



**Cavanaugh Macdonald**  
CONSULTING, LLC

*The experience and dedication you deserve*

**Teachers' Retirement System  
State of Montana**

**Actuarial Valuation  
As of July 1, 2018**





# Cavanaugh Macdonald

CONSULTING, LLC

*The experience and dedication you deserve*

October 5, 2018

Teachers' Retirement Board  
State of Montana  
1500 Sixth Avenue  
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 Teachers' Retirement System of Montana (TRS), 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. 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 31 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 3.25% 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 that reads "Edward Macdonald".

Edward A. Macdonald, ASA, FCA, MAAA  
President

A handwritten signature in blue ink that reads "Todd B. Green".

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

EAM:TBG/jw



**Teachers' Retirement System  
State of Montana**

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## Section I

### Summary of Findings

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

(Dollar amounts in thousands)

<b>VALUATION DATE</b>	<b>July 1, 2018</b>	<b>July 1, 2017</b>
Active members		
Number		
Full-Time Members	13,027	12,808
Part-Time Members	6,240	6,109
Annual valuation compensation	\$ 829,709	\$ 818,123
Retired members and beneficiaries		
Number	15,933	15,566
Annual allowances	\$ 367,990	\$ 352,005
Inactive Members		
Vested Terminated Members	1,772	1,779
Non-Vested Terminated Members	13,967	13,712
Assets		
Actuarial value	\$ 4,094,393	\$ 3,973,519
Market value	4,148,324	3,950,705
Actuarial Accrued Liability (AAL)	\$ 6,004,434	\$ 5,636,842
Unfunded Actuarial Accrued Liability	\$ 1,910,042	\$ 1,663,323
Funded Ratio	68.19%	70.49%
Market Value Rate of Return	8.82%	11.92%
<b>Annual Cost</b>		
Total Normal Rate	9.96%	9.82%
Employee Contribution Rate	<u>8.15%</u>	<u>8.15%</u>
Employer Normal Rate	1.81%	1.67%
Employer Statutory Contribution Rate		
Normal Rate	1.81%	1.67%
Administrative Expense Load	0.36%	0.33%
UAAL Rate	<u>9.29%</u>	<u>9.36%</u>
Total Rate	11.46%	11.36%
Amortization Period*	31 Years	22 Years

\* Reflects anticipated increases in employer contribution rates.



As a result of this actuarial valuation of the benefits in effect under the Montana Teachers' Retirement System as of July 1, 2018, the statutory employer contributions are sufficient to amortize the Unfunded Actuarial Accrued Liability (UAAL) of the Retirement System within 31 years. The Funded Ratio is 68.19%.

The table below shows a history of the legislated contribution rates as a percent of pay. In addition to these contributions the State will contribute \$25 million annually to the System payable July 1<sup>st</sup> of each year.

Finally, MCA 19-20-605 requires each employer to contribute 9.85% of total compensation paid to all re-employed TRS retirees employed in a TRS reportable position. Pursuant to MCA 19-20-609, this amount shall increase by 1.00% for fiscal year 2014 and increase by 0.10% each fiscal year through 2024 until the total employer contribution is equal to 11.85% of re-employed retiree compensation.

History of Legislated Contributions  
(as a Percent of Pay)

**School District and Other Employers**

	<u>Members</u>	<u>Employers</u>	<u>General fund</u>	<u>Total employee &amp; employer</u>
Prior to July 1, 2007	7.15%	7.47%	0.11%	14.73%
July 1, 2007 to June 30, 2009	7.15%	7.47%	2.11%	16.73%
July 1, 2009 to June 30, 2013	7.15%	7.47%	2.49%	17.11%
July 1, 2013 to June 30, 2014	8.15%	8.47%	2.49%	19.11%
July 1, 2014 to June 30, 2015	8.15%	8.57%	2.49%	19.21%
July 1, 2015 to June 30, 2016	8.15%	8.67%	2.49%	19.31%
July 1, 2016 to June 30, 2017	8.15%	8.77%	2.49%	19.41%
July 1, 2017 to June 30, 2018	8.15%	8.87%	2.49%	19.51%
July 1, 2018 to June 30, 2019	8.15%	8.97%	2.49%	19.61%
July 1, 2019 to June 30, 2020	8.15%	9.07%	2.49%	19.71%
July 1, 2020 to June 30, 2021	8.15%	9.17%	2.49%	19.81%
July 1, 2021 to June 30, 2022	8.15%	9.27%	2.49%	19.91%
July 1, 2022 to June 30, 2023	8.15%	9.37%	2.49%	20.01%
July 1, 2023 to June 30, 2024	8.15%	9.47%	2.49%	20.11%

