 2017	\$	2,395,381,000
2. Contributions	\$	103,910,000
3. Decreases during year		
a. Retirement benefits	\$	(137,914,000)
b. Refunds of contributions		(1,649,000)
c. Administrative expenses		(1,721,000)
d. Total deductions	\$	(141,284,000)
4. Expected return on assets at 7.5%	\$	178,277,000
5. Expected Market Value as of June 30, 2018 (1) + (2) + (3d) + (4)	\$	2,536,284,000
6. Actual Market Value as of June 30, 2018	\$	2,563,446,000
7. Year end 2018 asset gain/(loss) (6) - (5)	\$	27,162,000

#### Schedule of Asset Gains/(Losses)

Year End	Original Amount	Recognized in Prior Years	Recognized in This Year	Recognized in Future Years
2014	\$ 152,333,000	\$ 121,867,000	\$ 30,466,000	\$ 0
2015	(80,117,000)	(48,069,000)	(16,023,000)	(16,025,000)
2016	(189,424,000)	(75,770,000)	(37,885,000)	(75,769,000)
2017	79,083,000	15,817,000	15,817,000	47,449,000
2018	27,162,000	0	5,432,000	21,730,000
Total			\$ (2,193,000)	\$ (22,615,000)

8. Asset gain/(loss) to be recognized in the future	\$	(22,615,000)
9. Initial Actuarial Value as of June 30, 2018 (6) - (8)	\$	2,586,061,000
10. Constraining values:		
a. 80% of market value (6) x 0.8	\$	2,050,757,000
b. 120% of market value (6) x 1.2	\$	3,076,135,000
11. Actuarial Value as of June 30, 2018 (9), but not less than (10a), nor greater than (10b), rounded	\$	2,586,061,000



## Oklahoma Police Pension and Retirement System

In the previous section, an actuarial valuation was compared with an inventory process, and an analysis was given of the inventory of assets of the System as of the valuation date, July 1, 2018. In this section, the discussion will focus on the commitments of the System, which are referred to as its liabilities.

Table 4 contains the actuarial present value of all future benefits (PVFB) for contributing members, inactive members, retirees and their beneficiaries.

The liabilities summarized in Table 4 include the actuarial present value of all future benefits expected to be paid with respect to each member. For an active member, this value includes measures of both benefits already earned and future benefits expected to be earned. For all members, active and retired, the value includes benefits earnable and payable for the rest of their lives and, if an optional benefit is chosen, for the lives of the surviving beneficiaries.

The actuarial assumptions used to determine liabilities are shown in Appendix B. The liabilities reflect the benefit structure in place as of July 1, 2018.

### Actuarial Liabilities

A fundamental principle in financing the liabilities of a retirement program is that the cost of its benefits should be related to the period in which benefits are earned, rather than to the period of benefit distribution. An actuarial cost method is a mathematical technique that allocates the present value of future benefits into annual costs. In order to do this allocation, it is necessary for the funding method to “break down” the present value of future benefits into two components:

- (1) that which is attributable to the past; and
- (2) that which is attributable to the future.

Actuarial terminology calls the part attributable to the past the “past service liability” or the “actuarial accrued liability”. The portion allocated to the future is known as the “present value of future normal costs”, with the specific piece of it allocated to the current year being called the “normal cost”. Table 5 contains the calculation of actuarial liabilities for all groups.





## Oklahoma Police Pension and Retirement System

**Table 4**

**Present Value of Future Benefits  
As of July 1, 2018**

	Total
1. Active Employees	
a. Retirement Benefit	\$ 1,774,755,000
b. Withdrawal Benefit	48,219,000
c. Pre-Retirement Death Benefit	22,930,000
d. Disability Benefit	5,821,000
e. Subtotal	\$ 1,851,725,000
2. Inactive Nonvested Members	\$ 2,926,000
3. Inactive Vested Members	\$ 19,391,000
4. Disabled Members	\$ 25,799,000
5. Retirees	\$ 1,021,501,000
6. Beneficiaries	\$ 165,528,000
7. DOP Members, Including DOP Balances	\$ 10,417,000
8. October 2018 Stipend Due	\$ 2,161,000
9. Total PVFB	\$ 3,099,448,000
Inactive Members Eligible for Automatic COLA	\$ 103,661,000
Inactive Members Not Eligible for Automatic COLA	1,144,062,000
Total Inactive Liability	\$ 1,247,723,000



## Oklahoma Police Pension and Retirement System

**Table 5**

**Actuarial Accrued Liability  
As of July 1, 2018**

	Total
1. Present Value of Future Benefits for Active Members	
a. Retirement Benefit	\$ 1,774,755,000
b. Withdrawal Benefit	48,219,000
c. Pre-Retirement Death Benefit	22,930,000
d. Disability Benefit	5,821,000
e. Subtotal	\$ 1,851,725,000
2. Present Value of Future Normal Costs for Active Members	
a. Retirement Benefit	\$ 505,997,000
b. Withdrawal Benefit	56,828,000
c. Pre-Retirement Death Benefit	14,331,000
d. Disability Benefit	6,481,000
e. Subtotal	\$ 583,637,000
3. Present Value of Future Benefits for Inactive Members	1,247,723,000
4. Total Actuarial Accrued Liability (1e) - (2e) + (3)	\$ 2,515,811,000



## Oklahoma Police Pension and Retirement System

In the previous two sections, attention has been focused on the assets and the liabilities (present value of future benefits) of the System. A comparison of Tables 3 and 4 indicates that there is a shortfall in current actuarial assets needed to meet the present value of all future benefits for current members and beneficiaries.

In an active system, there will always be a difference between the assets and the present value of all future benefits. An actuarial valuation determines a schedule of future contributions that will provide for this funding in an orderly fashion.

The method used to determine the incidence of the contributions in various years is called the actuarial cost method. Under an actuarial cost method, the contributions required to meet the difference between current assets and current liabilities are allocated each year between two elements: (1) the normal cost and (2) the payment on the unfunded actuarial accrued liability.

