



# Cavanaugh Macdonald

CONSULTING, LLC

*The experience and dedication you deserve*

October 21, 2016

Public Employees' Retirement Board  
100 North Park, Suite 200  
Helena, MT 59620-0139

Members of the Board:

We are submitting the results of the annual valuation of the assets and liabilities of the Public Employees' Retirement System of the State of Montana (PERS), prepared as of June 30, 2016. The purpose of this letter is to disclose differences between the valuation report issued on October 3, 2016, which was presented at the October 6, 2016 Board meeting, and the valuation report issued October 21, 2016. These differences reflect changes made by Cavanaugh MacDonald LLC and such changes are made through no fault of the Montana Public Employee Retirement Administration (MPERA).

The first step in any actuarial valuation is to perform a data reconciliation to catch any data discrepancies that exist in the current year's valuation data provided by MPERA staff from what would have been expected from the prior year's valuation data. As a result, it is not uncommon for final valuation data to have participant counts that do not exactly match the participant counts in the data provided by the MPERA staff. This is especially true in a year when transitioning from one actuarial firm to another. As a result, the participant demographic information disclosed in the Summary of Results, Appendix D and Appendix E has been updated to reflect the participant counts provided by MPERA, without adjustment for data processing, and to correct any inconsistencies in the demographic information between tables.

In addition to the data changes mentioned above, there were a couple of numerical changes. On page 4, the Plan Choice Rate Unfunded Liability as of June 30, 2016 is completely amortized. It was originally displayed as not being less than \$0. The limitation has been removed, and it is now shown as (\$497,137). On page 8, the experience loss on actuarial liabilities changed by \$1 due to a rounding error.

The changes mentioned above have no material impact. The funded ratio and the remaining amortization period of the unfunded actuarial accrued liability were unchanged.

Respectfully submitted,

Edward A. Macdonald, ASA, FCA, MAAA  
President

Todd B. Green, ASA, FCA, MAAA  
Principal and Consulting Actuary

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**Cavanaugh Macdonald**  
CONSULTING, LLC

*The experience and dedication you deserve*

**Public Employees' Retirement System  
of the State of Montana**

**Actuarial Valuation  
As of June 30, 2016**

**Issued as of October 21, 2016**





# Cavanaugh Macdonald

CONSULTING, LLC

*The experience and dedication you deserve*

October 21, 2016

Public Employees' Retirement Board  
100 North Park, Suite 200  
Helena, MT 59620-0139

Members of the Board:

In this report are submitted the results of the annual valuation of the assets and liabilities of the Public Employees' Retirement System of the State of Montana (PERS), prepared as of June 30, 2016.

The purpose of this report is to provide a summary of the funded status of the System as of June 30, 2016. While not verifying the data at source, the actuary performed tests for consistency and reasonability. The valuation indicates that the statutory contribution rate reflecting all anticipated contribution increases are sufficient to amortize the unfunded accrued liability within a 26-year period.

The promised benefits of the System are included in the actuarially calculated contribution rates, which are developed using the Entry Age Normal Cost Method. Four-year market related value of assets is used for actuarial valuation purposes. Gains and losses are reflected in the unfunded accrued liability that is being amortized by regular annual contributions as a level percentage of payroll, on the assumption that payroll will increase by 4.00% annually. The assumptions recommended by the actuary and adopted by the Board are, in the aggregate, reasonably related to the experience under the Fund and to reasonable expectations of anticipated experience under the Fund.

This is to certify that Edward Macdonald and Todd Green, Principal and Consulting Actuaries for Cavanaugh Macdonald Consulting, are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. This also certifies that the undersigned 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. Since 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, appearing to read 'Edward Macdonald'.

Edward A. Macdonald, ASA, FCA, MAAA  
President

A handwritten signature in blue ink, appearing to read 'Todd B. Green'.

Todd B. Green, ASA, FCA, MAAA  
Principal and Consulting Actuary

A handwritten signature in blue ink, appearing to read 'Joseph A. Nichols'.

Joseph A. Nichols, ASA, EA, FCA, MAAA, MSPA  
Senior Actuary

A handwritten signature in blue ink, appearing to read 'Matthew Yonz'.

Matthew Yonz, ASA  
Senior Actuarial Analyst



**Public Employees' Retirement System  
State of Montana**

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## Section I: 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:

<b>VALUATION DATE</b>	<b>June 30, 2016</b>	<b>June 30, 2015</b>
Active Members	28,390	28,237
Retirees and Beneficiaries	21,164	20,505
Disabled Members*	169	176
Terminated Vested Members	3,062	2,925
Terminated Non-Vested Members	<u>10,031</u>	<u>8,839</u>
Total**	62,816	60,682
Covered Payroll of Active Members	\$1,185,646,179	\$1,156,855,431
Average Salaries from Covered Payroll	\$ 41,763	\$ 40,969
Annual Retirement Allowances for Retired Members and Beneficiaries	\$ 351,707,923	\$ 326,390,329
Assets		
Actuarial value	\$5,247,685,310	\$4,926,515,810
Market value	5,032,807,110	5,061,058,221
Actuarial Accrued Liability (AAL)	\$6,787,923,154	\$6,470,303,179
Unfunded Actuarial Accrued Liability (UAAL)	\$1,540,237,844	\$1,543,787,369
Funded Ratio	77.31%	76.14%
Market Value Rate of Return	2.02%	4.60%
<b>Annual Cost</b>		
Statutory Funding Rate	16.37%	16.27%
Total Normal Rate	11.34%	11.18%
Employee Contribution Rate	<u>7.90%</u>	<u>7.90%</u>
Employer Normal Rate	3.44%	3.28%
Employer Contribution Rate		
Normal Rate	3.44%	3.28%
Administrative Expense Load	0.27%	0.27%
UAAL Rate	4.72%	4.78%
Transfer to DB Education Fund	<u>0.04%</u>	<u>0.04%</u>
Total Rate***	8.47%	8.37%
Amortization Period****	26 years	28 years
Employer Contribution Rate Necessary to Amortize UAAL over 30 Years		
Normal Rate	3.44%	3.28%
Administrative Expense Load	0.27%	0.27%
UAAL Rate (30-Year Rate)	4.68%	4.38%
Transfer to DB Education Fund	<u>0.04%</u>	<u>0.04%</u>
Total Rate	8.43%	7.97%
Shortfall/(Surplus)	(0.04%)	(0.40%)

\* Based on PERB categorization for the annual report. For actuarial purposes, 562 members in 2015 and 554 members in 2016 were valued as disabled members with offsetting reductions to the number of retired members.

\*\* A reconciliation between participant counts used for the annual report and counts for the valuation appears at the beginning of Appendix D.

\*\*\* The rates shown are for the fiscal year immediately following the valuation date. The schedule on page 3 highlights the statutory contribution rates payable in each fiscal year including scheduled increases.

\*\*\*\* Reflects anticipated increases in employer contribution rates and Coal Tax Revenue.



## **Section I: Summary of Results**

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As a result of this actuarial valuation of the benefits in effect under the Public Employees' Retirement System as of June 30, 2016, the statutory employer contributions are sufficient to amortize the Unfunded Actuarial Accrued Liability (UAAL) of the Retirement System within 26 years. The Funded Ratio is 77.31%.

### **Calculations based on the Market Value of Assets**

MCA 19-2-407 requires this report to show how market performance is affecting the actuarial funding of the Retirement System. The June 30, 2016, market value of assets is \$214,878,200 less than the actuarial value of assets. This is due to the smoothing of investment gains and losses over a four-year period. If the market value of assets was used, the amortization period would be 34 years, and the Funded Ratio would be 74.14%.

### **Additional Details**

The actuarial costs are calculated using the entry age actuarial cost method. This is the method used by most public plans. It is designed to provide a stable contribution rate as a percent of member pay. This actuarial valuation measures the adequacy of the contribution rates set in Montana State Law.

HB 454 was enacted during the 2013 legislative session and made changes to PERS with respect to enhanced funding and reductions in levels of Guaranteed Annual Benefit Adjustments (GABA). However, the GABA provision of this Bill was overturned by the Montana Courts. Therefore the liabilities reflect the GABA provisions as they existed prior to the enactment of HB 454.

MCA 19-3-316 requires each employer to contribute 6.90% of total compensation paid to all members employed in a PERS reportable position. This amount increased by 1.27% for fiscal year 2014 and will increase by 0.10% each fiscal year through 2024 until the total employer contribution is equal to 9.17% of member compensation. The employer contribution increases may terminate on January 1 following the board's receipt of the system's actuarial valuation if the actuarial valuation determines that terminating the additional employer contribution would not cause the amortization period of the unfunded actuarial accrued liability to exceed 25 years.

MCA 19-3-315 requires each member to contribute 7.90% compensation. Each member's contribution must be reduced to 6.90% on January 1 following the system's annual actuarial valuation if the valuation determines that reducing the employee contribution and reducing the employer contribution would not cause the system's amortization period of the unfunded actuarial accrued liability to exceed 25 years.

Beginning July 1, 2014, and each July 1 thereafter, the System will receive the unallocated portion of the revenue from the coal severance taxes each year.

Beginning July 1, 2014, and each July 1 until 2019, PERS will receive up to \$21 million of interest income from the coal tax permanent fund. In fiscal year 2020, interest income contributions are capped at \$24 million.

Beginning July 1, 2013, employers who hire PERS retirees who work less than 960 hours in the calendar year, but do not become active member contribute the employer's contribution rate on the working retiree's compensation.



## Section I: Summary of Results

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The table below summarizes the legislated contribution increases for both the members and the employers.

### History of Legislated Contributions (as a Percent of Pay)

	<u>Members</u>	<u>Employers</u>
July 1, 1999 to June 30, 2007	6.90%	6.90%
July 1, 2007 to June 30, 2009	6.90	7.035
July 1, 2009 to June 30, 2013	6.90	7.17
July 1, 2013 to June 30, 2014	7.90	8.17
July 1, 2014 to June 30, 2015	7.90	8.27
July 1, 2015 to June 30, 2016	7.90	8.37
July 1, 2016 to June 30, 2017	7.90	8.47
July 1, 2017 to June 30, 2018	7.90	8.57
July 1, 2018 to June 30, 2019	7.90	8.67
July 1, 2019 to June 30, 2020	7.90	8.77
July 1, 2020 to June 30, 2021	7.90	8.87
July 1, 2021 to June 30, 2022	7.90	8.97
July 1, 2022 to June 30, 2023	7.90	9.07
July 1, 2023 to June 30, 2024	7.90	9.17

Based on MCA 19-3-1605, for Members hired on or after July 1, 2013, the GABA as of January 1, will be 1.50%, but must be reduced if the funded ratio is less than 90% as of the prior actuarial valuation date. The funded ratio for this purpose is 77.31%. For each full 2% that the unrounded funded ratio is less than 90%, the GABA must be reduced by 0.1%. As of June 30, 2016, the funded ratio determined for this purpose is 77%. As a result, the GABA rate for those hired on or after July 1, 2013, is 0.9%. In addition, if the amortization period of the unfunded actuarial accrued liability is equal to or exceeds 40 years, the GABA for members hired on or after July 1, 2013, would be equal 0.0%, regardless of the funded ratio. Since the System amortizes within 26 years which is less than 40 years, the GABA for members hired on or after July 1, 2013 can remain at 0.90%.