**State and University Employers**

	<u>Members</u>	<u>Employers</u>	<u>General fund</u>	<u>Total employee &amp; employer</u>
Prior to July 1, 2007	7.15%	7.47%	0.11%	14.73%
July 1, 2007 to June 30, 2009	7.15%	9.47%	0.11%	16.73%
July 1, 2009 to June 30, 2013	7.15%	9.85%	0.11%	17.11%
July 1, 2013 to June 30, 2014	8.15%	10.85%	0.11%	19.11%
July 1, 2014 to June 30, 2015	8.15%	10.95%	0.11%	19.21%
July 1, 2015 to June 30, 2016	8.15%	11.05%	0.11%	19.31%
July 1, 2016 to June 30, 2017	8.15%	11.15%	0.11%	19.41%
July 1, 2017 to June 30, 2018	8.15%	11.25%	0.11%	19.51%
July 1, 2018 to June 30, 2019	8.15%	11.35%	0.11%	19.61%
July 1, 2019 to June 30, 2020	8.15%	11.45%	0.11%	19.71%
July 1, 2020 to June 30, 2021	8.15%	11.55%	0.11%	19.81%
July 1, 2021 to June 30, 2022	8.15%	11.65%	0.11%	19.91%
July 1, 2022 to June 30, 2023	8.15%	11.75%	0.11%	20.01%
July 1, 2023 to June 30, 2024	8.15%	11.85%	0.11%	20.11%



### Calculations based on the Market Value of Assets

MCA 19-20-201 requires this report to show how market performance is affecting the actuarial funding of the Retirement System. The July 1, 2018 market value of assets is \$53.9 million greater 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 29 years, and the Funded Ratio would be 69.09%.

### Additional Details

MCA 19-20-604 states that the contribution from the State General Fund will be reduced by 0.11% when the amortization period of the System’s UAAL is 10 years or less according to the System’s latest actuarial valuation.

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.

### Investment Experience

The market assets earned 8.82% net of investment and operating expenses. As a result of prior years’ unrecognized losses, the actuarial assets earned 6.85% which is 0.90% less 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	Market Return over Assumption	Actuarial Return over Assumption
7/1/2008 to 6/30/2009	(20.80)%	(10.26)%	(28.55)%	(18.01)%
7/1/2009 to 6/30/2010	12.87%	9.78%	5.12%	2.03%
7/1/2010 to 6/30/2011	21.67%	(0.13)%	13.92%	(7.88)%
7/1/2011 to 6/30/2012	2.21%	3.21%	(5.54)%	(4.54)%
7/1/2012 to 6/30/2013	12.94%	11.99%	5.19%	4.24%
7/1/2013 to 6/30/2014	17.09%	13.21%	9.34%	5.46%
7/1/2014 to 6/30/2015	4.57%	9.59%	(3.18)%	1.84%
7/1/2015 to 6/30/2016	2.08%	8.79%	(5.67)%	1.04%
7/1/2016 to 6/30/2017	11.92%	8.24%	4.17%	0.49%
7/1/2017 to 6/30/2018	8.82%	6.85%	1.07%	(0.90)%



Asset gains or losses result when the return on the actuarial value of assets differs from the actuarial investment return assumption of 7.75%.

On a market value basis the System earned \$148.5 million greater than anticipated by the 7.75% assumption in the year ended June 30, 2017 and \$43.3 million greater than anticipated by the 7.75% assumption in the year ended June 30, 2018. The net result as of July 1, 2018 is that the market value of assets is \$53.9 million greater than the actuarial value of assets. This \$53.9 million in unrecognized asset gains will either offset any future investment losses or if there are none, decrease the amortization period of the UAAL in future valuations.

### **Recent Contribution Increases**

The Montana University System Retirement Program (MUS-RP) supplemental contribution ensures university member benefits are funded by university employers. The supplemental contribution was increased from 4.04% to 4.72% of MUS-RP member pay at July 1, 2007. The valuation that determined the 4.72% contribution rate of MUS-RP member pay was based on the valuation completed as of July 1, 2006. The most recent MUS-RP valuation completed as of July 1, 2016 indicated an increase is needed in the supplemental contribution rate from 4.72% to 10.22% of MUS-RP member compensation rate.

MCA 19-20-608 and MCA 19-20-609 dictate that employers and members are required to make supplemental contributions if the funded ratio of the System is less than 90%. Since the funded ratio is currently 68.19%, Tier One Members are required to contribute an additional 1% of compensation. The individual employers are required to contribute an additional 1% of compensation. The employer contribution shall increase by an additional 0.1% each year following July 1, 2013 until the total employer supplemental contribution is equal to 2% of compensation.

MCA 19-20-605 requires each employer to contribute 9.85% of total compensation paid to all re-employed TRS retirees employed in a TRS reportable position. Pursuant to MCA 19-20-609, this amount shall increase by 1.00% for fiscal year 2014 and increase by 0.10% each fiscal year through 2024 until the total employer contribution is equal to 11.85% of re-employed retiree compensation.