The term “fully funded” is often applied to a system in which contributions at the normal cost rate are sufficient to pay for the benefits of existing employees as well as for those of new employees. More often than not, systems are not fully funded, either because of past benefit improvements that have not been completely funded and/or because of actuarial deficiencies that have occurred because experience has not been as favorable as anticipated under the actuarial assumptions. Under these circumstances, an unfunded actuarial accrued liability (UAAL) exists. However, as of the July 1, 2018 valuation, the Oklahoma Police Pension and Retirement System has a negative UAAL. This is an indication that the funding of benefits is proceeding slightly ahead of schedule.

### Description of Rate Components

The actuarial cost method used by the System is the traditional Entry Age Normal (EAN) – level percent of pay cost method. Under the EAN cost method, the actuarial present value of each member’s projected benefit is allocated on a level basis over the member’s compensation between the entry age of the member and the assumed exit ages. The portion of the actuarial present value allocated to the valuation year is called the normal cost. The actuarial present value of benefits allocated to prior years of service is called the actuarial accrued liability. The unfunded actuarial accrued liability represents the difference between the actuarial accrued liability and the actuarial value of assets as of the valuation date. The unfunded actuarial accrued liability is calculated each year and reflects experience gains/losses. The UAAL is amortized as a level dollar amount over an open 5-year period, while a surplus is amortized over 30 years.

### Contribution Rate Summary

The normal cost rate is developed in Table 6. Table 7 develops the contribution rate for amortization of the unfunded actuarial accrued liability. Table 8 develops the total actuarial contribution rate.



## Oklahoma Police Pension and Retirement System

**Table 6**

**Normal Cost Contribution Rates  
As Percentages of Salary**

	Total	% of Pay
1. Normal Cost		
a. Retirement Benefit	\$ 52,303,000	17.73%
b. Withdrawal Benefit	5,823,000	1.97%
c. Pre-Retirement Death Benefit	1,480,000	0.50%
d. Disability Benefit	652,000	0.22%
e. Total	\$ 60,258,000	20.42%
2. Estimated Payroll for Current Actives	\$ 295,051,000	
3. Normal Cost Rate (1e)/(2)		20.42%



**Oklahoma Police Pension and Retirement System**

**Table 7**

**Unfunded Actuarial Accrued Liability Contribution Rate**

1. Actuarial Present Value of Future Benefits	\$ 3,099,448,000
2. Actuarial Present Value of Future Normal Costs	<u>583,637,000</u>
3. Actuarial Accrued Liability (1) - (2)	\$ 2,515,811,000
4. Actuarial Value of Assets	<u>2,586,061,000</u>
5. Unfunded Actuarial Accrued Liability (UAAL) (3) - (4)	\$ (70,250,000)
6. Amortization of UAAL over 30 years (mid-year)*	\$ (5,737,000)
7. Total Estimated Payroll for Year Ending June 30, 2019	\$ 324,190,000
8. Amortization as a Percent of Payroll	(1.8%)

\*The UAAL is amortized as a level dollar amount.



## Oklahoma Police Pension Retirement System

Table 8

## Actuarial Contribution Rate

	Valuation as of July 1,			
	2018		2017	
	Amount	Rate of Pay	Amount	Rate of Pay
1. Total Normal Cost Rate*	\$66,180,000	20.4%	\$66,286,000	21.1%
2. Amortization of UAAL	(5,737,000)	(1.8%)	(10,555,000)	(3.4%)
3. Budgeted Expenses	2,126,000	0.7%	2,114,000	0.7%
4. Total Required Contribution	\$62,569,000	19.3%	\$57,845,000	18.4%
5. Member Contributions	25,849,000	8.0%	25,047,000	8.0%
6. Estimated Employer Contributions**	42,075,000	13.0%	40,785,000	13.0%
7. Required State Contribution (4) - (5) - (6) (not less than \$0)	\$0	0.0%	\$0	0.0%
8. Prior year actual state contributions Rate is percentage of prior year compensation	\$39,028,000	12.4%	\$34,283,000	10.9%

\* Normal cost is typically determined as a rate of pay. Dollar amount shown is an estimate only.

## \*\*Determination of Employer Rate

Active member projected payroll	323,111,811	313,087,696
Employer contribution rate	13.0%	13.0%
Estimated employer contributions	42,004,535	40,701,400
DOP member payroll	1,078,331	1,286,253
Employer contribution rate	6.5%	6.5%
Estimated employer contributions	70,092	83,606
Total contributions	42,074,627	40,785,006
As a percentage of total pay	13.0%	13.0%

Note: Due to rounding, there may be differences in addition or multiplication.



## Oklahoma Police Pension and Retirement System

### Table 9

#### Calculation of Actuarial Gain/(Loss)

1. Expected actuarial accrued liability	
a. Actuarial accrued liability at July 1, 2017	\$ 2,403,073,000
b. Normal cost for FY 2018	58,508,000
c. Benefit payments for fiscal year ending June 30, 2018	(139,563,000)
d. Interest on (a), (b), and (c)	179,480,000
e. Impact of assumption changes	25,307,000
f. Impact of benefit changes (stipend)	2,161,000
g. Expected actuarial accrued liability as of July 1, 2018	\$ <u>2,528,966,000</u>
2. Actuarial accrued liability at July 1, 2018	\$ 2,515,811,000
3. Actuarial accrued liability gain/(loss) (1g) - (2)	\$ 13,155,000
4. Expected actuarial value of assets	
a. Actuarial value of assets at July 1, 2017	\$ 2,447,351,000
b. Contributions for fiscal year ending June 30, 2018	103,910,000
c. Benefit payments and expenses for fiscal year ending June 30, 2018	(141,284,000)
d. Interest on (a), (b), and (c)	182,175,000
e. Expected actuarial value of assets as of July 1, 2018	\$ <u>2,592,152,000</u>
5. Actuarial value of assets at July 1, 2018	\$ 2,586,061,000
6. Actuarial value of assets gain/(loss) (5) - (4e)	\$ (6,091,000)
7. Net actuarial gain/(loss) (3) + (6)	\$ 7,064,000



**Oklahoma Police Pension and Retirement System**

In this section we have an exhibit showing the expected benefit payments for the System, an exhibit showing the Present Value of Accrued Benefits, and some historical information.