## Section I: Summary of Results

The table below shows the development of the portion of the unfunded actuarial liability allocated to PERS members who are in alternative defined contribution plans. This liability is funded by the Plan Choice Rate (PCR) contributions. As of June 30, 2016, the PCR unfunded accrued liability has been fully amortized.

Plan Choice Rate Unfunded Liability	
1. PCR-UAL as of June 30, 2015	\$ 2,589,223
2. Assumed Interest at 7.75% per year	200,665
3. Less: PCR Contributions to DBRP	(3,164,404)
4. Interest at 7.75% on 3.	(122,621)
5. PCR – UAL as of June 30, 2016	\$ (497,137)

### Investment Experience

The market assets earned 2.02% net of investment and operating expenses. As a result of prior years' unrecognized gains, the actuarial assets earned 9.27%, which is 1.52% greater than the actuarial assumption of 7.75%. The return on the actuarial assets differs from the return on market assets because the actuarial value of assets spreads gains and losses over four years. The chart below shows the annual returns for the past ten years.

Year	Market Return	Actuarial Return	Assumed Investment Return	Market Return over Assumption	Actuarial Return over Assumption
7/1/2006 to 6/30/2007	17.92%	11.94%	8.00%	9.92%	3.94%
7/1/2007 to 6/30/2008	(4.91)	7.62	8.00	(12.91)	(0.38)
7/1/2008 to 6/30/2009	(20.85)	(0.16)	8.00	(28.85)	(8.16)
7/1/2009 to 6/30/2010	12.91	(1.18)	7.75	5.16	(8.93)
7/1/2010 to 6/30/2011	21.70	(0.08)	7.75	13.95	(7.83)
7/1/2011 to 6/30/2012	2.27	3.28	7.75	(5.48)	(4.47)
7/1/2012 to 6/30/2013	12.99	11.91	7.75	5.24	4.16
7/1/2013 to 6/30/2014	17.12	13.21	7.75	9.37	5.46
7/1/2014 to 6/30/2015	4.60	9.63	7.75	(3.15)	1.88
7/1/2015 to 6/30/2016	2.02	9.27	7.75	(5.73)	1.52

Asset gains or losses result when the return on the actuarial value of assets differs from the assumed actuarial investment return.

### Recent Contribution Increases

MCA 19-3-316 and MCA 19-3-315 dictate that employers and members are required to make supplemental contributions until the January 1 following an actuarial valuation shows the unfunded actuarial accrued liability can be amortized over a period of no more than 25 years (without considering the supplemental employee and employer contributions). The individual employers are required to contribute an additional 1.27% of compensation. The employer contribution shall increase by an additional 0.10% each year following June 30, 2013, until the total employer supplemental contribution is equal to 2.27% of compensation.



## **Section I: Summary of Results**

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Each member's contribution must be reduced to 6.90% on January 1 following the system's annual actuarial valuation if the valuation determines that reducing the employee contribution would not cause the system's amortization period to exceed 25 years.

### **Amortization of the UAAL**

The June 30, 2015, actuarial valuation calculated a 28-year amortization period for the UAAL. The resulting amortization period at June 30, 2016, is 26 years. The amortization period anticipates future increases in employer supplemental contributions and future Coal Tax Revenue as projected by the Office of Budget and Program Planning.

### **Funding and Benefits Policy**

The Public Employees' Retirement System has adopted a Funding and Benefits Policy to provide general guidelines to help ensure decisions are made based on sound, consistent, and thoroughly examined criteria. The Funding and Benefits Policy includes guidance on the following topics:

#### **1) Funding Requirement**

a) The Funding and Benefits Policy states:

1. The Entry Age Normal Cost Method shall be applied to the projected benefits in determining the Normal Cost and Actuarial Accrued Liability.
2. Asset smoothing can be used in the valuation process to spread the recognition of investment gains and losses over a four-year period.
3. The unfunded actuarial accrued liability should be amortized over a reasonable period of time and should not exceed 30 years on a rolling basis. Generally, the funding period should be constant or decreasing.

b) Analysis: The liabilities of the System are determined using the Entry Age Normal Cost Method and are compared to the actuarial value of assets, which are developed using asset smoothing that recognizes gains and losses over a four-year period. Finally, the amortization period as of June 30, 2016, is 26 years based on actuarial value of assets. The current employer and employee statutory rates keep the System's funding within Board policy guidelines.

#### **2) Funding Objectives**

a) The Funding and Benefits Policy states: "The primary objectives are to: 1) ensure that the systems are financially sound and pay all benefits promised using assets accumulated from required employer and member contributions and investment income; and 2) achieve a well-funded status with a range of safety to absorb market volatility without creating a UAAL."

b) Analysis: The employer and employee contributions provided for in statute are sufficient to amortize the unfunded actuarial accrued liability within a 26-year period. This ensures that the System is financially sound and will be able to pay all promised benefits and eventually achieve a well-funded status with a range of safety to absorb market volatility without creating and UAAL.

#### **3) Benefit Enhancements**

a) The Funding and Benefits Policy states: "Proposals must provide funding from sources sufficient to cover future costs. Unfunded liabilities created by the proposal must be amortized over a period of time appropriate to the retirement system, but not more than 30 years."



## Section I: Summary of Results

- b) Analysis: Without supplemental funding, a benefit enhancement would increase the amortization period of the unfunded actuarial accrued liability and further delay the goal of achieving a well-funded status with a range of safety to absorb market volatility without creating a UAAL.

### Sensitivity to Future Experience

The valuation results are projections based on the actuarial assumptions. Actual experience will differ from these assumptions, either increasing or decreasing the ultimate cost. The following illustrations provide simple analyses on how the costs are sensitive to changes in the assumed rate of return.

Investment Return – The investment return generally has the largest impact on the funding of the System.

Impact of Assuming 1.00% Lower Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.75%	77.31%
Lower Assumption 6.75%	<u>69.28%</u>
Decrease	(8.03)%
	<u>Amortization Period Increase / (Decrease)</u>
Current Assumption 7.75%	26 Years
Lower Assumption 6.75%	<u>Does not amortize</u>
Increase	N/A
Impact of Assuming 1.00% Higher Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.75%	77.31%
Higher Assumption 8.75%	<u>85.71%</u>
Increase	8.40%
	<u>Amortization Period Increase / (Decrease)</u>
Current Assumption 7.75%	26 Years
Higher Assumption 8.75%	<u>16 Years</u>
Decrease	(10) Years



## **Section I: Summary of Results**

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The future funding status of the System will be determined by the System's experience. The System's actual asset returns and retirement rates, as well as member longevity, salary increases, withdrawal rates, disability rates and future legislation will all impact the funding status of the System. The entry age normal cost method and four-year smoothing of asset gains and losses will help to provide a more orderly funding of the System's liabilities, but will not change the actual experience. The amortization period of the UAAL is not likely to decrease by the expected 1.0 year with each passing actuarial valuation. Instead, the amortization period is expected to decrease more or less than 1.0 years each year, reflecting gains and losses due to experience different than the actuarial assumptions.

### **Initial Valuation**

This is the first actuarial valuation report prepared by Cavanaugh Macdonald Consulting (CMC) for PERS. As part of our transition work, we replicated the June 30, 2015 actuarial valuation. Results were well within acceptable limits.

### **Assumption Changes**

There have been no assumption changes since the previous valuation.

### **Benefit Changes**

There have been no benefit changes since the previous valuation.

### **Contribution Changes**

An employer supplemental contribution of 1.27% of compensation is required beginning in fiscal year 2014 which will increase by 0.10% each subsequent fiscal year through 2024. For fiscal years beginning after June 30, 2024, the supplemental employer contribution will equal 2.27% of compensation.

### **Method Changes**

There have been no method changes since the previous valuation.



## Section I: Summary of Results

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### Impact of Changes

The following table summarizes how experience has changed the UAAL since the June 30, 2015 Actuarial Valuation. Further detail can be found in Table 10.

#### Changes in the Unfunded Actuarial Accrued Liability (UAAL)

June 30, 2015 Valuation UAAL	\$1,543,787,369
Normal Cost	123,081,961
Contributions	(230,470,928)
Interest	<u>120,418,261</u>
Expected June 30, 2016 UAAL	\$1,556,816,663
Experience Loss on Actuarial Liabilities	\$57,170,006
Experience Gain on Actuarial Assets	(73,748,825)
Assumption & Method Changes	0
Plan Changes	<u>0</u>
Total Gain	<u>\$(16,578,819)</u>
June 30, 2016 Valuation UAAL	\$1,540,237,844



## Section I: Summary of Results

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### Summary

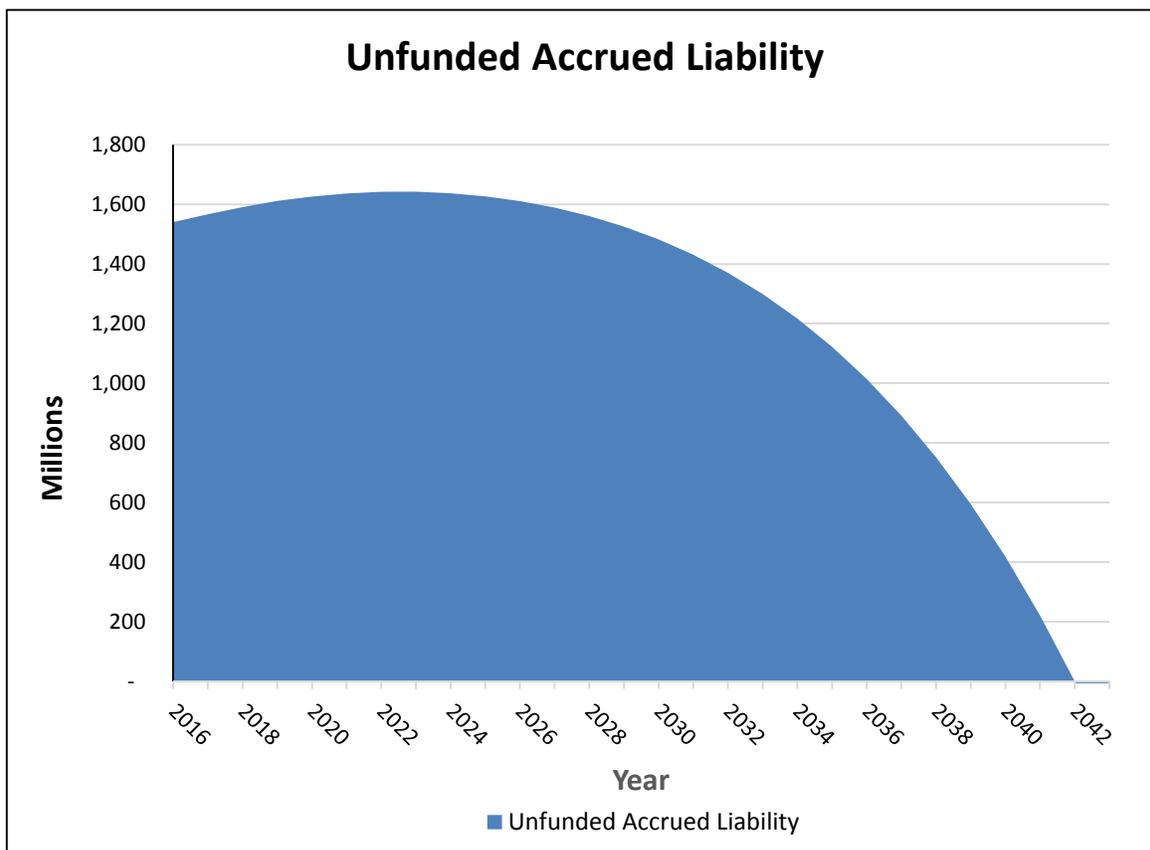
- \* The System's actuarial value investment return of 9.27% for the year ended June 30, 2016, is 1.52% more than the actuarial assumption of 7.75%. This represents an asset gain of \$73,748,825 due to investment return more than anticipated. As of June 30, 2016, the market value of assets was \$5,032,807,110. As of June 30, 2016, the actuarial value of assets was \$5,247,685,310. The June 30, 2016, market value of assets will be recognized in future actuarial valuations unless it is offset by returns greater than the 7.75% assumption.
- \* As of June 30, 2016, the amortization period of the UAAL is 26 years. Prior to this valuation, the funding period was 28 years. Liability losses, offset by the asset gain, attributed to the decrease in the amortization period. The ultimate goal of the Board's Funding and Benefits Policy is to increase the funded status to a level such that the amortization period is below 30 years. The System is currently being funded within the parameters defined by the Board.
- \* The funding of the retirement system will be impacted by future experience, which will sometimes be more favorable than the actuarial assumptions and sometimes less favorable. In particular, investment returns larger and smaller than the 7.75% assumption are expected to have significant impacts on the System's funding progress. In the long term, the favorable experience is needed to offset the less favorable experience. This is the reason for using an actuarial value of assets that allows gains and losses to be smoothed over four years.