### **Amortization of the UAAL**

The July 1, 2017 actuarial valuation calculated a 22 year amortization period for the UAAL. The resulting amortization period at July 1, 2018 is 31 years. The amortization period anticipates future increases in employer supplemental contributions. In addition, it anticipates future State General Fund contributions will decrease by 0.11% when the amortization period of the System's UAAL is 10 years or less. Future decreases in the Employer and Member Supplemental Contributions are not anticipated.



## Funding and Benefits Policy

The Teachers' 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) Additional Funding

#### a) The Funding and Benefits Policy states:

- “1. If the amortization period is greater than 30 years, the actuary will recommend the single contribution rate increase that can reasonably expect to fully amortize the UAAL over a closed 30-year period effective July 1, following the next regular legislative session.
2. If the amortization period is less than 30 years, but greater than 0, and it is projected to continue to decline over the remainder of the closed period, the actuary will not recommend a change in the statutory contribution rates.
3. If the amortization period is less than 30 years, but has increased over prior valuations and is projected to continue to grow, the actuary will recommend a contribution rate increase that is reasonably expected to reverse the recent trend and reestablish a closed amortization period equal to that of the last valuation.”

### 2) Analysis: The amortization period as of July 1, 2018 is 31 years based on actuarial assets and 29 years based on market assets. Assuming experience follows the actuarial assumptions, the amortization period is projected to decline.

### 3) Ultimate Goal

#### a) The Funding and Benefits Policy states: “It is the desire of the Board to fully fund the System. However, until the System becomes fully funded, any unfunded liabilities will be amortized over a closed period of no more than 30 years and funded as a level percent of pay. At such time as the System becomes fully funded and has as stabilization reserve of at least 10% of the actuarial accrued liability, the allowed amortization period for any subsequent unfunded liabilities will be reduced to a closed period of not greater than 20 years.”

#### b) Analysis: The amortization period on an actuarial value of asset basis is 31 years and is anticipated to decline. It is important to note that the normal cost rate for members hired on or after July 1, 2013 is less than the rate for members hired before July 1, 2013. As members hired before July 1, 2013 terminate or retire and are replaced with members with a lower normal cost rate, more of the employer contribution will be available to amortize the UAAL. As a result, the effective amortization period is less than the amortization period calculated in the actuarial valuation, which does not reflect new hires.



#### 4) Benefit Enhancements

- a) The Funding and Benefits Policy states: “Any recommendation for a benefit enhancement must include recommendations for necessary additional funding or other benefit reduction to cover any increase in normal cost arising from the recommended enhancement and to amortize any increase in the unfunded actuarial accrued liabilities arising from the recommended enhancement over a period not to exceed 25 years.

The Board will determine its position with respect to supporting or opposing legislation, on a case-by-case basis, and will apply this policy, actuarial funding standards, and other industry-standard information and resources it finds persuasive, as decision guides. The Board may not support legislation to enhance benefits if the funded ratio is less than 85%, and the amortization period is greater than 20 years.”

- b) Analysis: Since the funded ratio at July 1, 2018 of 68.19% is below 80% the Board's Funding and Benefits policy does not currently support enhanced benefits.



## 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 1.0% Higher Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.50%	68.19%
Higher Assumption 8.50%	<u>75.52%</u>
Change	7.33%
	<u>Amortization Period Increase / (Decrease)</u>
Current Assumption 7.50%	31 Years
Higher Assumption 8.50%	<u>15 Years</u>
Increase	(16) Years
Impact of Assuming 0.5% Higher Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.50%	68.19%
Higher Assumption 8.00%	<u>71.83%</u>
Change	3.64%
	<u>Amortization Period Increase / (Decrease)</u>
Current Assumption 7.50%	31 Years
Higher Assumption 8.00%	<u>21 Years</u>
Increase	(10) Years
Impact of Assuming 0.5% Lower Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.50%	68.19%
Lower Assumption 7.00%	<u>64.61%</u>
Change	(3.58)%
	<u>Amortization Period Increase / (Decrease)</u>
Current Assumption 7.50%	31 Years
Lower Assumption 7.00%	<u>46 Years</u>
Increase	15 Years
Impact of Assuming 1.0% Lower Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.50%	68.19%
Lower Assumption 6.50%	<u>61.11%</u>
Change	(7.08)%
	<u>Amortization Period Increase / (Decrease)</u>
Current Assumption 7.50%	31 Years
Lower Assumption 6.50%	<u>90 Years</u>
Increase	59 Years



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.

### **Assumption Changes**

Since the previous valuation, the following assumptions were updated based upon an experience study for the five year period ended July 1, 2017:

<b>Assumption Changes</b>
Price Inflation was reduced from 3.25% to 2.50%
Investment return was reduced from 7.75% to 7.50%
Wage growth was reduced from 4.00% to 3.25%
Updated pre and post retirement mortality rates
Updated termination rates
Updated retirement rates
Updated rates of salary increase
Payroll growth assumption was reduced from 4.00% to 3.25%

It is important to note the assumption changes are prospective. The liabilities are determined on the valuation date and are based upon the updated assumptions noted above, including the assumed rate of return. Since the assumption changes are prospective beginning on the valuation date, the expected rate of return for the year ended June 30, 2018 was 7.75%.