**Oklahoma Police Pension and Retirement System****Table 10****Projected Benefit Payments**

The table below shows estimated benefits expected to be paid over the next twenty years, based on the assumptions used in this valuation. The “Actives” column shows benefits expected to be paid to members currently active on July 1, 2018. The “Retirees” column shows benefits as of July 1, 2018 expected to be paid to all members receiving benefit payments or to members who have terminated employment and are entitled to a deferred vested benefit.

**Retirement, Survivor and Withdrawal Benefits**

<b>Year Ending June 30</b>		<b>Actives</b>		<b>Retirees</b>		<b>Total</b>
2019*	\$	75,651,000	\$	118,179,000	\$	193,830,000
2020		59,268,000		114,993,000		174,261,000
2021		65,579,000		113,855,000		179,434,000
2022		72,660,000		112,672,000		185,332,000
2023		80,771,000		111,393,000		192,164,000
2024		86,898,000		109,895,000		196,793,000
2025		93,512,000		108,366,000		201,878,000
2026		98,158,000		106,673,000		204,831,000
2027		106,093,000		104,968,000		211,061,000
2028		114,462,000		103,065,000		217,527,000
2029		121,907,000		101,043,000		222,950,000
2030		133,790,000		98,847,000		232,637,000
2031		143,577,000		96,486,000		240,063,000
2032		151,958,000		94,012,000		245,970,000
2033		160,869,000		91,411,000		252,280,000
2034		170,247,000		88,663,000		258,910,000
2035		178,618,000		85,815,000		264,433,000
2036		187,358,000		82,867,000		270,225,000
2037		202,939,000		79,823,000		282,762,000
2038		214,248,000		76,682,000		290,930,000

\*The benefits for fiscal year 2019 include a one-time stipend for current retirees.

**Oklahoma Police Pension and Retirement System****Table 11****Present Value of Accumulated System Benefits**

The actuarial present value of accumulated vested and non-vested system benefits was computed on an ongoing System basis to provide information that generally complies with FASB Accounting Standards Codification (ASC 960). While ASC 960 is not directly applicable to public retirement systems, the information is included to allow for historical comparisons.

In this calculation, the benefits valued are based on the present salary and service information for each member. Eligibility for retirement and other future benefits takes into consideration future service as assumed by the System's demographic assumptions. The liabilities presented here may not be appropriate to reflect the settlement obligations of the System, nor are they necessarily appropriate for information regarding the funding of the System.

	July 1, 2018	July 1, 2017
<b>Accumulated System Benefits</b>		
Vested Benefits		
a. Active Members	\$835,642,000	\$825,282,000
b. Deferred Option Plan Members	10,417,000	13,112,000
c. Vested Terminated Members	19,391,000	17,605,000
d. Members Receiving Benefits	1,212,828,000	1,180,564,000
e. October 2018 Stipend	2,161,000	0
f. Total Vested Benefits	\$2,080,439,000	\$2,036,563,000
Non-vested Benefits	255,962,000	251,070,000
Total Accumulated System Benefits (PVAB)	\$2,336,401,000	\$2,287,633,000
Market Value of Assets Available for Benefits (MVA)	\$2,563,446,000	\$2,395,381,000
Funded Ratio (MVA / PVAB)	109.7%	104.7%
Assumed Rate of Interest	7.50%	7.50%



## Oklahoma Police Pension and Retirement System

Table 12

## Historical Investment Returns

Historical asset return information may be useful in explaining the current funded status of the System.

FYE June 30	Actuarial Value			Market Value		
	Annual	Cumulative	10 Years	Annual	Cumulative	10 Years
1990	8.6%	8.6%		9.2%	9.2%	
1991	7.9%	8.2%		8.1%	8.6%	
1992	8.7%	8.4%		13.8%	10.3%	
1993	10.3%	8.9%		15.1%	11.5%	
1994	9.3%	9.0%		0.0%	9.1%	
1995	11.0%	9.3%		17.7%	10.5%	
1996	11.9%	9.7%		13.5%	10.9%	
1997	12.8%	10.1%		17.3%	11.7%	
1998	13.5%	10.4%		16.9%	12.3%	
1999	14.3%	10.8%	10.8%	9.7%	12.0%	12.0%
2000	12.8%	11.0%	11.2%	8.7%	11.7%	12.0%
2001	8.8%	10.8%	11.3%	(5.3%)	10.2%	10.5%
2002	4.9%	10.3%	10.9%	(5.6%)	8.9%	8.4%
2003	2.7%	9.8%	10.1%	3.5%	8.5%	7.3%
2004	3.3%	9.3%	9.5%	15.0%	8.9%	8.8%
2005	3.0%	8.9%	8.7%	8.7%	8.9%	7.9%
2006	6.1%	8.8%	8.1%	11.0%	9.0%	7.7%
2007	10.6%	8.9%	7.9%	17.3%	9.5%	7.7%
2008	8.9%	8.9%	7.5%	(2.4%)	8.8%	5.8%
2009	(0.9%)	8.3%	5.9%	(16.4%)	7.4%	2.9%
2010	4.4%	8.2%	5.1%	11.7%	7.6%	3.2%
2011	5.6%	8.0%	4.8%	18.3%	8.0%	5.5%
2012	2.6%	7.8%	4.6%	0.5%	7.7%	6.2%
2013	5.4%	7.7%	4.9%	12.5%	7.9%	7.1%
2014	11.4%	7.8%	5.6%	15.0%	8.2%	7.1%
2015	9.3%	7.9%	6.3%	3.4%	8.0%	6.6%
2016	6.2%	7.8%	6.3%	(0.9%)	7.6%	5.4%
2017	7.5%	7.8%	6.0%	11.1%	7.8%	4.8%
2018	7.3%	7.8%	6.7%	8.6%	7.8%	5.7%

Note: Returns prior to 2016 were prepared by the prior actuary.