## Section I: Summary of Results

### Projected Progress toward 100% Funding

The table below shows the projected progress toward reaching 100%. When the System is 100% funded, the Unfunded Actuarial Accrued Liability will be fully amortized. This is scheduled to occur within 26 years. The ultimate goal of the System is to achieve a well-funded status with a range of safety to absorb market volatility without creating an unfunded actuarial accrued liability.





## Section II: Assets

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### Assets

In many respects, an actuarial valuation can be regarded as an inventory process. The inventory is taken as of the actuarial valuation date, which for this valuation is June 30, 2016. On that date, the assets available for the payment of benefits are appraised. These assets are compared with the actuarial liabilities. The actuarial process thus leads to a method of determining what contributions by members and their employers are needed to strike a balance.

The asset valuation method being used is a four-year smoothing method. The expected return is determined each year based on the beginning of year market value and actual cash flows during the year. Any difference between the expected market value return and the actual market value return is recognized evenly over a period of four years.

Table 1 lists the assets held and their market value for the past two years. Table 2 summarizes the fund's activity during the past two years. Table 3 summarizes the determination of the actuarial value of assets. Table 4 summarizes historical asset returns for the last 10 years including the amount recognized by the actuarial asset valuation method which was greater or lesser than the actuarial investment return assumption. Table 5 summarizes the historical asset values on a market value and actuarial value basis, to the extent it was available. Additional data can be included in this table for future reports, if provided by the System.

**Section II: Assets**

**Table 1:**  
**Statement of Fiduciary Net Assets**  
**Fiscal Year Ended June 30,**

	<u>2016</u>	<u>2015</u>
<b>ASSETS</b>		
Cash and Short Term Investments	\$ 145,322,760	\$ 94,135,312
Securities Lending Collateral	\$ 139,745,427	\$ 192,822,991
Receivables:		
Interest Receivable	\$ 6,832,899	\$ 6,847,878
Accounts Receivable	1,710,157	1,426,093
Due from Other Funds	565,881	514,746
Due from Primary Government	3,410,149	4,133,310
Notes Receivable	29,675	18,133
Total Receivables	<u>\$ 12,548,761</u>	<u>\$ 12,940,160</u>
Investments, at fair value:		
Investment Pools	4,875,780,391	4,955,140,592
Other Investments	-	-
Total Investments	<u>\$ 4,875,780,391</u>	<u>\$ 4,955,140,592</u>
Capital Assets		
Property and Equipment, at cost, net of Accumulated Depreciation	\$ 30,687	\$ 39,636
Equipment	1,194,884	963,481
Total Capital Assets	<u>\$ 1,225,571</u>	<u>\$ 1,003,117</u>
<b>TOTAL ASSETS</b>	<u>\$ 5,174,622,910</u>	<u>\$ 5,256,042,172</u>
<b>LIABILITIES</b>		
Securities Lending Liability	\$ 139,745,427	\$ 192,822,991
Accounts Payable	366,866	950,418
Unearned Revenue	326,189	107,643
Due to Other Funds	648,090	407,924
Compensated Absences	266,404	292,124
OPEB Implicit Rate Subsidy LT	462,824	402,851
<b>TOTAL LIABILITIES</b>	<u>\$ 141,815,800</u>	<u>\$ 194,983,951</u>
<b>NET ASSETS HELD IN TRUST FOR PENSION BENEFITS</b>	<u>\$ 5,032,807,110</u>	<u>\$ 5,061,058,221</u>

**Section II: Assets**

**Table 2:  
Statement of Changes in Fiduciary Net Assets  
Fiscal Year Ended June 30,**

	<u>2016</u>	<u>2015</u>
<b>ADDITIONS</b>		
Contributions:		
Employer	\$ 102,327,838	\$ 100,175,856
Plan Member	97,342,719	95,424,031
Other	30,800,371	32,397,353
Total Contributions	<u>\$ 230,470,928</u>	<u>\$ 227,997,240</u>
Misc Income	\$ -	\$ -
Investment Income:		
Net Appreciation/(Depreciation) in Fair Value of Investments	\$ (99,366,978)	\$ 78,183,994
Investment Earnings	229,855,037	173,616,880
Security Lending Income	1,454,001	1,231,870
Investment Income/(Loss)	<u>\$ 131,942,060</u>	<u>\$ 253,032,744</u>
Investment Expense	(30,281,909)	(27,703,157)
Security Lending Expense	(460,295)	(222,895)
Net Investment Income/(Loss)	<u>\$ 101,199,856</u>	<u>\$ 225,106,692</u>
Total Additions	<u>\$ 331,670,784</u>	<u>\$ 453,103,932</u>
<b>DEDUCTIONS</b>		
Benefit Payments	\$ 344,103,875	\$ 319,501,818
Refunds/Distributions	10,379,388	11,687,946
Refunds to Other Plans	265,869	833,963
Transfers to DCRP	1,104,737	1,252,311
Transfers to MUS-RP	129,897	125,425
OPEB Expense	79,799	84,953
Administrative Expense	3,858,330	3,551,450
Total Deductions	<u>\$ 359,921,895</u>	<u>\$ 337,037,866</u>
<b>NET INCREASE (DECREASE) IN PLAN NET ASSETS</b>	\$ (28,251,111)	\$ 116,066,066
<b>NET ASSETS HELD IN TRUST FOR PENSION BENEFITS BEGINNING OF YEAR</b>	\$ 5,061,058,221	\$ 4,942,906,706
<b>ADJUSTMENT</b>		\$ 2,085,449
<b>END OF YEAR</b>	<u>\$ 5,032,807,110</u>	<u>\$ 5,061,058,221</u>



**Section II: Assets**

**Table 3:  
Determination of Actuarial Value of Assets**

<b>Valuation Date June 30:</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
A. Actuarial Value Beginning of Year	\$ 4,595,805,330	\$ 4,926,515,810			
B. Market Value End of Year	5,061,058,221	5,032,807,110			
C. Market Value of Beginning of Year	4,942,769,917	5,061,058,221			
D. Cash Flow					
D1. Contributions	230,066,606	230,470,928			
D2. Benefit Payments	(333,401,463)	(355,983,766)			
D3. Administrative Expenses	(3,483,531)	(3,858,330)			
D4. Investment Expenses	-	(30,742,204)			
D5. Net	\$ (106,818,388)	\$ (129,371,168)			
E. Investment Income					
E1. Market Total: B. - C. - D5.	\$ 225,106,692	\$ 101,120,057			
E2. Assumed Rate	7.75%	7.75%			
E3. Amount for Immediate Recognition C.*E2. + ((D1.+D2.+D3.)*E2.*0.5) - D4.	379,002,688	417,961,083			
E4. Amount for Phased-in Recognition E1. - E3.	(153,895,996)	(316,841,026)			
F. Phased-In Recognition of Investment Income					
F1. Current Year: 0.25 * E4.	\$ (38,473,999)	\$ (79,210,257)	\$ -	\$ -	\$ -
F2. First Prior Year	99,700,567	(38,473,999)	(79,210,257)	-	-
F3. Second Prior Year	50,563,274	99,700,567	(38,473,999)	(79,210,257)	-
F4. Third Prior Year	(53,263,662)	50,563,274	99,700,567	(38,473,999)	(79,210,257)
F5. Total Recognized Investment Gain	\$ 58,526,180	\$ 32,579,585	\$ (17,983,689)	\$ (117,684,256)	\$ (79,210,257)
G. Actuarial Value End of Year A. + D5. + E3. + F5.	\$ 4,926,515,810	\$ 5,247,685,310			



**Section II: Assets**

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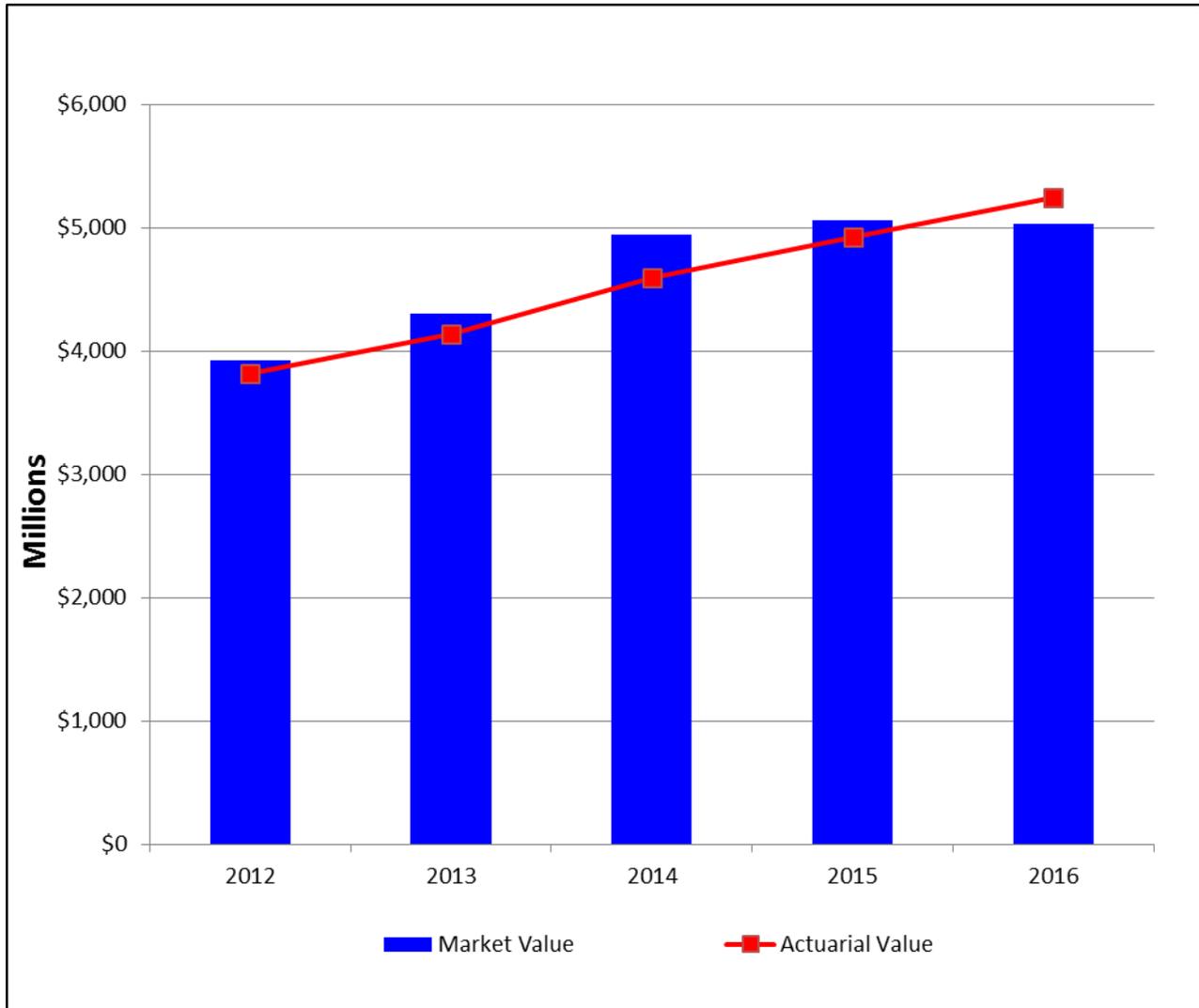
**Table 4:  
Historical Investment Returns\***