### **Benefit Changes**

There have been no benefit changes since the previous valuation that would have a material effect on the liabilities of the System.

### **Contribution Changes**

An employer supplemental contribution of 1% 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 2.00% of compensation.

### **Method Changes**

There have been no method changes since the previous valuation.



## Impact of Changes

The following table summarizes how experience has changed the UAAL since the July 1, 2017 Actuarial Valuation. Further detail can be found in Table 12.

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

(In millions)

July 1, 2017 Valuation UAAL	\$ 1,663.3
Expected Decrease	<u>(12.3)</u>
Expected July 1, 2018 UAAL	\$ 1,651.0
Experience Loss on Actuarial Liabilities	\$ 17.7
Experience Loss on Actuarial Assets	35.1
Assumption & Method Changes	206.3
Plan Changes	<u>0.0</u>
Total Loss	<u>\$ 259.1</u>
July 1, 2018 Valuation UAAL	\$ 1,910.0



## Teachers' Retirement System State of Montana

### Summary

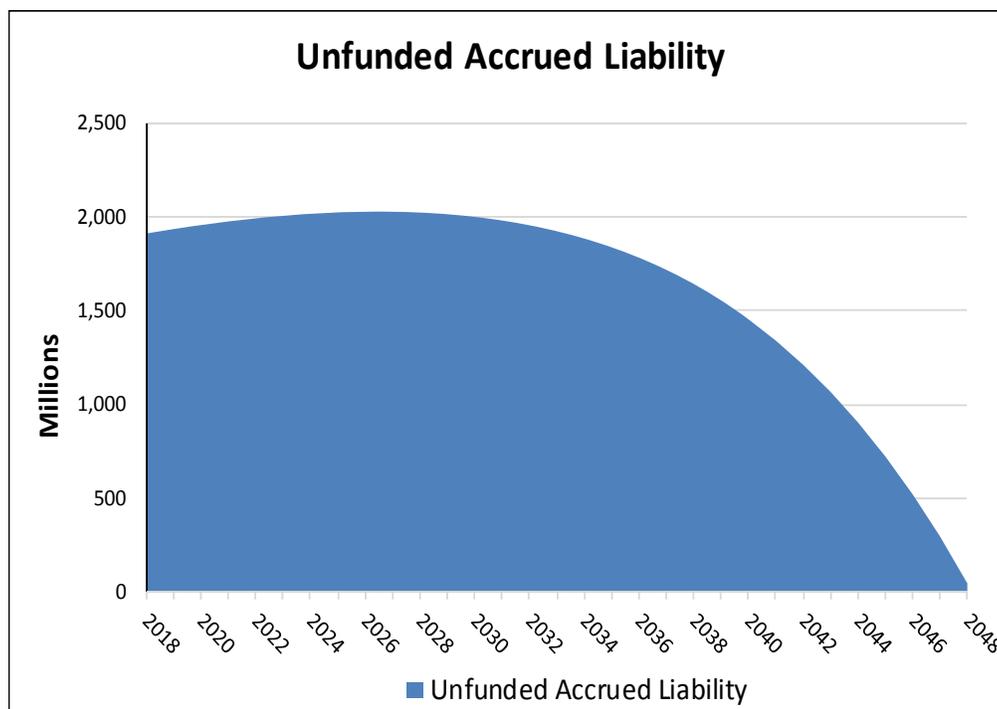
- \* The System's actuarial value investment return of 6.85% for the year ended June 30, 2018 is (0.90)% less than the actuarial assumption of 7.75%. This represents an asset loss of 35.1 million due to investment return less than anticipated. The actuarial value of assets is not allowed to be greater than 120% or less than 80% of the market value of assets. As of July 1, 2018, the market value of assets was \$4,148.3 million. As of July 1, 2018 the preliminary actuarial value of assets was \$4,094.4 million. Since the preliminary actuarial value is within the corridor no adjustment is required to the preliminary actuarial value of assets. The July 1, 2018 market value of assets is \$53.9 million greater than the actuarial value of assets. This \$53.9 million gain will be recognized in future actuarial valuations unless it is offset by returns less than the 7.50% assumption.
- \* As of July 1, 2018 the amortization period of the UAAL is 31 years. Prior to this valuation the funding period was 22 years. Asset losses, experience losses and updating the assumptions with the experience study account for the increase in the amortization period. The ultimate goal of the Board's Funding and Benefits Policy is to increase the current net funded ratio of 68.19% above 110% to encourage stable contribution rates.
- \* 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 7.50% 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 smoothes gains and losses over four years.
- \* The unfunded actuarial accrued liability is amortized using a level percentage of payroll method over the amortization period. Under the level percentage of payroll method, amortization payments will not be large enough to cover interest on the UAAL in the beginning of the amortization schedule, which means that as a dollar amount, the UAAL is expected to grow. After a period of time, amortization payments will be large enough that the amortization payments will cover both interest and principal, and the UAAL as a dollar amount will be projected to decrease in each subsequent year. The payroll growth assumption is used to determine the percentage of payroll required over the remaining amortization period to fully amortize the UAAL. The payroll growth assumption is 3.25%.