Oklahoma Police Pension and Retirement System

Table 13  
Solvency Test

Valuation Year	Aggregate Accrued Liabilities For			Valuation Assets	Portion of Accrued Liabilities Covered by Assets		
	(1)	(2)	(3)		(1)	(2)	(3)
	Active Member Contributions	Retirees and Beneficiaries	Active and Terminated Vested Members (Employer Financed Portion)				
2010	\$174,025,925	\$1,111,074,787	\$1,056,518,440	\$1,754,372,000	100%	100%	44.4%
2011	184,781,373	944,081,922	831,112,711	1,822,702,000	100	100	83.5
2012	189,459,953	983,507,261	861,517,957	1,834,170,000	100	100	76.7
2013	199,233,453	1,037,456,527	894,482,192	1,902,581,000	100	100	74.4
2014	209,576,572	1,057,853,545	937,367,037	2,086,297,000	100	100	87.4
2015	214,685,883	1,112,855,884	941,531,659	2,229,272,000	100	100	95.8
2016	223,255,000	1,176,401,000	955,159,000	2,323,407,000	100	100	96.7
2017	238,151,000	1,193,676,000	971,246,000	2,447,351,000	100	100	104.6
2018	245,909,000	1,225,406,000	1,044,496,000	2,586,061,000	100	100	106.7



## APPENDIX A – SUMMARY OF SYSTEM PROVISIONS

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<b>Effective Date and Plan Year:</b>	The System became effective July 1, 1981 and has been amended each year since then. The plan year is July 1 to June 30.
<b>Administration:</b>	The System is administered by the Oklahoma Police Pension Retirement Board consisting of thirteen Members. The Board shall be responsible for the policies and rules for the general administration of the System.
<b>Plan Type:</b>	Defined benefit plan.
<b>Employers Included:</b>	An eligible employer may join the System on the first day of any month. An application of affiliation must be filed in the form of a resolution before the eligible municipality can become a participating municipality.
<b>Eligibility:</b>	All persons employed full-time as officers working more than 25 hours per week or any person undergoing police training to become a permanent police officer with a police department of a participating municipality, with ages not less than twenty-one (21) nor more than forty-five (45) when accepting membership.
<b>Salary Considered:</b>	<p>Base salary used in the determination of benefits does not include payment for accumulated sick and annual leave upon termination of employment or any uniform allowances.</p> <p>Final average salary means the average paid base salary for normally scheduled hours of an officer over the highest 30 consecutive months of the last 60 months of credited service.</p>
<b>Service Considered:</b>	Credited service consists of the period during which the Member participated in the System or predecessor municipal pay as an active employee, plus any service prior to the establishment of the municipal plan which was credited under the predecessor municipal systems of credited service granted by the State Board, plus any applicable military service.
<b>State Contributions:</b>	Insurance premium tax allocation. Historically, the System has received 14% of these collected taxes. For the fiscal years beginning July 1, 2004 and ending June 30, 2009, the System received 17% of these collected taxes. For the fiscal year thereafter, the System received 14% of these collected taxes. Beginning in fiscal year July 1, 2006, the System began receiving 26% of a special allocation established to refund the System for reduced allocations of insurance premium taxes resulting from increases in insurance premium tax credits. Beginning in fiscal year July, 1 2010, the amount of insurance premium tax apportioned to the System will be applied prior to the calculation of the Home Office Credit.



## APPENDIX A – SUMMARY OF SYSTEM PROVISIONS

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<b>Member Contributions:</b>	8% percent of paid salary. These contributions shall “be picked up” after December 31, 1988 pursuant to Section 414(h)(2) of the Internal Revenue Code.
<b>Municipality Contributions:</b>	Contribution is 13% percent as of July 1, 1996.
<b>Normal Retirement Benefit:</b>	
Normal Retirement Eligibility:	20 years of credited service.
Benefit Amount:	2 1/2% of the final average salary multiplied by the years of credited service, with a maximum of 30 years of credited service considered.
Normal Form of Benefit:	The benefit is paid as a Joint and 100% Survivor Annuity if the Member was married 30 months prior to death.
<b>Termination Benefit:</b>	
Less than 10 Years of Service:	Refund of contributions without interest.
More than 10 Years of Service:	If greater than 10 years of service, but not eligible for the normal retirement benefit, the benefit is payable at the date the Member would have had 20 years of service in an amount equal to 2 1/2% of the greater of final average salary or the salary paid to active employees as described under “salary considered” multiplied by the years and completed months of credited service.
<b>Disability Benefit (Duty):</b>	<u>Total Disability</u>  Upon determination of disability incurred as a result of the performance of duty, the normal disability benefit is 50% of final average salary.  <u>Partial Disability</u>  Upon determination of partial disability incurred as a result of the performance of duty, the normal disability is reduced according to the percentage of impairment, as outlined in the “American Medical Association’s Guide to the Evaluation of Permanent Impairment.” The following shows the percent of normal disability benefit payable as related to the percent of impairment.



**APPENDIX A – SUMMARY OF SYSTEM PROVISIONS**

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% Impairment	% of Benefit
1% to 49%	50%
50% to 74%	75%
75% to 100%	100%

**Disability Benefit (Non-Duty):**

Upon determination of disability after 10 years of service due to causes other than duty, the benefit equals the accrued benefit of 2 ½% of final average salary times years of credited service (maximum of 30 years) times:

- 100%, if permanent and total, or
- The following percentages, if partial disability:

1% to 24%	25%
25% to 49%	50%
50% to 74%	75%
75% to 99%	90%

**Death Benefits Payable to Beneficiaries:**

Prior to Retirement (Duty):

The greater of:

- 1) 2 ½% of final average salary times years of credited service (maximum of 30 years), or
- 2) 50% of final average salary.

Prior to Retirement (Non-Duty):

After 10 years of service, a benefit equal to 2 ½% of final average salary times years of credited service (maximum if 30 years).

Prior to 10 years of service, a refund of the accumulated contributions made by the Member will be paid to the estate.

After Retirement:

100% of the Member’s retirement or deferred vested benefit, payable when the Member would have been eligible to receive it, payable to the beneficiary.

Lump Sum:

The beneficiary shall receive a lump-sum amount of \$5,000.

Beneficiary:

Surviving spouses must be married to the member 30 months prior to the date of death (waived in the case of duty related death).