<b>Fiscal Year Ending</b>	<b>Market Returns</b>	<b>Actuarial Returns</b>	<b>Assumed Rate of Return</b>	<b>Actuarial Return Over Assumption</b>
June 30, 2007	17.92%	11.94%	8.00%	3.94%
June 30, 2008	(4.91)%	7.62%	8.00%	(0.38)%
June 30, 2009	(20.85)%	(0.16)%	8.00%	(8.16)%
June 30, 2010	12.91%	(1.18)%	7.75%	(8.93)%
June 30, 2011	21.70%	(0.08)%	7.75%	(7.83)%
June 30, 2012	2.27%	3.28%	7.75%	(4.47)%
June 30, 2013	12.99%	11.91%	7.75%	4.16%
June 30, 2014	17.12%	13.21%	7.75%	5.46%
June 30, 2015	4.60%	9.63%	7.75%	1.88%
June 30, 2016	2.02%	9.27%	7.75%	1.52%
10 Year Average	5.82%	6.41%		(1.42)%

\* Returns reflect all investment returns, including investment income and realized and unrealized investment gains and losses, and are net of investment expenses and administrative expenses paid by the System.



**Table 5:  
Market Value of Assets vs. Actuarial Value of Assets**





### **Section III: Actuarial Present Value of Future Benefits**

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#### **Actuarial Present Value of Future Benefits**

In the previous section, an actuarial valuation was related to an inventory process, and an analysis was given of the inventory of assets of the System as of the valuation date. In this section, the discussion will focus on the commitments of the System, which will be referred to as its actuarial liabilities.

Table 6 contains an analysis of the actuarial present value of all future benefits for actives, for retirees, and for beneficiaries. The analysis is given by type of benefit.

The actuarial liabilities summarized in Table 6 include the actuarial present value of all future benefits expected to be paid with respect to each member covered as of the valuation date. For an active member, this value includes a measure of both benefits already earned and future benefits to be earned. Thus, for all members, active and retired, the value extends over benefits earnable and payable for the rest of their lives and, if an optional benefit is chosen, for the lives of their surviving beneficiaries.

The actuarial valuation does not recognize liabilities for employees who become members and participate in the System after the valuation date.



**Section III: Actuarial Present Value of Future Benefits**

**Table 6:  
Actuarial Present Value of Future Benefits for Actives,  
Retirees, and Beneficiaries**

	<u>June 30, 2016</u> Total	<u>June 30, 2015</u> Total
<b>A. Active Members Liability Due to Probability of</b>		
Retirement	\$ 3,338,732,426	\$ 3,250,321,019
Disability	\$ 58,477,323	\$ 60,034,623
In-Service Death	\$ 132,383,431	\$ 111,345,914
Termination	\$ 117,207,073	\$ 107,398,661
Total	\$ 3,646,800,253	\$ 3,529,100,217
<b>B. Inactive Members and Annuitants</b>		
Service Retirement	\$ 3,632,977,777	\$ 3,360,935,439
Disability Retirement	\$ 90,005,521	\$ 88,532,055
Beneficiaries*	\$ 232,417,069	\$ 237,983,473
Vested Terminated Members	\$ 194,316,023	\$ 169,963,575
Refund of Member Contributions	\$ -	\$ 23,382,787
Total	\$ 4,149,716,390	\$ 3,880,797,329
<b>C. Grand Total</b>	<b>\$ 7,796,516,643</b>	<b>\$ 7,409,897,546</b>

\* Includes survivors of active and retired members.



## Section IV: Employer Contributions

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### Employer Contributions

In the previous two sections, attention has been focused on the assets and the present value of all future benefits of the System. A comparison of Tables 3 and 6 indicates that there is a shortfall in current actuarial assets 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 sets a schedule of future contributions that will deal with 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. For this valuation, the entry age actuarial cost method has been used. A description of the entry age actuarial cost method is provided in Appendix A. Under this method, or essentially any actuarial cost method, the contributions required to meet the difference between current assets and the present value of all future benefits are allocated each year between three elements:

- A normal cost amount, which ideally is relatively stable as a percentage of salary over the years;
- A load for administrative expenses; and
- An amount which is used to amortize the UAAL.

The two items described above, normal cost and UAAL, are the keys to understanding the actuarial cost method. Let us first discuss the normal cost.

The normal cost is the theoretical contribution rate, which will meet the ongoing costs of a group of average new employees. Suppose that a group of new employees were covered under a separate fund from which all benefits and to which all contributions and associated investment return were to be paid. Under the entry age actuarial cost method, the normal cost contribution rate is that level percentage of pay which would be exactly right to maintain this fund on a stable basis. If experience were to follow the actuarial assumptions exactly, the fund would be completely liquidated with the last payment to the last survivor of the group.

The assumed investment rate of return is 7.75%, net of investment expenses only. As a result, the actuarially determined contribution must include an amount for administrative expenses expected to occur during the year.

We have determined the normal cost rates separately by type of benefit under the System. These are summarized in Table 7. In Table 7 we also provide a summary of the member and employer statutory contributions.

The term "fully funded" is often applied to a system where contributions for everyone at the normal cost rate will fully pay for the benefits of existing as well as new employees. Often, systems are not fully funded, either because of benefit improvements in the past that have not been completely paid for or actuarial deficiencies that have occurred because experience has not been as anticipated. Under these circumstances, a UAAL exists.



#### **Section IV: Employer Contributions**

---

Table 8 shows how the UAAL was derived for the System. Lines A and B show, respectively, the total present value of future benefits and the portion of the future liability that is expected to be paid from future normal cost contributions, both employer and employee. The future normal cost contributions are the portion of the present value of future benefits that are attributed to future years of service that have not been earned yet by the active membership. Line C shows the actuarial accrued liability. Line D shows the amount of assets available for benefits. Line E shows the UAAL.

The UAAL at any date after establishment of a system is affected by any actuarial gains or losses arising when the actual experience of the system varies from the experience anticipated by the actuarial assumptions used in the valuations. To the extent actual experience as it develops differs from the assumptions used, so also will the actual emerging costs differ from the estimated costs. The impact of these differences in actual experience from the assumptions is included in Section 1, the Summary of Results.



**Section IV: Employer Contributions**

**Table 7:  
Normal Cost Contribution Rates  
As Percentages of Salary**

	<b>June 30, 2016 Total</b>	<b>June 30, 2015 Total</b>
Service retirement	8.90%	8.76%
Disability retirement	0.28%	0.30%
In Service death	0.41%	0.38%
Vested retirement	1.75%	1.74%
<b>Total Normal Rate</b>	<b>11.34%</b>	<b>11.18%</b>
Employee Normal Rate	7.90%	7.90%
Employer Normal Rate	3.44%	3.28%
Administrative Expense Load	0.27%	0.27%
Transfer to DB Education Fund	0.04%	0.04%
Rate Available to Amortize Unfunded Actuarial Accrued Liability	4.72%	4.78%
Statutory Funding Rate*	16.37%	16.27%

\* Rates shown are for the fiscal year following the valuation date.



**Section IV: Employer Contributions**

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**Table 8:  
Unfunded Actuarial Accrued Liability**

	<b>June 30, 2016</b>	<b>June 30, 2015</b>
A. Actuarial present value of all future benefits for actives and retirees and their survivors (Table 6)	\$ 7,796,516,643	\$ 7,409,897,546
B. Less actuarial present value of total future normal costs for present members	<u>\$ 1,008,593,489</u>	<u>\$ 939,594,367</u>
C. Actuarial accrued liability	\$ 6,787,923,154	\$ 6,470,303,179
D. Less assets available for benefits	<u>\$ 5,247,685,310</u>	<u>\$ 4,926,515,810</u>
E. Unfunded actuarial accrued liability	\$ 1,540,237,844	\$ 1,543,787,369



### **Cash Flows**

The fundamental equation for funding a retirement system is that benefits and administrative expenses must be provided for by contributions (past and future) and investment income. When a retirement system matures, benefits and administrative expenses often exceed contributions. In this case we say the system has a “negative cash flow.” Mature systems are characterized by negative cash flows and large pools of assets. This is natural. Actuarial funding is designed to accumulate large pools of assets which will in turn provide investment income and finance negative cash flows when systems mature. If the fund is looked at as a whole, investment income is usually larger than the difference between contributions and benefit payments. The retirement system’s investment strategy should maximize potential returns at a prudent level of risk while providing for needed cash flows.

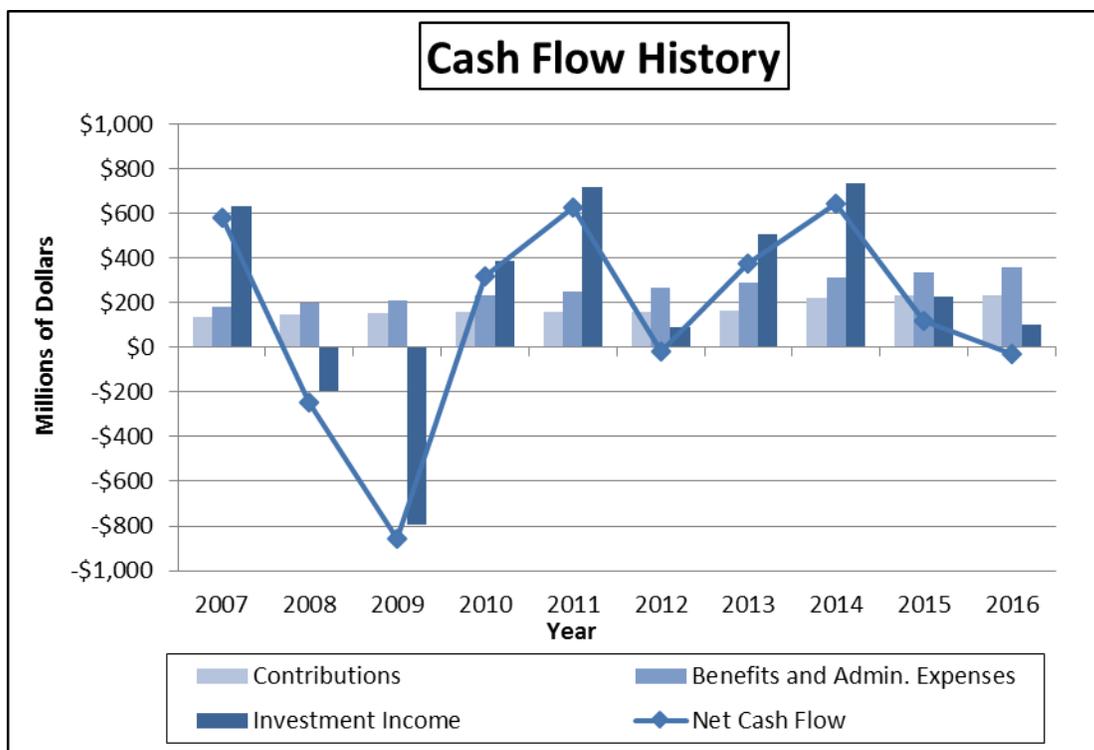
Table 9 shows the System had a negative cash flow for the year ended June 30, 2016. The System’s total cash flow including benefits payments, administrative expenses and investment earnings was \$(28.2) million. Of the \$(28.2) million, \$101.2 million was due to investment returns.