## Teachers' Retirement System State of Montana

### 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 31 years. The ultimate goal of the TRS System is to become at least 100% funded and to establish a reserve equal to 10% of the System's Actuarial Accrued Liability.





## **Teachers' Retirement System State of Montana**

### **Section 2**

#### **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 July 1, 2018. 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. The actuarial value of assets is not allowed to be greater than 120% or less than 80% of the market value of assets.

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 15 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 returns since 1995 on market value and actuarial value basis. Table 5 also shows the assumed rate of return since 1995 which was reduced from 8.00% to 7.75% in the FYE 2005. Table 6 summarizes the historical asset values on a market value and actuarial value basis.



Teachers' Retirement System  
State of Montana

Table 1

Statement of Fiduciary Net Assets

	<b>TOTAL TRS 2018</b>	<b>TOTAL TRS 2017</b>
<b>ASSETS</b>		
Cash/Cash Equivalents-Short Term		
Investment Pool	\$ 93,460,641	\$ 108,492,708
Receivables:		
Accounts Receivable	21,518,287	20,953,774
Interest Receivable	159,755	99,189
Total Receivables	<u>\$ 21,678,042</u>	<u>\$ 21,052,963</u>
Investments, at fair value:		
Investment Pools	4,032,277,147	3,820,401,750
Other Investments	-	-
Securities Lending Collateral	26,245,686	22,352,540
Total Investments	<u>\$ 4,058,522,833</u>	<u>\$ 3,842,754,290</u>
Assets Used in Plan Operations:		
Land and Buildings	\$ 193,844	\$ 193,844
Less: Accumulated Depreciation	(150,545)	(150,545)
Equipment	1,721,073	2,380,990
Less: Accumulated Depreciation	(16,286)	(16,286)
Construction Work in Progress	786,729	224,557
Intangible Assets, net of amortization	-	-
Total Other Assets	<u>2,534,815</u>	<u>2,632,560</u>
<b>TOTAL ASSETS</b>	<u>\$ 4,176,196,331</u>	<u>\$ 3,974,932,520</u>
Pension Deferred Outflows	\$ 436,537	\$ 311,169
OPEB Deferred Outflows	\$ 121,739	
<b>LIABILITIES</b>		
Accounts Payable	\$ 130,252	\$ 117,052
Securities Lending Liability	26,245,686	22,352,540
Compensated Absences	156,460	192,956
OPEB Implicit Rate Subsidy	138,145	369,209
Net Pension Liability	1,745,607	1,502,397
<b>TOTAL LIABILITIES</b>	<u>\$ 28,416,150</u>	<u>\$ 24,534,153</u>
Pension Deferred Inflows	\$ 14,251	\$ 4,974
<b>NET ASSETS HELD IN TRUST FOR PENSION BENEFITS</b>	<u><u>\$ 4,148,324,206</u></u>	<u><u>\$ 3,950,704,562</u></u>



Teachers' Retirement System  
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Table 2

Statement of Changes in Fiduciary Net Assets

	<u>TOTAL TRS 2018</u>	<u>TOTAL TRS 2017</u>
<b>ADDITIONS</b>		
Contributions:		
Employer	\$ 94,233,469	\$ 91,853,678
Plan Member	75,594,333	74,253,046
Other	45,005,672	44,414,109
Total Contributions	<u>\$ 214,833,474</u>	<u>\$ 210,520,833</u>
Misc Income	\$ 31,829	\$ 27,504
Investment Income:		
Net Appreciation/(Depreciation) in Fair Value of Investments	\$ 353,254,843	\$ 232,277,627
Investment Earnings	15,247,636	213,998,273
Security Lending Income	794,534	1,134,799
Investment Income/(Loss)	<u>\$ 369,297,013</u>	<u>\$ 447,410,698</u>
Less: Investment Expense	25,259,126	19,978,359
Less: Security Lending Expense	317,054	446,861
Net Investment Income/(Loss)	<u>\$ 343,720,833</u>	<u>\$ 426,985,479</u>
Total Additions	<u>\$ 558,586,136</u>	<u>\$ 637,533,815</u>
<b>DEDUCTIONS</b>		
Benefit Payments	\$ 352,854,025	\$ 333,633,717
Withdrawals	5,322,642	7,355,344
Administrative Expense	2,849,527	2,459,458
OPEB Expenses	(89,962)	55,181
Pension Expense	247,739	156,351
Total Deductions	<u>\$ 361,183,972</u>	<u>\$ 343,660,051</u>
<b>NET INCREASE (DECREASE) IN PLAN NET ASSETS</b>	<u>\$ 197,402,165</u>	<u>\$ 293,873,764</u>
<b>NET ASSETS HELD IN TRUST FOR PENSION BENEFITS BEGINNING OF YEAR</b>	\$ 3,950,704,563	\$ 3,656,830,798
<b>ADJUSTMENT</b>	217,479	-
<b>END OF YEAR</b>	<u>\$ 4,148,324,206</u>	<u>\$ 3,950,704,563</u>