If the beneficiary is a child, the benefits are payable to age 18, or to age 22 if a full-time student. If the beneficiary is a spouse to whom the Member was married for at least 30 months prior to death, if the death was not duty related, the benefits are payable for life.

**Postretirement Adjustments:**

Police officers eligible to receive increased benefits according to repealed Section 50-120 of Title 11 of the Oklahoma Statutes pursuant to a court order receive an adjustment of 1/3 to 1/2 of the increase or decrease of any adjustment to the base salary of a regular police officer.

**Deferred Option Plan:**

A Member with 20 or more years of service may elect to participate in the Deferred Option Plan (DOP). Participation in the DOP shall not exceed five years. The members' contributions cease upon entering the Plan, but the agency contributions are divided equally between the Retirement System and Deferred Option Plan. The monthly retirement benefits that the member is eligible to receive are paid into the Deferred Option Plan account.

Members can elect to retroactively join the DOP as of a back-drop-date which is no earlier than the member's normal retirement date or five years before his termination date. The monthly retirement benefits and employee contributions that would have been payable had the member elected to join the DOP are credited to the member's DOP account with interest.

The retirement benefits are not recalculated for service and salary past the election date to join the Deferred Option Plan. However, the benefits are increased by cost-of-living increases applicable to retired members during the DOP period.

When the Member actually terminates employment, the Deferred Option Plan account balance may be paid in a lump sum or to an annuity provider. Monthly retirement benefits are then paid directly to the retired Member.

This Plan became effective during the July 1, 1991 to June 30, 1992 Plan Year. The Deferred Option Plan account is guaranteed a minimum of the valuation interest rate for investment return, or 2% less than the fund rate of return, if greater.





### Actuarial Cost Method

Liabilities and contributions shown in this report are computed using the Individual Entry Age method of funding. Sometimes called the “funding method,” this is a particular technique used by actuaries for establishing the amount of the annual actuarial cost of pension benefits, or normal cost, and the related unfunded actuarial accrued liability. Ordinarily the annual contribution to the System is comprised of (1) the normal cost; and (2) an amortization payment on the unfunded actuarial accrued liability.

Under the Entry Age Actuarial Cost Method, the **Normal Cost** is computed as the level percentage of pay which, if paid from the earliest time each member would have been eligible to join the System had it existed (thus entry age) until his retirement or termination, would accumulate with interest at the rate assumed in the valuation to a fund sufficient to pay all benefits under the System.

The **Actuarial Accrued Liability** under this method, at any point in time, is the theoretical amount of the fund that would have accumulated had annual contributions equal to the normal cost been made in prior years (it does not represent the liability for benefits accrued to the valuation date). The **Unfunded Actuarial Accrued Liability** is the excess of the actuarial accrued liability over the actuarial value of System assets on the valuation date.

Under this method, experience gains or losses, i.e. decreases or increases in actuarial accrued liabilities attributable to deviations in experience from the actuarial assumptions, adjust the unfunded actuarial accrued liability.

### Asset Valuation Method

The actuarial value of assets is based on a five-year moving average of expected and actual market values determined as follows:

- at the beginning of each fiscal year, a preliminary expected actuarial asset value is calculated as the sum of the previous year’s actuarial value increased with a year’s interest at the System valuation rate plus net cash flow adjusted for interest (at the same rate) to the end of the previous fiscal year;
- the expected actuarial asset value is set equal to the preliminary expected actuarial value plus the unrecognized investment gains and losses as of the beginning of the previous fiscal year;
- the difference between the expected actuarial asset value and the market value is the investment gain or loss for the previous year;
- the (final) actuarial asset value is the preliminary value plus 20% of the investment gains and losses for each of the five previous fiscal years, but in no case more than 120% of the market value or less than 80% of the market value.

### Amortization Method

The unfunded actuarial accrued liability is amortized as a level dollar amount over a 5-year open period. Surplus, if any, is amortized as a level dollar amount over a 30-year open period.



**Valuation Procedures**

The wages used in the projection of benefits and liabilities are pay for the year ending June 30, 2018 (including longevity bonuses). These amounts were projected into the valuation year using the valuation salary scale.

In computing accrued benefits, average earnings were determined using the valuation salary scale. Historical earnings for the past five years have been retained.

Retired Members were assumed to be married according to the probability of marriage assumption. For those in the Baker group, the assumption is 100% married.

The impact from compensation limit under IRC Section 401(a)(17) and from the dollar limitation required by the Internal Revenue Code Section 415 for governmental plans were considered in this valuation and was determined to be *de minimis*.

The calculations for the required state contribution are determined as of mid-year. Since the agency contributions, member contributions and State insurance premium tax allocations are made on a monthly basis throughout the year, a mid-year determination date represents an average weighting of the contributions.



**APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS**

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**Actuarial Assumptions**

**Economic Assumptions**

- 1. Inflation 2.75%, per annum, compound annually.
- 2. Investment Return 7.50%, net of investment expenses, per annum, compound annually.
- 3. Salary Scale Sample rates are shown below:

Attained Service	Inflation %	Merit %	Increase %
0	3.50	6.50	10.00
1	3.50	5.50	9.00
2	3.50	4.50	8.00
3	3.50	3.50	7.00
4-12	3.50	2.50	6.00
13	3.50	1.50	5.00
14	3.50	1.00	4.50
15	3.50	0.50	4.00
16+	3.50	0.00	3.50

**Demographic Assumptions**

- 1. Retirement Rates Sample rates are shown below:

Attained Service	Annual Rates of Retirement
20	15%
21	8
22	8
23	8
24	8
25	20
26	10
27	10
28	10
29	15
30	20
31	30
32	40
33	50
34	75
35	100



**APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS**

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2. Mortality Rates

- (a) Active participants RP-2000 Combined Blue Collar Healthy Employees (Fully generational using Scale AA) with age set back four years
- (b) Active participants (post-retirement) and nondisabled pensioners RP-2000 Combined Blue Collar Healthy Employees with Generational Projection
- (c) Disabled pensioners RP-2000 Combined Blue Collar Healthy Combined with age set forward four years

3. Disability Rates

Sample rates are shown below:

Age	Rate
20-24	.0002
25-29	.0002
30-34	.0004
35-39	.0006
40-44	.0008
45-49	.0010
50-54	.0012
55-59	.0014

4. Withdrawal Rates

Sample rates are shown below:

Service Range	Rate
0	.150
1	.120
2	.100
3	.080
4	.070
5	.060
6	.050
7	.045
8	.040
9	.035
10	.030
11	.025
12	.020
13	.015
14-20	.010
Over 20	.000



## APPENDIX B – ACTUARIAL ASSUMPTIONS AND METHODS

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### 5. Marital Status

- (a) Percentage married: Males: 85%; Females: 85%
- (b) Age difference: Males are assumed to be three (3) years older than females.