If the System had a positive cash flow, there would be no need to plan where the funds would come from to pay benefits since benefits could be paid by incoming contributions. A negative cash flow, as defined above, requires planning what funds will be used to pay the difference between benefits and contributions.



**Section V: Cash Flow History**

**Table 9:  
Cash Flow History  
(Dollar amounts in millions)**



Year Ended June 30	Historical Cash Flows			
	Contributions	Benefits & Administrative Expenses	Investment Income	Net Cash Flow
2007	\$ 136.8	\$ 183.8	\$ 630.0	\$ 583.0
2008	145.5	197.8	(197.0)	(249.3)
2009	152.3	211.9	(796.2)	(855.8)
2010	159.5	229.8	387.9	317.6
2011	157.6	246.9	715.4	626.1
2012	159.9	269.2	91.4	(17.9)
2013	163.3	290.7	505.0	377.6
2014	223.0	311.5	732.4	643.9
2015	230.1	337.0	225.1	118.2
2016	230.5	359.9	101.2	(28.2)



## **Section VI: Actuarial Gains of Losses**

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### **Actuarial Gains or Losses**

An analysis of actuarial gains or losses is performed in conjunction with all regularly scheduled valuations.

The results of our analysis of the financial experience of the System in the three most recent regular actuarial valuations are presented in Table 10. Each gain or loss shown represents our estimate of how much the given type of experience caused the Unfunded Actuarial Accrued Liability or Funding Reserve to change in the period since the previous actuarial valuation.

Gains and losses shown due to demographic sources are approximate. Demographic experience is analyzed in greater detail in our periodic experience studies.

Non-recurring gains and losses result from changes in the actuarial assumptions and benefit improvements.



**Section VI: Actuarial Gains of Losses**

**Table 10:**  
**Analysis of Actuarial (Gains) or Losses\***  
(Dollar amounts in thousands)

	<b>UAAL (Gain)/Loss</b>		
	<b>June 30, 2016</b>	<b>June 30, 2015</b>	<b>June 30, 2014</b>
<b>Investment Income</b>			
Investment income was (greater) less than expected based on actuarial value of assets.	\$ (73,748.8)	\$ (85,415.9)	\$ (223,502.0)
<b>Pay Increases</b>			
Pay increases were (less) greater than expected.	43,091.1	(1,329.7)	(11,773.5)
<b>Age &amp; Service Retirements</b>			
Members retired at (older) younger ages or with (less) greater final average pay than expected	2,730.4	4,415.4	552.5
<b>Disability Retirements</b>			
Disability claims were (less) greater than expected	834.0	(1,278.7)	(1,309.7)
<b>Death-in-Service Benefits</b>			
Survivor claims were (less) greater than expected	(633.4)	945.6	916.4
<b>Withdrawal From Employment</b>			
(More) less reserves were released by withdrawals than expected	4,953.4	(2,612.0)	(1,560.3)
<b>Death After Retirement</b>			
Retirees (died younger) lived longer than expected	(3,963.9)	7,162.0	9,272.7
<b>Data Adjustments and Benefit Payment Timing</b>			
Service purchases, data corrections, etc.	21,259.2	-	-
<b>Other</b>			
Miscellaneous (gains) and losses	(11,100.8)	4,070.3	(7,374.4)
<b>Total (Gain) or Loss During Period From Financial Experience</b>	<b>\$ (16,578.8)</b>	<b>\$ (74,043.0)</b>	<b>\$ (234,778.2)</b>
<b>Non-Recurring Items.</b>			
Changes in actuarial assumptions and methods	-	-	-
Changes in benefits caused a (gain) loss	-	-	810,722.3
<b>Composite (Gain) Loss During Period</b>	<b>\$ (16,578.8)</b>	<b>\$ (74,043.0)</b>	<b>\$ 575,944.0</b>

\* Effects related to gains are shown in parentheses. Numerical results are expressed as a (decrease) increase in the Unfunded Actuarial Accrued Liability (UAAL). Gains decrease the UAAL and losses increase the UAAL.



## **Appendix A: Actuarial Procedures and Methods**

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The actuarial assumptions (other than the administrative expense rate) were adopted by the Board based upon the results of an actuarial experience study covering the period July 1, 2003, through June 30, 2009.

Tables B-1 through B-7 give rates of decrement for service retirement, disablement, mortality, and other terminations of employment.

### **Actuarial Cost Method**

The actuarial valuation was prepared using the entry age actuarial cost method. Under this method, the actuarial present value of the projected benefits of each individual included in the valuation is allocated as a level percentage of the individual's projected compensation between entry age and assumed exit. The portion of this actuarial present value allocated to a valuation year is called the normal cost. The normal cost was first calculated for each individual member. The normal cost rate is defined to equal the total of the individual normal costs, divided by the total pay rate.

The portion of this actuarial present value not provided for at a valuation date by the sum of (a) the actuarial value of the assets and (b) the actuarial present value of future normal costs is called the UAAL. The UAAL is amortized as a level percentage of the projected salaries of present and future members of the System.

### **Records and Data**

The data used in the valuation consist of financial information; records of age, sex, service, salary, contribution rates, and account balances of contributing members; and records of age, sex, and amount of benefit for retired members and beneficiaries. All of the data were supplied by the System and are accepted for valuation purposes without audit.

### **Replacement of Terminated Members**

The ages at entry and distribution by sex of future members are assumed to average the same as those of the present members they replace. If the number of active members should increase, it is further assumed that the average entry age of the larger group will be the same, from an actuarial standpoint, as that of the present group. Under these assumptions, the normal cost rates for active members will not vary with the termination of present members.

### **Administrative and Investment Expenses**

The investment expenses of the System are assumed to be funded by investment earnings in excess of 7.75% per year.

The administrative expense rate is based upon actual recurring administrative expenses during the period July 1, 2008, through June 30, 2013.

Administrative expenses are assumed to equal 0.27% of payroll.



## **Appendix A: Actuarial Procedures and Methods**

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### **Valuation of Assets**

The actuarial asset valuation method spreads asset gains and losses over four years. The expected return is determined each year based on the beginning of year market value and actual cash flows during the year. Any difference between the expected market value return and the actual market value return is recognized evenly over a period of four years.

### **Investment Earnings**

The annual rate of investment earnings of the assets of the System is assumed to be 7.75% per year net of investment expenses, compounded annually.

### **Interest on Member Contributions**

Interest on member contributions is assumed to accrue at a rate of 3.50% per annum, compounded annually.

### **Future Salaries**

The rates of annual salary increase assumed for the purpose of the valuation are illustrated in Table B-2. In addition to increases in salary due to merit and longevity, this scale includes an assumed 4.0% annual rate of increase in the general wage level of the membership.

### **Service Retirement**

Table B-3 shows the annual assumed rates of retirement for actives members meeting the service retirement eligibilities.

### **Disablement**

The rates of disablement used in this valuation are illustrated in Table B-4.

### **Mortality**

The mortality rates used in this valuation are illustrated in Table B-5. A written description of each table used is included in Table B-1.

There is sufficient margin in the current mortality tables for possible future improvement in mortality rates and that margin will be reviewed again when the next experience investigation is conducted.

### **Other Terminations of Employment**

The rates of assumed future withdrawal from active service for reasons other than death, disability or retirement are shown for representative ages in Table B-6.

### **Benefits for Terminating Members**

Members terminating with less than five years of service are assumed to request an immediate withdrawal of their contributions with interest. Table B-7 shows the assumed probability of retaining membership in the System among members terminating with five or more years of service.



## **Appendix A: Actuarial Procedures and Methods**

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We estimated the present value of future benefits for terminated vested members based on the greater of the present value of their deferred benefit at age 60 or their available contribution account.

### **Probability of Marriage & Dependent Children**

If death occurs in active status, all members are assumed to have an eligible surviving spouse with no dependent children.

### **Records with no Birth Date**

New records with no birth date are assumed to be 37 years old. Records that are not new and have no birth date used the same birth date as the prior year's valuation.



**Table B-1**

**Summary of Valuation Assumptions**

I. Economic assumptions	
A. General wage increases	4.00%
B. Investment return	7.75%
C. Price inflation assumption	3.00%
D. Growth in membership	0.00%
E. Interest on member accounts	3.50%
F. Administrative expenses as a percentage of payroll	0.27%
II. Demographic assumptions	
A. Individual salary increase due to promotion and longevity	Table B-2
B. Retirement	Table B-3
C. Disablement	Table B-4
D. Mortality among contributing members, service retired members, and beneficiaries. The tables include margins for mortality improvement which is expected to occur in the future. For Males and Females: RP 2000 Combined Mortality Table projected to 2015 using Scale AA.	Table B-5
E. Mortality among disabled members For Males and Females: RP 2000 Combined Mortality Table.	Table B-5
F. Other terminations of employment	Table B-6
G. Probability of retaining membership in the System upon vested termination	Table B-7



Table B-2

Future Salaries

Years of Service	Individual Merit & Longevity	General Wage Increase	Total Salary Increase
1	6.00%	4.00%	10.00%
2	4.90	4.00	8.90
3	3.90	4.00	7.90
4	3.10	4.00	7.10
5	2.40	4.00	6.80
6	1.80	4.00	5.80
7	1.40	4.00	5.40
8	1.00	4.00	5.00
9	0.70	4.00	4.70
10	0.50	4.00	4.50
11	0.30	4.00	4.30
12	0.30	4.00	4.30
13	0.30	4.00	4.30
14	0.30	4.00	4.30
15	0.30	4.00	4.30
16	0.10	4.00	4.10
17	0.10	4.00	4.10
18	0.10	4.00	4.10
19	0.10	4.00	4.10
20	0.10	4.00	4.10
21	0.00	4.00	4.00
22 & Up	0.00	4.00	4.00



**Appendix B: Summary of Valuation Assumptions**

**Table B-3**  
**Retirement**  
**Annual Rates**

<u>Age</u>	<u>Less than 30 Years of Service</u>	<u>30 Years or more of Service and age 60 with 25 Years of Service</u>
Less than 45		10.0%
45		10.0
46		10.0
47		10.0
48		10.0
49		10.0
50	3.0%	10.0
51	3.0	10.0
52	3.0	10.0
53	3.0	10.0
54	3.0	10.0
55	3.0	15.0
56	4.0	15.0
57	5.0	15.0
58	5.0	15.0
59	6.0	15.0
60	8.0	15.0
61	15.0	15.0
62	25.0	25.0
63	15.0	15.0
64	15.0	15.0
65	30.0	30.0
66	30.0	30.0
67	25.0	25.0
68	25.0	25.0
69	25.0	25.0
70 & Over	100.0	100.0

Vested terminations are assumed to retire at their earliest unreduced eligibility.