**Teachers' Retirement System  
State of Montana  
Table 3**



**Determination of Actuarial Value of Assets**

Valuation Date July 1:	2017	2018	2019	2020	2021
A. Actuarial Value Beginning of Year	\$ 3,798,943,990	\$ 3,973,519,183			
B. Market Value End of Year	3,950,704,563	4,148,324,206			
C. Market Value of Beginning of Year	3,656,830,798	3,950,704,563			
D. Cash Flow					
D1. Contributions	210,520,833	214,833,474			
D2. Benefit Payments	(340,989,061)	(358,176,667)			
D3. Administrative Expenses	(2,459,458)	(2,849,527)			
D4. Pension and OPEB Expenses	(211,532)	(157,777)			
D5. Net	<u>\$ (133,139,218)</u>	<u>\$ (146,350,497)</u>			
E. Investment Income					
E1. Market Total: B. - C. - D5.	\$ 427,012,983	\$ 343,970,140			
E2. Assumed Rate	7.75%	7.75%			
E3. Amount for Immediate Recognition	278,464,971	300,672,413			
E4. Amount for Phased-in Recognition	148,548,012	43,297,727			
F. Phased-In Recognition of Investment Income					
F1. Current Year: 0.25 * E4.	\$ 37,137,003	\$ 10,824,432	\$ -	\$ -	\$ -
F2. First Prior Year	(52,815,617)	37,137,003	10,824,432	-	-
F3. Second Prior Year	(28,594,387)	(52,815,617)	37,137,003	10,824,432	-
F4. Third Prior Year	73,522,441	(28,594,387)	(52,815,617)	37,137,003	10,824,432
F5. Total Recognized Investment Gain	<u>\$ 29,249,440</u>	<u>\$ (33,448,569)</u>	<u>\$ (4,854,182)</u>	<u>\$ 47,961,435</u>	<u>\$ 10,824,432</u>
G. Preliminary Actuarial Value End of Year A. + D5. + E3. + F5.	\$ 3,973,519,183	\$ 4,094,392,530			
H. Corridor					
H1. 80% of Market Value	\$ 3,160,563,650	\$ 3,318,659,365			
H2. 120% of Market Value	4,740,845,476	4,977,989,047			
I. Actuarial Value End of Year G. Not Less than H1. or Not Greater than H2.	\$ 3,973,519,183	\$ 4,094,392,530			
J. Difference Between Market & Actuarial Values	\$ (22,814,620)	\$ 53,931,676			