### **Other Assumptions:**

1. Deferred Benefits Begin at: Age 50, or the date at which the participant would have achieved 20 years of service, if later.
2. Provision for Expenses: Administrative Expenses, as budgeted by the Oklahoma Police Pension and Retirement System.
3. Percentage of Disability: Members becoming disabled have a 50%-74% impairment.
4. Duty-Related Death: All pre-retirement deaths are duty-related.
5. Cost-of-Living Allowance: Police officers eligible to receive increased benefits according to repealed Section 50-120 of Title 11 of the Oklahoma Statutes pursuant to a court order receive an adjustment of 1/3 to 1/2 of the increase or decrease of any adjustment to the base salary of a regular police officer, based on an increase in base salary of 3.5% (wage inflation).
6. Deferred Option Plan: Members currently participating in the Deferred Option Plan (DOP) are assumed to remain in the DOP for the maximum of five years. Active members leaving active service are assumed to retroactively elect to join the DOP for the maximum allowable period. DOP account balances are assumed to accumulate at 11% (to reflect the interest rate guarantee prior to retirement) for future BackDOP elections and members are assumed to elect a lump sum at retirement. All balances held in Deferred Option payout accounts are assumed to be paid immediately upon the end of employment.



**Oklahoma Police Pension and Retirement System  
Valuation Data Distribution - Actives**

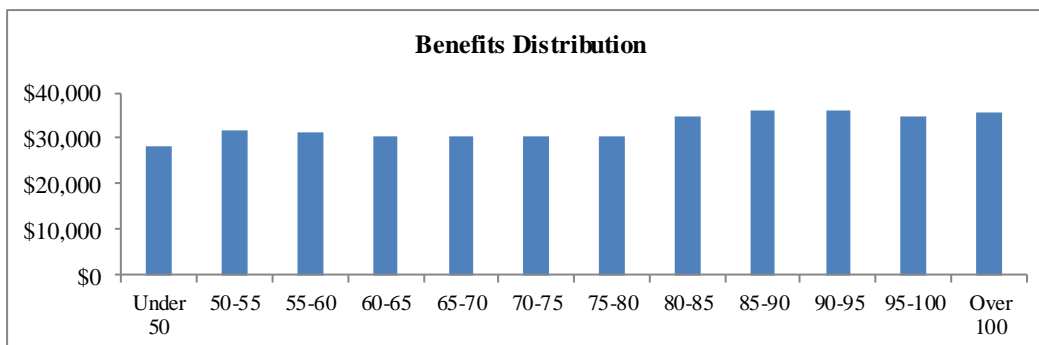
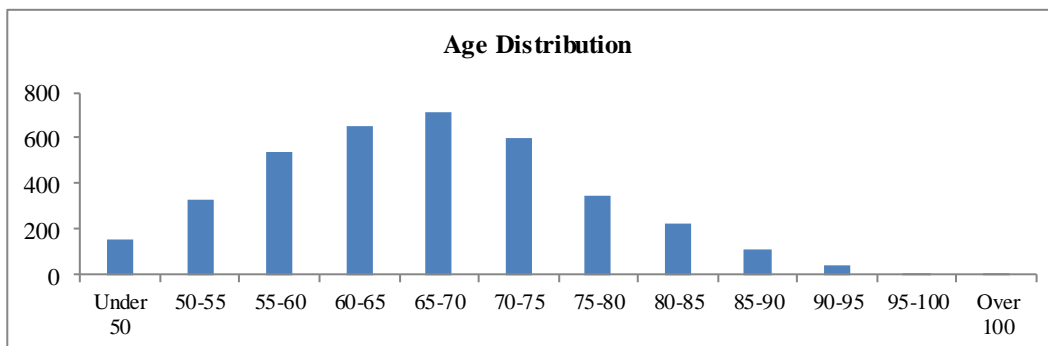
Age	Years of Service									Total
	0 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 & Up	
<b>Under 25</b> Avg. Pay	158 \$39,255									158 \$39,255
<b>25 to 29</b> Avg. Pay	564 \$44,266	71 \$51,392								635 \$45,063
<b>30 to 34</b> Avg. Pay	389 \$45,187	328 \$58,272	65 \$66,700							782 \$52,463
<b>35 to 39</b> Avg. Pay	214 \$43,405	203 \$59,694	312 \$71,148	57 \$77,780						786 \$61,117
<b>40 to 44</b> Avg. Pay	103 \$41,294	100 \$53,533	213 \$69,545	301 \$79,931	57 \$83,610					774 \$68,792
<b>45 to 49</b> Avg. Pay	55 \$42,461	62 \$50,331	127 \$63,645	219 \$76,943	252 \$83,451	55 \$89,617				770 \$73,179
<b>50 to 54</b> Avg. Pay	10 \$36,842	26 \$50,116	44 \$63,591	76 \$73,381	124 \$77,873	188 \$89,400	35 \$91,885			503 \$78,978
<b>55 to 59</b> Avg. Pay	1 \$34,075		21 \$65,604	26 \$70,365	47 \$75,754	101 \$87,166	82 \$90,258	18 \$94,476		296 \$83,470
<b>60 &amp; up</b> Avg. Pay	1 \$33,497	1 \$33,306	1 \$69,904	10 \$64,697	17 \$72,153	17 \$74,493	18 \$90,517	17 \$90,579	5 \$93,286	87 \$79,451
<b>Total</b> Avg. Pay	1,495 \$43,518	791 \$56,498	783 \$68,551	689 \$77,499	497 \$80,963	361 \$88,106	135 \$90,714	35 \$92,583	5 \$93,286	4,791 \$63,623