**Appendix B: Summary of Valuation Assumptions**

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**Table B-4**  
**Disablement**  
**Annual Rates**

Age	All Members
22	.00%
27	.01
32	.01
37	.04
42	.10
47	.13
52	.25
57	.36
60	.00
62	.00

All disabilities are assumed to be permanent and without recovery.



**Table B-5**  
**Mortality**  
**Annual Rates**

Age	Contributing Members, Service Retired Members and Beneficiaries		Disabled Members	
	Men	Women	Men	Women
25	0.0323%	0.0168%	0.0376%	0.0207%
30	0.0412	0.0227	0.0444	0.0264
35	0.0717	0.0402	0.0773	0.0475
40	0.0957	0.0563	0.1079	0.0706
45	0.1239	0.0882	0.1508	0.1124
50	0.1628	0.1296	0.2138	0.1676
55	0.2718	0.2409	0.3624	0.2717
60	0.5297	0.4689	0.6747	0.5055
65	1.0309	0.9003	1.2737	0.9706
70	1.7702	1.5529	2.2206	1.6742
75	3.0622	2.4916	3.7834	2.8106
80	5.5360	4.1291	6.4368	4.5879
85	9.9680	7.0761	11.0757	7.7446
90	17.2706	12.5879	18.3408	13.1682
95	25.9578	18.8755	26.7491	19.4509



Table B-6

**Other Terminations of Employment  
Among Members Not Eligible to Retire  
Annual Rates**

<u>Years of Service</u>	<u>All Members</u>
0	25.0%
1	20.0
2	15.0
3	10.0
4	10.0
5	5.0
6	5.0
7	5.0
8	5.0
9	5.0
10	5.0
11	5.0
12	5.0
13	5.0
14	5.0
15	2.0
16	2.0
17	2.0
18	2.0
19	2.0
20	2.0
21	2.0
22	2.0
23	2.0

No terminations are assumed after age 50 with five years of service.



**Table B-7**

**Probability of Retaining Membership in the System  
Upon Vested Termination**

<u>Age</u>	<u>Probability of Retaining Membership</u>
Under 35	40%
35	50
36	50
37	50
38	50
39	50
40	55
41	55
42	55
43	55
44	55
45	65
46	65
47	65
48	65
49	65
50 & Over	70

**Family Composition**

Female spouses are assumed to be three years younger than males. 100% of non-retired employees are assumed married for both male and female employees. Actual marital characteristics are used for retirees.

**Vested Benefits for Termination Members**

Vested benefits for members who terminated during years ending June 30, 2009 and later were estimated based upon compensation and service information in the census data. For members who terminated prior to June 30, 2008, vested benefits valued were the same as had been calculated by the prior actuary for the June 30, 2008 actuarial valuation.



## Appendix C: Summary of Benefit Provisions

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Service Credit	<ul style="list-style-type: none"><li>• Service credit is used to determine the amount of a member's retirement benefit.</li><li>• One month of service credit is earned for each month where the member is paid for 160 hours. This includes certain transferred and purchased service.</li></ul>
Membership Service	<ul style="list-style-type: none"><li>• Membership service is used to determine eligibility for vesting, retirement or other benefits.</li><li>• One month of membership service is earned for any month member contributions are made, regardless of the number hours worked.</li><li>• Members may purchase service that counts toward membership service.</li></ul>
Contributions	<ul style="list-style-type: none"><li>• Member contributions are made through an "employer pick-up" arrangement which result in deferral of taxes on the contributions.</li></ul>
Compensation	<ul style="list-style-type: none"><li>• Compensation generally means all remuneration paid, excluding certain allowances, benefits, and lump sum payments. Compensation is specifically defined in law and differs amongst the systems.</li><li>• Bonuses paid on or after July 1, 2013 to any member will not be treated as compensation for retirement purposes. No member or employer contributions will be paid on bonuses.</li></ul>
Withdrawal of employee contributions	<ul style="list-style-type: none"><li>• A member is eligible for a withdrawal of their contributions when they terminate service and are either not eligible for or have not taken a retirement benefit.</li><li>• The member receives the accumulated member contributions which consists of member contributions and regular interest.</li><li>• Upon receipt of a refund of accumulated contributions a member's vested right to a monthly benefit is forfeited.</li></ul>
Member contributions interest credited (regular interest)	<ul style="list-style-type: none"><li>• Interest is credited to member accounts at the rates determined by the Board.</li><li>• The current interest rate credited to member accounts is 0.25%.</li></ul>



## Appendix C: Summary of Benefit Provisions

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Vesting eligibility and benefit	<ul style="list-style-type: none"><li>• 5 years of membership service</li><li>• Accrued normal retirement benefit, payable when eligible for retirement</li><li>• In lieu of a pension, a member may receive a refund of accumulated contributions.</li><li>• Upon receipt of a refund of contributions, a member's vested right to a monthly benefit is forfeited.</li></ul>
Type of Plan	<ul style="list-style-type: none"><li>• Multiple-employer cost sharing</li></ul>
Membership eligibility	<ul style="list-style-type: none"><li>• Employees of the State and local governments that have contracted for PERS coverage</li><li>• Certain employees of the university system and school districts, not covered by a separate retirement system governed by Title 19 of the Montana Code Annotated</li></ul>
Member contributions	<ul style="list-style-type: none"><li>• 7.9% of member's compensation</li><li>• Temporary 1% increase for members hired prior to July 1, 2011 and remains the same for members hired on or after July 1, 2011</li><li>• Reduced to 6.9% when amortization period drops below 25 years and remains below 25 years following the termination of the temporary 1% increase and the additional employer contribution rate.</li></ul>
Employer contributions	<ul style="list-style-type: none"><li>• 8.37% of each member's compensation for state and university. Reduced when amortization period drops below 25 years and remains below 25 years following the termination of the additional employer contribution rate and the member's temporary 1% increase.</li><li>• 8.27% of each member's compensation for local governments</li><li>• 8.00% of each member's compensation for school districts</li><li>• Contribution going into the PERS Defined Benefit Plan is reduced by 0.04% of compensation paid into the Educational Fund.</li><li>• Employers who hire PERS retirees who work less than 960 hours in the calendar year, but do not become active members, contribute the employer's contribution rate on the working retiree's compensation.</li></ul>



## Appendix C: Summary of Benefit Provisions

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State contributions	<ul style="list-style-type: none"><li>• 0.10% of compensation from the State for local governments</li><li>• 0.37% of compensation from State for School Districts</li><li>• Contributions are also made to the system from the Coal Tax Fund.</li></ul>
Compensation period used in benefit calculation	<p>HAC = Highest Average Compensation</p> <p><b>Hired prior to July 1, 2011:</b> HAC is average of the highest 36 consecutive months (or shorter period of total service) of compensation paid by member.</p> <p><b>Hired on or after July 1, 2011:</b> HAC is average of the highest 60 consecutive months (or shorter period of total service) of compensation paid to member.</p> <p><b>Hired on or after July 1, 2013:</b> 110% annual cap on compensation considered as part of a member's HAC.</p>
Service retirement eligibility	<p><b>Members hired prior to July 1, 2011:</b></p> <ul style="list-style-type: none"><li>• Age 60, 5 years membership service</li><li>• Age 65, regardless of service</li><li>• Any age, 30 years of membership service</li></ul> <p><b>Members hired on or after July 1, 2011:</b></p> <ul style="list-style-type: none"><li>• Age 65, 5 years of membership service</li><li>• Age 70, regardless of service</li></ul>
Service retirement benefit formula	<p><b>Members hired prior to July 1, 2011:</b></p> <ul style="list-style-type: none"><li>• Less than 25 years of membership service: 1.785% of HAC x years of service credit</li><li>• 25 years or more of membership service: 2% of HAC x years of service credit</li><li>• OR, if greater than either of the above: the actuarial equivalent of 2 times the member's regular contributions and interest plus the actuarial equivalent of any additional contributions and interest.</li></ul> <p><b>Members hired on or after July 1, 2011:</b></p> <ul style="list-style-type: none"><li>• Less than 10 years of membership service: 1.5% of HAC x years of service credit</li><li>• Between 10 and 30 years of membership service: 1.785% of HAC x years of service credit</li><li>• 30 years or more of membership service: 2% of HAC x years of service credit</li><li>• OR, if greater than any of the above: the actuarial equivalent of 2 times the member's regular contributions and interest plus the actuarial equivalent of any additional contributions and interest.</li></ul>



## Appendix C: Summary of Benefit Provisions

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Second retirement benefit

Members who retire **before January 1, 2016, return to PERS-covered employment, and accumulate less than 2 years of additional service credit receive:**

- A refund of the member's contributions plus regular interest;
- No service credit for second employment;
- The same benefit amount starting the month following termination; and
- The member's Guaranteed Annual Benefit Adjustment (GABA) starting again in January immediately following the member's second retirement.

Members who retire **before January 1, 2016, and return to PERS covered employment for at least 2 years of additional service credit receive:**

- A re-calculated retirement benefit based on provisions in effect after member's initial retirement; and
- GABA on member's re-calculated benefit starting in January after receiving the re-calculated benefit for 12 months.

Members who retire **on or after January 1, 2016, return to PERS service, and accumulate less than 5 years of additional service credit receive:**

- A refund of a member's contributions plus regular interest;
- No service credit for second employment;
- The same benefit amount starting the month following termination; and
- The member's GABA starting again in January immediately following the member's second retirement.

Members who retire **on or after January 1, 2016, return to PERS service, and accumulate 5 or more years of additional service credit receive:**

- The same retirement benefit paid immediately prior to member's return to service;
- A second retirement benefit for member's second period of service based on laws in effect upon the member's rehire date; and
- The member's GABA on both benefits starting in January after receiving the original and new benefit for 12 months.

Early retirement eligibility

**Members hired prior to July 1, 2011:**

- Age 50 with 5 years of membership service; or
- Any age under age 60 with 25 years of membership service

**Members hired on or after July 1, 2011:**

- Age 55 with 5 years of membership service.



## Appendix C: Summary of Benefit Provisions

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Early retirement  
benefit formula

### **Members hired prior to July 1, 2011 and**

- who retire prior to October 1, 2011

The actuarial equivalent of the accrued portion of the service retirement benefit that would have been payable to the member commencing at age 60 or upon completion of 30 years of membership service. The service retirement benefit is reduced by a factor resulting from multiplying 0.5% (for first five years from service retirement eligibility) and 0.3% (for six to 10 years from service retirement eligibility) by the number of months by which the retirement date precedes the date at which the member would have attained age 60 or completed 30 years of membership service.

- who retire on or after October 1, 2011

The actuarial equivalent of the accrued portion of the service retirement benefit that would have been payable to the member commencing at age 60 or upon completion of 30 years of membership service. The service retirement benefit must be reduced using actuarially equivalent factors based on the most recent valuation.