**Teachers' Retirement System  
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**Table 4**

**Historical Investment Returns\***

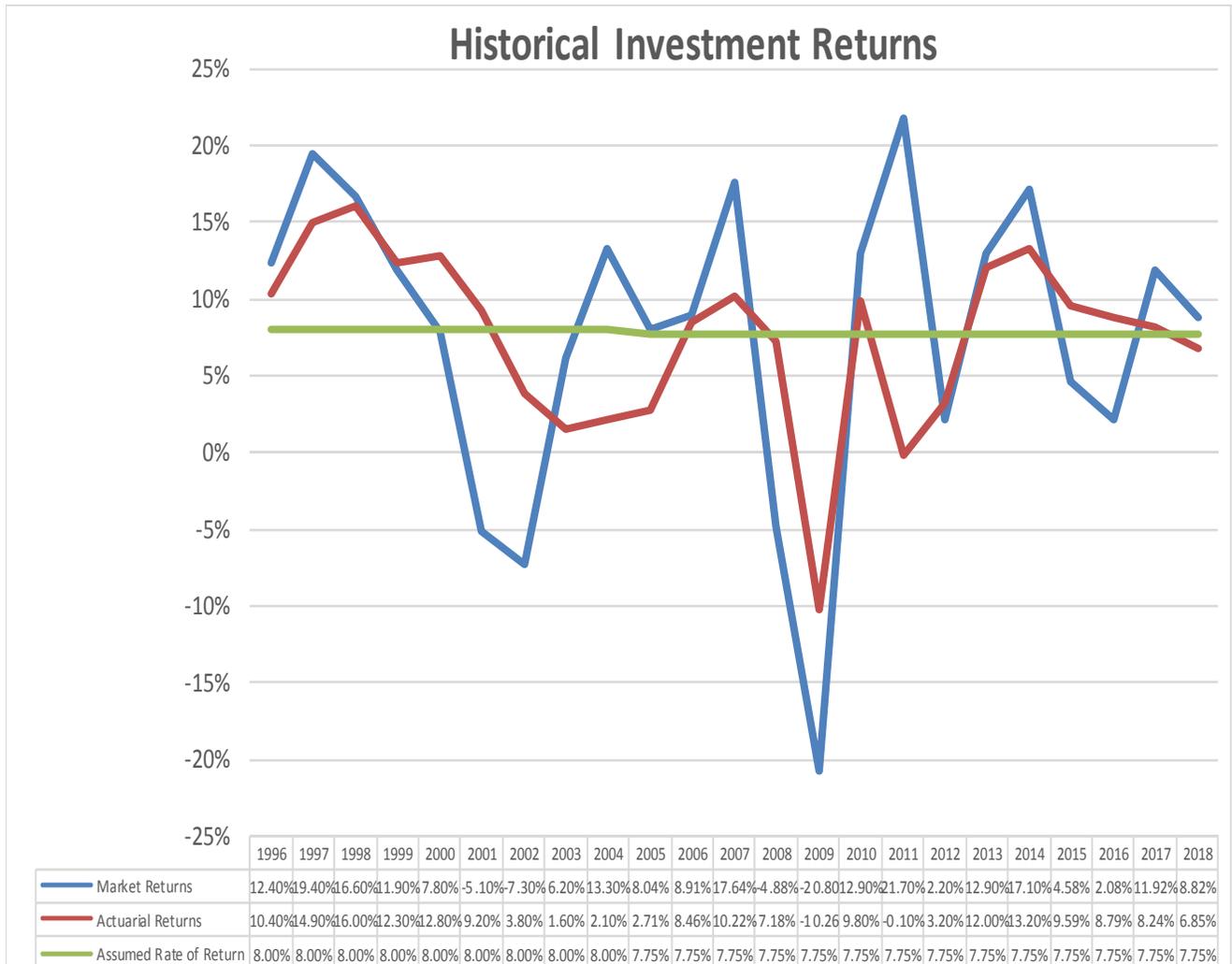
<b>Fiscal Year Ending</b>	<b>Market Returns</b>	<b>Actuarial Returns</b>	<b>Actuarial Return Over 8.00% Assumption</b>
June 30, 2004	13.3%	2.1%	(5.9)%
<b>Fiscal Year Ending</b>	<b>Market Returns</b>	<b>Actuarial Returns</b>	<b>Actuarial Return Over 7.75% Assumption</b>
June 30, 2005	8.0%	2.7%	(5.0)%
June 30, 2006	8.9%	8.5%	0.7%
June 30, 2007	17.6%	10.2%	2.5%
June 30, 2008	(4.9)%	7.2%	(0.6)%
June 30, 2009	(20.8)%	(10.3)%	(18.0)%
June 30, 2010	12.9%	9.8%	2.0%
June 30, 2011	21.7%	(0.1)%	(7.9)%
June 30, 2012	2.2%	3.2%	(4.6)%
June 30, 2013	12.9%	12.0%	4.3%
June 30, 2014	17.1%	13.2%	5.5%
June 30, 2015	4.6%	9.6%	1.8%
June 30, 2016	2.1%	8.8%	1.0%
June 30, 2017	11.9%	8.2%	0.5%
June 30, 2018	8.8%	6.9%	(0.9)%
15 Year Average	7.2%	6.0%	(1.8)%

\* 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.