### Oklahoma Police Pension and Retirement System

#### Retirees, Beneficiaries, & Disableds

Age	Number			Annual Benefits		
	Male	Female	Total	Male	Female	Total
Under 50	134	20	154	\$ 3,924,415	\$ 430,920	\$ 4,355,335
50-55	264	67	331	8,618,317	1,875,915	10,494,232
55-60	453	85	538	15,024,315	1,907,209	16,931,524
60-65	550	100	650	17,584,339	2,202,228	19,786,567
65-70	629	85	714	19,747,666	1,848,629	21,596,295
70-75	529	68	597	16,497,415	1,710,084	18,207,499
75-80	286	58	344	8,496,502	1,984,364	10,480,866
80-85	144	78	222	4,755,222	2,942,110	7,697,332
85-90	50	61	111	1,817,786	2,165,825	3,983,611
90-95	19	27	46	634,376	1,031,001	1,665,377
95-100	2	9	11	55,767	328,135	383,902
Over 100	0	2	2	0	71,318	71,318
<b>Total</b>	<b>3,060</b>	<b>660</b>	<b>3,720</b>	<b>\$ 97,156,120</b>	<b>\$ 18,497,738</b>	<b>\$ 115,653,858</b>





### Oklahoma Police Pension and Retirement System

#### Deferred Vesteds

Age	Number			Annual Benefits		
	Male	Female	Total	Male	Female	Total
Under 35	1	0	1	\$ 0	\$ 0	\$ 0
35-40	19	6	25	230,008	75,610	305,618
40-45	43	9	52	701,148	152,903	854,051
45-50	39	5	44	580,916	97,087	678,003
50-55	12	2	14	199,029	78,568	277,597
Over 55	10	1	11	187,942	14,538	202,480
<b>Total</b>	<b>124</b>	<b>23</b>	<b>147</b>	<b>\$ 1,899,043</b>	<b>\$ 418,706</b>	<b>\$ 2,317,749</b>

#### DOP Participants

Age	Number			Annual Benefits		
	Male	Female	Total	Male	Female	Total
Under 50	2	0	2	\$ 88,482	\$ 0	\$ 88,482
50-55	2	0	2	90,599	0	90,599
55-60	3	0	3	176,113	0	176,113
Over 60	4	0	4	96,585	0	96,585
<b>Total</b>	<b>11</b>	<b>0</b>	<b>11</b>	<b>\$ 451,779</b>	<b>\$ 0</b>	<b>\$ 451,779</b>





### Oklahoma Police Pension and Retirement System

	Actuarial Valuation as of		% Change
	7/1/2018	7/1/2017	
<b>1. Active members</b>			
a. Number	4,791	4,695	2.0%
b. Annual compensation	\$ 304,819,587	\$ 293,041,602	4.0%
c. Average annual compensation	\$ 63,623	\$ 62,416	1.9%
d. Average age	40.0	40.0	0.0%
e. Average service	12.0	12.0	0.0%
<b>2. Non-vested terminated members</b>			
a. Number	779	721	8.0%
b. Total contribution balances	\$ 2,926,134	\$ 2,828,626	3.4%
c. Average balance	\$ 3,756	\$ 3,923	(4.3%)
<b>3. Vested terminated members</b>			
a. Number	147	132	11.4%
b. Annual deferred benefits	\$ 2,317,749	\$ 2,142,406	8.2%
c. Average annual deferred benefit	\$ 15,767	\$ 16,230	(2.9%)
<b>4. Retired members</b>			
a. Number	2,802	2,769	1.2%
b. Annual retirement benefits	\$ 92,086,797	\$ 89,877,094	2.5%
c. Average annual retirement benefit	\$ 32,865	\$ 32,458	1.3%
<b>5. Beneficiaries</b>			
a. Number	778	748	4.0%
b. Annual retirement benefits	\$ 21,149,784	\$ 20,035,851	5.6%
c. Average annual retirement benefit	\$ 27,185	\$ 26,786	1.5%
<b>6. Disabled members</b>			
a. Number	140	141	(0.7%)
b. Annual retirement benefits	\$ 2,417,279	\$ 2,432,107	(0.6%)
c. Average annual retirement benefit	\$ 17,266	\$ 17,249	0.1%
<b>7. DOP Participants</b>			
a. Number	11	14	(21.4%)
b. Annual retirement benefits	\$ 451,779	\$ 545,202	(17.1%)
c. Average annual retirement benefit	\$ 41,071	\$ 38,943	5.5%
<b>8. Total members included in valuation</b>	<b>9,448</b>	<b>9,220</b>	<b>2.5%</b>



## Oklahoma Police Pension and Retirement System

Year Ended	Added to Rolls		Removed from Rolls		Rolls end of Year			Average Annual Benefits
	No.	Annual Benefits	No.	Annual Benefits	No.	Annual Benefits	% Increase	
2010	259*	8,245,373	51	1,619,770	2,993	87,074,817	8.2%	29,093
2011	127	2,261,138	60	1,652,074	3,060	87,683,881	0.7%	28,655
2012	139	4,587,513	51	1,073,612	3,148	91,197,782	4.0%	28,970
2013	151	4,773,719	60	694,596	3,239	95,276,905	4.5%	29,416
2014	123	3,873,758	42	1,303,391	3,320	97,847,272	2.7%	29,472
2015	175	6,613,773	47	947,483	3,448	103,513,562	5.8%	30,021
2016	175	6,489,659	73	2,024,379	3,550	107,978,842	4.3%	30,417
2017	181	6,601,023	73	2,234,813	3,658	112,345,052	4.0%	30,712
2018	177	6,561,513	115	3,252,707	3,720	115,653,858	2.9%	31,090

\*Total headcount increased by 97 as a result of QDROs being reported as a separate account.