### **Members hired on or after July 1, 2011:**

- The actuarial equivalent of the accrued portion of the service retirement benefit that would have been payable to the member commencing at age 65. The service retirement benefit must be reduced using actuarially equivalent factors based on the most recent valuation.

Disability eligibility  
and benefit formula

- 5 years of membership service

### **If hired on or before February 24, 1991 and did not make a contrary election, the greater of:**

- (90% of 1.785% of HAC) x service credit, or
- 25% of HAC

### **If hired after February 24, 1991 and prior to July 1, 2011, or hired on or before February 24, 1991 and so elected:**

- Less than 25 years of membership service:  
1.785% of HAC x service credit, or
- At least 25 years of membership service:  
2% of HAC x service credit

### **If hired on or after July 1, 2011:**

- Less than 10 years of membership:  
1.5% of HAC x years of service credit
- Between 10 and 30 years of membership service:  
1.785% of HAC x years of service credit
- 30 years or more of membership service:  
2% of HAC x years of service credit



## Appendix C: Summary of Benefit Provisions

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Survivor's benefit eligibility

Member's status at time of death:

- active;
- receiving disability benefit for less than six months;
- continuously disabled without receiving a disability benefit; or
- inactive

Death payment benefit formula

- (Accumulated contributions + monthly compensation) x (lesser of years of service credit or 6) + interest until benefit paid.
- However, a survivor of an inactive member who was inactive for more than 6 months will receive only accumulated contributions and interest from the date of death until payment.
- A survivor may elect to receive the payment as a non-increasing annuity that is the actuarial equivalent of the death payment amount.

Survivor benefit formula

**Members hired prior to July 1, 2011:**

- The survivorship benefit payable to a vested member's survivor is:
  - the actuarial equivalent of the member's accrued retirement benefit at the time of death; or,
- If the member dies prior to age 50 or 25 years of membership service:
  - the actuarial equivalent of the accrued portion of the early retirement benefit that would have been paid to the member at age 50.

**Members hired on or after July 1, 2011:**

- The survivorship benefit payable to an active vested member's survivor is:
  - the actuarial equivalent of the member's accrued retirement benefit at the time of death; or
- If the member dies prior to age 55:
  - the actuarial equivalent of the accrued portion of the early retirement benefit that would have been paid to the member at age 55.

Retirement benefits - Form of payment

The normal form of payment is a single life annuity with a refund of any remaining account balance to a designated beneficiary. (Option 1)

Optional Benefits:

- Option 2, a life annuity and joint 100% survivor benefit,
- Option 3, a life annuity and joint 50% survivor benefit, and



## Appendix C: Summary of Benefit Provisions

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Post retirement benefit increases	<ul style="list-style-type: none"><li>• Option 4, a life annuity with a period certain.</li></ul> <p>If a retiring member selects Option 2 or 3 and the contingent annuitant predeceases or is divorced from the member, the retiree may, within 18 months of the death or divorce, choose to revert to the higher Option 1 benefit available at retirement or the retiree may select a different contingent annuitant and/or a different option.</p> <p>For retired members who have been retired at least 12 months, a Guaranteed Annual Benefit Adjustment (GABA) will be made each year equal to:</p> <ul style="list-style-type: none"><li>• 3% for members hired before July 1, 2007, and</li><li>• 1.5% for members hired on or after July 1, 2007</li></ul> <p>For retired members who were hired on or after July 1, 2013 and who have been retired at least 12 months, a Guaranteed Annual Benefit Adjustment (GABA) will be made each year equal to:</p> <ul style="list-style-type: none"><li>• A maximum of 1.5% for each year PERS is funded at or above 90%, subject to a 0.1% reduction for each 2% PERS is funded below 90%; or</li><li>• 0% whenever the amortization period for PERS is 40 years or more.</li></ul>
Changes since last valuation	None



**Appendix D: Valuation Data**

**Valuation Data**

This chart is presented for informational purposes only. The counts shown in the valuation line were used for preparation of the liabilities disclosed within this report. The counts disclosed for the Annual Financial Report and the Summary of Results (page 1) match the CAFR at the request of the Board. The differences between counts, if any, have no material effect upon the liability calculation.

	<u>Active</u>	<u>Disabled</u>	<u>Retirees and Beneficiaries</u>	<u>Terminated Vested Members</u>	<u>Terminated Non-Vested Members</u>	<u>Total</u>
<b>Participant Counts Used for Valuation</b>	28,390	723	20,610	3,062	10,031	62,816
Disabled Members having attained normal retirement age		(554)	554			-
Beneficiaries of Disabled Members						-
Beneficiaries with less than one year of certain payments remaining						-
Other Adjustments						-
<b>Participant Counts shown in the Annual Financial Report</b>	28,390	169	21,164	3,062	10,031	62,816



## Appendix D: Valuation Data

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### Valuation Data

This valuation is based upon the membership of the System as of June 30, 2016. Membership data were supplied by the System and accepted for valuation purposes without audit. However, tests were performed to ensure that the data are sufficiently accurate for valuation purposes.

The salaries used in the tables and charts which follow are different than the salaries used for the Board Summary on page 1. The valuation projected salaries to be paid for the following fiscal year, whereas the Board Summary, salaries are applicable in the year ending on the valuation date.

<u>Active Members</u>	<u>Number</u>	<u>Valuation Projected Salaries</u>	
Full-Time Members	22,444	\$	1,115,690,825
Part-Time Members	<u>5,946</u>	\$	<u>202,794,724</u>
Total Active Members	28,390	\$	1,318,485,549

Table D-1 contains summaries of the data for contributing members. For full-time members, values shown in the tables are the numbers of members and their total and average annual salaries. For part-time members, only the numbers of members are shown.

Table D-2 presents distributions of the following:

- Members receiving service retirement benefits.
- Members receiving disability retirement benefits.
- Survivors of deceased retired members receiving benefits.
- Survivors of deceased active members.
- Terminated vested members.

Table D-3 is a reconciliation of membership data from June 30, 2015, to June 30, 2016.



## Appendix D: Valuation Data

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The following is a summary of retired members and beneficiaries currently receiving benefits. The chart reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page 44 for an explanation of the number of annuitants used for valuation purposes.

<u>Type of Annuitant</u>	<u>Number</u>	<u>Annual Benefits</u>	<u>Average Annual Benefits</u>
Service Retirement	18,524	\$ 318,931,631	\$ 17,217
Survivors of Deceased Retired Members	1,634	20,108,171	12,306
Survivors of Deceased Active Members	<u>452</u>	<u>5,088,683</u>	<u>11,258</u>
Total Retirees and Beneficiaries	20,610	\$ 344,128,485	\$ 16,697
Disability Retirement	723	7,579,438	10,483
Total Annuitants	21,333	\$ 351,707,923	\$ 16,487

<u>Terminated Members with Contributions Not Withdrawn</u>	<u>Number</u>
Vested Terminated Members	3,062
Non-Vested Terminated Members	<u>10,031</u>
Total Terminated Members	13,093



Table D-1:  
Active Members Distribution of  
Full-Time Employees and Salaries  
as of June 30, 2016

Number of Employees

Age	Completed Years of Service												Totals
	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+	
<25	313	133	62	37	6								551
25 to 29	412	302	229	284	153	4							1,384
30 to 34	356	292	214	396	502	102	2						1,864
35 to 39	765	327	214	375	585	376	87	1					2,730
40 to 44	266	190	177	267	504	409	255	76	3				2,147
45 to 49	249	199	173	294	605	406	354	285	94	1			2,660
50 to 54	261	172	157	330	620	542	488	368	360	97	3		3,398
55 to 59	215	178	144	317	633	591	591	498	488	217	98	6	3,976
60 to 64	84	84	88	187	485	450	406	382	315	200	129	40	2,850
65 to 69	26	13	13	41	133	110	111	91	74	40	23	31	706
70 and up	6	7	5	14	31	21	33	20	13	17	2	9	178
Totals	2,953	1,897	1,476	2,542	4,257	3,011	2,327	1,721	1,347	572	255	86	22,444



**Appendix D: Valuation Data**

**Table D-1:  
Active Members Distribution of  
Full-Time Employees and Salaries  
as of June 30, 2016**

**Annual Salaries in Thousands**

Age	<u>Completed Years of Service</u>											Totals	
	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39		40+
<25	9,638	4,665	2,336	1,318	220								18,177
25 to 29	14,598	12,081	9,810	12,580	6,878	179							56,125
30 to 34	13,292	12,625	9,545	18,574	24,812	5,281	103						84,232
35 to 39	27,687	13,545	9,736	17,943	30,634	21,307	5,019	55					125,926
40 to 44	10,226	8,156	7,719	13,138	26,128	23,701	16,597	4,936	220				110,821
45 to 49	9,400	8,341	7,955	13,561	30,640	22,036	21,424	19,380	6,296	59			139,092
50 to 54	9,554	6,793	6,970	14,900	29,767	27,751	27,590	23,431	23,182	6,356	187		176,482
55 to 59	7,718	7,739	6,126	14,080	30,465	30,157	32,400	29,211	30,865	13,892	6,348	344	209,345
60 to 64	3,422	3,595	3,515	8,260	22,574	21,787	21,019	21,175	20,005	13,175	8,443	2,730	149,700
65 to 69	915	587	513	1,960	6,258	5,862	5,470	5,287	4,266	2,316	1,584	2,221	37,239
70 and up	189	241	185	646	1,413	890	1,687	981	681	866	138	636	8,553
Totals	106,640	78,368	64,410	116,961	209,786	158,950	131,310	104,457	85,515	36,663	16,701	5,931	1,115,691



**Appendix D: Valuation Data**

**Table D-1:  
Active Members Distribution of  
Full-Time Employees and Salaries  
as of June 30, 2016**

**Average Annual Salary**

Age	Completed Years of Service												Totals	
	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+		
<25	30,793	35,074	37,674	35,632	36,659									32,990
25 to 29	35,431	40,003	42,838	44,294	44,952	44,779								40,553
30 to 34	37,337	43,237	44,603	46,904	49,426	51,777	51,449							45,189
35 to 39	36,193	41,422	45,494	47,849	52,365	56,668	57,688	55,331						46,127
40 to 44	38,444	42,926	43,611	49,207	51,842	57,948	65,086	64,949	73,193					51,617
45 to 49	37,751	41,914	45,980	46,127	50,644	54,277	60,521	67,999	66,983	58,766				52,290
50 to 54	36,606	39,496	44,392	45,153	48,011	51,200	56,537	63,672	64,394	65,525	62,458			51,937
55 to 59	35,900	43,475	42,543	44,415	48,127	51,027	54,822	58,656	63,249	64,017	64,780	57,359		52,652
60 to 64	40,742	42,801	39,944	44,170	46,544	48,415	51,772	55,431	63,507	65,873	65,450	68,251		52,526
65 to 69	35,174	45,191	39,448	47,814	47,049	53,290	49,281	58,102	57,645	57,900	68,870	71,648		52,746
70 and up	31,520	34,377	37,092	46,119	45,571	42,368	51,119	49,063	52,369	50,963	69,089	70,638		48,048
Totals	36,112	41,312	43,638	46,011	49,280	52,790	56,429	60,695	63,485	64,097	65,494	68,966		49,710



**Table D-1:  
Active Members Distribution of  
Part-Time Employees  
as of June 30, 2016**

**Number of Employees**

Age	<u>Completed Years of Service</u>												Totals	
	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+		
<25	132	31	12	2										177
25 to 29	163	75	51	30	11									330
30 to 34	160	97	45	46	50	5								403
35 to 39	436	117	68	54	72	13	3							763
40 to 44	140	68	57	75	74	35	13	2						464
45 to 49	165	96	62	92	108	54	16	8						601
50 to 54	151	108	78	109	168	81	43	13	10	1				762
55 to 59	147	115	83	104	220	139	78	40	14	7				947
60 to 64	120	84	71	109	172	128	95	57	30	4	3	1		874
65 to 69	67	43	25	58	91	56	26	22	13	1		1		403
70 and up	26	23	22	40	54	26	14	7	6	2	2			222
Totals	1,707	857	574	719	1,020	537	288	149	73	15	5	2		5,946



**Appendix D: Valuation Data**

**Table D-2:  
Distribution of Inactive Lives**

The charts reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page 44 for an explanation of the number of annuitants used for valuation purposes.