APPENDIX C – DATA

Oklahoma Police Pension and Retirement System

Retirement Effective Dates July 1, 2008 to June 30, 2018	Years of Credited Service				
	10 - 15	15 - 20	20 - 25	25 - 30	30+
- Period 7/1/08 to 6/30/09					
Average Monthly Benefit	0.00	2,012.30	2,346.78	3,516.98	4,071.43
Average Final Average Salary	0.00	4,391.69	4,449.17	5,222.62	5,428.57
Number of Retired Members	0	6	52	14	8
- Period 7/1/09 to 6/30/10					
Average Monthly Benefit	1,627.72	2,169.65	2,498.58	3,512.78	4,261.49
Average Final Average Salary	4,448.65	5,083.47	4,735.54	5,062.36	5,681.98
Number of Retired Members	1	2	83	24	11
- Period 7/1/10 to 6/30/11					
Average Monthly Benefit	0.00	1,661.80	2,760.39	3,833.83	4,340.60
Average Final Average Salary	0.00	4,022.97	5,223.88	5,558.07	5,787.46
Number of Retired Members	0	2	65	13	8
- Period 7/1/11 to 6/30/12					
Average Monthly Benefit	0.00	1,613.72	2,726.34	3,586.85	4,090.27
Average Final Average Salary	0.00	3,649.75	5,163.89	5,133.84	5,453.69
Number of Retired Members	0	2	72	23	6
- Period 7/1/12 to 6/30/13					
Average Monthly Benefit	0.00	0.00	2,721.31	3,891.38	4,880.42
Average Final Average Salary	0.00	0.00	5,186.65	5,673.97	6,507.22
Number of Retired Members	0	0	79	16	11
- Period 7/1/13 to 6/30/14					
Average Monthly Benefit	0.00	0.00	2,898.74	3,616.85	4,483.39
Average Final Average Salary	0.00	0.00	5,410.25	5,413.12	5,977.86
Number of Retired Members	0	0	70	15	4
- Period 7/1/14 to 6/30/15					
Average Monthly Benefit	0.00	0.00	3,017.32	4,431.50	4,847.67
Average Final Average Salary	0.00	0.00	5,652.31	6,556.21	6,463.57
Number of Retired Members	0	0	86	34	11
- Period 7/1/15 to 6/30/16					
Average Monthly Benefit	1,033.68	2,187.06	2,972.89	4,080.60	4,992.02
Average Final Average Salary	3,255.17	5,046.69	5,598.28	6,112.61	6,656.02
Number of Retired Members	5	4	72	21	20
- Period 7/1/16 to 6/30/17					
Average Monthly Benefit	855.06	2,135.63	3,087.72	3,808.06	4,696.16
Average Final Average Salary	3,323.17	4,970.40	5,783.97	5,527.60	6,261.54
Number of Retired Members	2	8	78	21	14
- Period 7/1/17 to 6/30/18					
Average Monthly Benefit	1,996.65	2,064.26	3,274.33	4,572.86	4,872.73
Average Final Average Salary	6,033.83	4,706.42	6,061.61	6,519.39	6,614.57
Number of Retired Members	5	3	73	10	16
<b>Five Year Average - Period 7/1/13 to 6/30/18</b>					
Average Monthly Benefit	1,405.15	2,135.07	3,050.97	4,121.92	4,843.20
Average Final Average Salary	4,424.28	4,937.95	5,703.27	6,076.70	6,486.55
Total Number of Retired Members	12	15	379	101	65
<b>Ten Year Average - Period 7/1/08 to 6/30/18</b>					
Average Monthly Benefit	1,422.27	2,036.67	2,844.44	3,897.69	4,653.28
Average Final Average Salary	4,426.15	4,664.14	5,352.11	5,704.06	6,221.63
Total Number of Retired Members	13	27	730	191	109

Note: This schedule includes service retirements as of July 1, 2018 and does not include disability retirements. For participants in the Deferred Option Plan, the Retirement Effective Date is the date the member left active service and the final average salary is determined as of the date the member effectively entered the Deferred Option Plan.



## Oklahoma Police Pension and Retirement System

### **Accrued Benefit**

The amount of an individual's benefit (whether or not vested) as of a specific date, determined in accordance with the terms of a pension plan and based on compensation and service to that date.

### **Actuarial Accrued Liability**

That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of pension plan benefits and expenses which is not provided for by future Normal Costs.

### **Actuarial Assumptions**

Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, withdrawal, disablement, and retirement; changes in compensation, rates of investment earnings, and asset appreciation or depreciation; procedures used to determine the Actuarial Value of Assets; and other relevant items.

### **Actuarial Cost Method**

A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an actuarially equivalent allocation of such value to time periods, usually in the form of a Normal Cost and an Actuarial Accrued Liability.

### **Actuarial Gain (Loss)**

A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions during the period between two (2) Actuarial Valuation dates, as determined in accordance with a particular Actuarial Cost Method.

### **Actuarial Present Value**

The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions.

### **Actuarial Valuation**

The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a pension plan.

### **Actuarial Value of Assets**

The value of cash, investments and other property belonging to a pension plan, as used by the actuary for the purpose of an Actuarial Valuation.

### **Actuarially Equivalent**

Of equal Actuarial Present Value, determined as of a given date with each value based on the same set of Actuarial Assumptions.

### **Amortization Payment**

That portion of the pension plan contribution which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.



**Deferred Vested Participant**

A vested member who has terminated employment prior to early or normal retirement age who does not withdraw his or her contributions and is, therefore, due a retirement benefit at a later date.

**Entry Age Actuarial Cost Method**

A method under which the Actuarial Present Value of the Projected Benefits of each individual included in an Actuarial Valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages. The portion of this Actuarial Present Value allocated to a valuation year is called the Normal Cost. The portion of this Actuarial Present Value not provided for at a valuation date by the Actuarial Present Value of future Normal Costs is called the Actuarial Accrued Liability.

**Market Value of Assets**

The fair value of cash, investments and other property belonging to a pension plan that could be acquired by exchanging them on the open market.

**Normal Cost**

That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method Projected Benefits.

**Projected Benefits**

Those pension plan benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits.

**Unaccrued Benefit**

The excess of an individual's Projected Benefits over the Accrued Benefits as of a specified date.

**Unfunded Actuarial Accrued Liability**

The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets.

**Withdrawal Liability**

The liability due to an active member terminating employment with a deferred vested benefit.