**Members Receiving Service Retirement Benefits as of June 30, 2016**

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits in Thousands</u>	<u>Average Annual Benefits</u>
<50	5	\$ 117,157	\$ 23,431
50 to 54	150	3,786,247	25,242
55 to 59	778	19,018,764	24,446
60 to 64	3,064	65,305,290	21,314
65 to 69	4,998	94,849,492	18,977
70 to 74	3,655	60,020,798	16,422
75 to 79	2,552	36,944,187	14,477
80 to 84	1,696	21,771,138	12,837
85 to 89	1,026	11,252,216	10,967
90 and up	600	5,866,341	9,777
Totals	18,524	\$ 318,931,631	\$ 17,217

**Members Receiving Disability Retirement Benefits as of June 30, 2016**

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits in Thousands</u>	<u>Average Annual Benefits</u>
<50	15	\$ 113,842	\$ 7,589
50 to 54	59	679,449	11,516
55 to 59	90	1,079,267	11,992
60 to 64	164	1,717,102	10,470
65 to 69	148	1,664,992	11,250
70 to 74	100	928,280	9,283
75 to 79	69	591,096	8,567
80 to 84	37	352,308	9,522
85 to 89	26	259,220	9,970
90 and up	15	193,881	12,925
Totals	723	\$ 7,579,438	\$ 10,483



**Appendix D: Valuation Data**

**Table D-2:  
Distribution of Inactive Lives**

The charts reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page 44 for an explanation of the number of annuitants used for valuation purposes.

**Survivors of Deceased Retired Members as of June 30, 2016**

Age	Number of Persons	Annual Benefits in Thousands	Average Annual Benefits
<50	62	\$ 490,711	\$ 7,915
50 to 54	27	220,783	8,177
55 to 59	50	586,788	11,736
60 to 64	100	1,142,362	11,424
65 to 69	168	2,545,484	15,152
70 to 74	192	2,566,124	13,365
75 to 79	248	3,342,724	13,479
80 to 84	308	3,827,800	12,428
85 to 89	275	3,359,669	12,217
90 and up	204	2,025,725	9,930
Totals	1,634	\$ 20,108,171	\$ 12,306

**Survivors of Deceased Active Members as of June 30, 2016**

Age	Number of Persons	Annual Benefits in Thousands	Average Annual Benefits
<50	84	\$ 633,178	\$ 7,538
50 to 54	32	255,758	7,992
55 to 59	46	507,389	11,030
60 to 64	58	649,824	11,204
65 to 69	77	1,005,986	13,065
70 to 74	48	609,659	12,701
75 to 79	52	550,169	10,580
80 to 84	30	529,192	17,640
85 to 89	14	190,332	13,595
90 and up	11	157,196	14,291
Totals	452	\$ 5,088,683	\$ 11,258



**Table D-2:  
Distribution of Inactive Lives**

The charts reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page 44 for an explanation of the number of annuitants used for valuation purposes.

**Terminated Vested Members as of June 30, 2016  
Number of Persons**

<u>Age</u>	<u>Number</u>
<25	2
25 to 29	9
30 to 34	126
35 to 39	216
40 to 44	255
45 to 49	395
50 to 54	590
55 to 59	842
60 to 64	460
65 to 69	146
70 and above	<u>21</u>
Total	3,062



**Appendix D: Valuation Data**

**Table D-3:  
Data Reconciliation**

The following table shows a reconciliation of the participants used in the previous valuation to this valuation. This chart reflects the counts used for valuation purposes as a result of data processing.

	<u>Active Members</u>	<u>Terminated Vested Members</u>	<u>Service Retired Members</u>	<u>Disabled Members</u>	<u>Survivors and Beneficiaries</u>
<b>June 30, 2015 Valuation</b>	28,237	2,925	17,658	738	2,266
Refunds and Non-Vested Terminations	(2,449)	(81)			
Vested Terminations	(536)	539	(1)		
Service Retirements	(1,003)	(185)	1,419		(180)
Disability Retirements	(21)	(8)		31	(1)
Deaths	(41)	(18)	(537)	(45)	(151)
New Entrants	3,650				152
Rehires	553	(110)	(4)		
Other		-	(11)	(1)	-
<b>June 30, 2016 Valuation</b>	28,390	3,062	18,524	723	2,086



## **Appendix E: Comparative Schedules**

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### **Comparative Schedules**

This section contains tables that summarize the experience of the System shown in present and past valuation reports.

Table E-1 shows a summary of the active members covered as of the various valuation dates.

Table E-2 shows a summary of the retired and inactive members as of the various valuation dates.

Table E-3 summarizes the contribution rates determined by each annual actuarial valuation.



**Table E-1:  
Active Membership Data**

<u>Valuation Date (June 30)</u>	<u>Actives</u>	<u>Annual Salaries in Thousands</u>	<u>Average Annual Salary</u>	<u>Average Age</u>	<u>Average Years of Service</u>	<u>Average Hire Age</u>
2016	28,390	1,185,646	41,763	48.3	9.3	39.0
2015	28,237	1,156,855	40,969	48.7	9.6	39.1
2014	28,229	1,129,939	39,709			
2013	28,401	1,098,341	38,673			
2012	28,548	1,078,710	37,786			



**Appendix E: Comparative Schedules**

**Table E-2:  
Members in Receipt of Annuities and Inactive Membership Data**

Valuation Date (June 30)	Number	All Annuitants					Terminated Members	
		Annual Benefits in Thousands	Average Annual Benefit	Average Current Age	Average Age at Retirement	Average Service at Retirement	Number Vested Terminated	Number Non-Vested Terminated
2016	21,333	351,708	16,487	72.0	59.5	20.1	3,062	10,031
2015	20,681	331,190	15,782	71.8	58.5	19.9	2,925	8,839
2014	20,081	302,758	15,077				2,825	7,666
2013	19,451	281,466	14,470				2,686	6,712
2012	18,738	258,469	13,794				2,560	6,164



Appendix E: Comparative Schedules

Table E-3: Contribution Rates

Valuation Date (June 30)	Contribution Rates****			Normal	UAAL
	Employee	Employer*	Total	Cost Rate**	Rate***
2016	7.90%	8.47%	16.37%	11.65%	4.72%
2015	7.90	8.37	16.27	11.49	4.78
2014	7.90	8.27	16.17	11.94	4.23
2013	7.90	8.17	16.07	10.94	5.13
2012****	7.01	7.17	14.18	11.84	2.34

\* Does not include Coal Tax Revenue

\*\* Includes DB Educational Fund contribution. Includes Administrative expenses starting with the 2014 Valuation Date.

\*\*\* The UAAL rate is the amount available to amortize the UAAL. It is equal to the total contribution rate, minus the normal cost rate.

\*\*\*\* The rates shown are for the fiscal year following the valuation date.

\*\*\*\*\* Employees hired prior to July 1, 2011 contributed 6.9%. Employees hired on or after July 1, 2011 contributed 7.90%.



## Appendix F: Financial Statement Information

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The information presented in the required supplementary schedules was determined as part of the actuarial valuation as of June 30, 2016. Additional information as of the latest actuarial valuation follows.

Valuation date	June 30, 2016
Actuarial cost method	Entry Age Normal
Amortization method	Open
Remaining amortization period	30 Years
Asset valuation method	Four-year smoothed market
Actuarial assumptions:	
Investment rate of return*	7.75%
General wage growth*	4.00%
Merit salary increases	0.0% - 6.0%
*Includes inflation	3.00%



**Appendix F: Financial Statement Information**

Gain and Loss in Accrued Liability During Years Ended June 30 Resulting from Differences Between Assumed Experience and Actual Experience						
Type of Activity	Gain or (Loss) for Year Ending June 30, (expressed in thousands)					
	2011	2012	2013	2014	2015	2016
Investment Income on Actuarial Value of Assets	\$(301,247)	\$(167,747)	\$155,958	\$223,502	\$85,416	\$73,749
Combined Liability Experience	90,607	30,578	16,760	11,276	(11,373)	(57,170)
(Loss)/Gain During Year from Financial Experience	\$(210,640)	\$(137,169)	\$172,718	\$234,778	\$74,043	\$16,579
Non-Recurring Items	35,686	0	755,248	(810,722)	0	0
Composite Gain or (Loss) During Year	\$(174,954)	\$(137,169)	\$927,966	\$(575,944)	\$74,043	\$16,579

Schedule of Funding Progress (expressed in thousands)						
Valuation Date June 30,	Actuarial Value of Assets	Actuarial Accrued Liability (AAL)	Funded Ratio	Unfunded AAL (UAAL)	Covered Payroll	UAAL as a Percentage of Covered Payroll
2016	\$5,247,685	\$6,787,923	77%	\$1,540,238	\$1,185,646	130%
2015	4,926,516	6,470,303	76%	1,543,787	1,154,867	134%
2014	4,595,805	6,177,505	74%	1,581,700	1,129,109	140%
2013	4,139,921	5,160,951	80%	1,021,030	1,104,000	92%
2012	3,816,920	5,661,281	67%	1,844,361	1,081,288	171%
2011	3,800,479	5,410,144	70%	1,609,665	1,071,376	150%



**Appendix F: Financial Statement Information**

Solvency Test Aggregate Accrued Liabilities for (expressed in thousands)							
Valuation Date June 30,	Active Member Contributions	Retirees & Beneficiaries	Active Member Employer Financed Contributions	Actuarial Value of Reported Assets	Portion of Accrued Liability Covered by Reported Assets		
	(1)	(2)	(3)		(1)	(2)	(3)
2016	\$ 842,772	\$ 3,955,400	\$ 1,989,751	\$ 5,247,685	100%	100%	23%
2015	841,907	3,687,451	1,940,945	4,926,516	100%	100%	20%
2014	838,145	3,436,212	1,903,148	4,595,805	100%	100%	17%
2013	828,657	2,790,430	1,541,864	4,139,921	100%	100%	34%
2012	837,663	2,958,076	1,865,542	3,816,920	100%	100%	1%
2011	840,762	2,728,687	1,840,695	3,800,479	100%	100%	13%



## **Appendix G: Glossary**

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The following definitions are largely excerpts from a list adopted in 1981 by the major actuarial organizations in the United States. In some cases the definitions have been modified for specific applicability to the Public Employees' Retirement System. Defined terms are capitalized throughout this Appendix.

### **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 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.



## **Appendix G: Glossary**

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### **Amortization Payment**

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

### **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**

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.