## Teachers' Retirement System State of Montana

**Table 5**

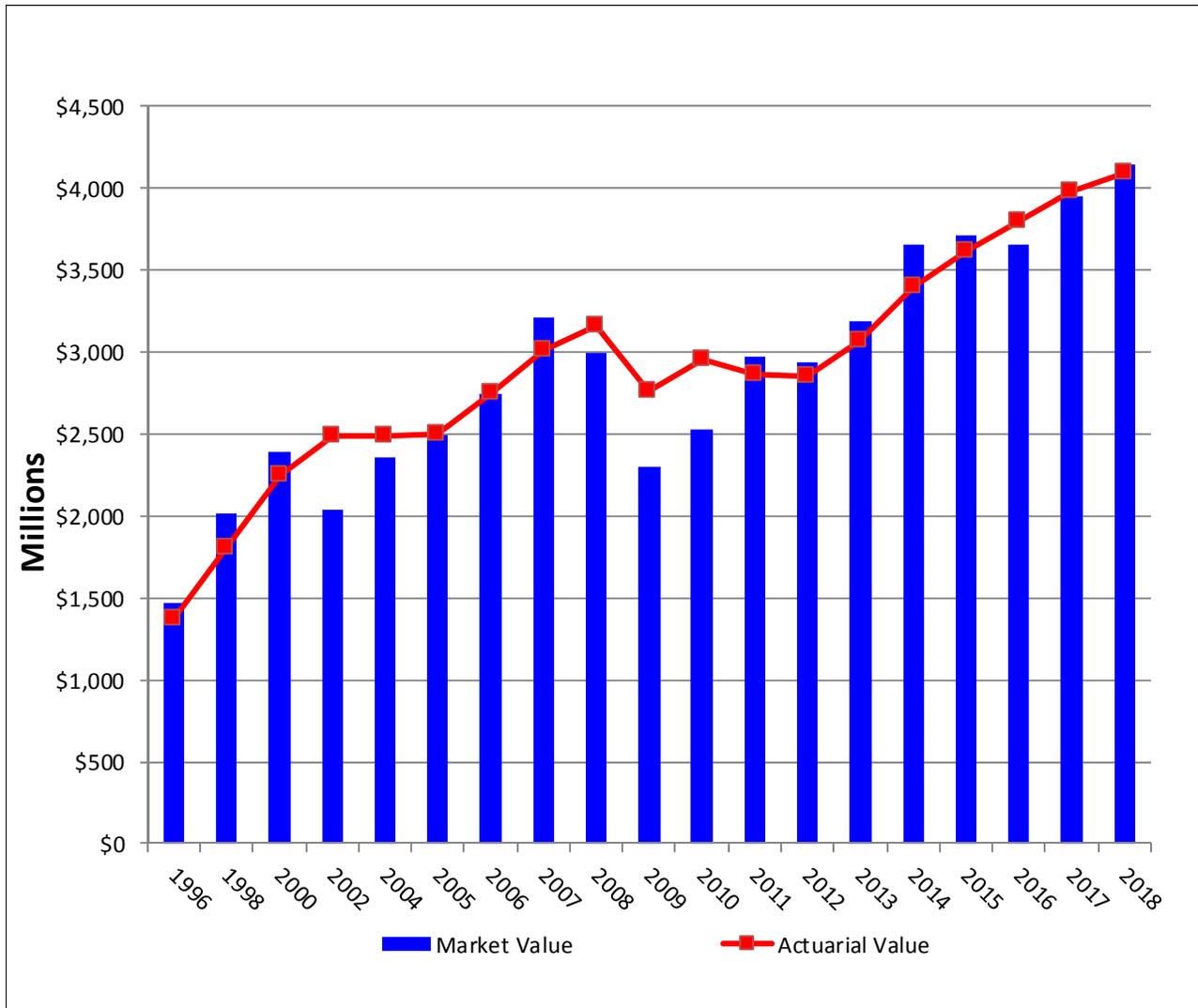




# Teachers' Retirement System State of Montana

Table 6

Market Value of Assets vs. Actuarial Value of Assets





## **Teachers' Retirement System State of Montana**

### **Section 3**

#### **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 7 contains an analysis of the actuarial present value of all future benefits for contributing members, for former contributing members, and for beneficiaries. The analysis is given by type of benefit.

The actuarial liabilities summarized in Table 7 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.



**Teachers' Retirement System  
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**Table 7**

**Actuarial Present Value of Future Benefits  
for Contributing Members, Former Contributing  
Members, and Beneficiaries**

(All amounts are actuarial present values in millions)

	<u>July 1, 2018</u> <b>Total</b>	<u>July 1, 2017</u> <b>Total</b>
<b>A. Active Members</b>		
Service Retirement	\$ 2,250.6	\$ 2,203.2
Disability Retirement	14.7	13.7
Survivors' Benefits	48.3	61.0
Vested Retirement	44.9	40.6
Refund of Member Contributions	42.7	44.5
<b>Total</b>	<b>\$ 2,401.2</b>	<b>\$ 2,363.0</b>
<b>B. Inactive Members and Annuitants</b>		
Service Retirement	\$ 3,806.1	\$ 3,544.0
Disability Retirement	25.4	23.3
Beneficiaries*	252.2	230.5
Vested Terminated Members	114.4	68.4
Refund of Member Contributions	25.3	22.3
<b>Total</b>	<b>\$ 4,223.4</b>	<b>\$ 3,888.5</b>
<b>C. Grand Total</b>	<b>\$ 6,624.6</b>	<b>\$ 6,251.5</b>

\* Includes survivors of active and retired members and children's benefits



## **Teachers' Retirement System State of Montana**

### **Section 4**

#### **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 7 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 7.50%, net of investment expenses. 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 8. In Table 8 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.

Table 9 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. Line C shows the actuarial accrued liability. Line D shows the amount of assets available for benefits. Line E shows the UAAL.

The amortization of the UAAL assumes university supplemental contributions are made as a percent of pay for members of the Montana University System Retirement Program (MUS-RP). Under Section 19-20-621, periodic separate valuations are to be performed to measure the liabilities of benefits to be paid under the Teachers' Retirement System (TRS) for MUS-RP members. The MUS-RP valuations calculate contribution rates that finance the university member benefits with university contributions and reflect actual experience including investment returns. In the prior valuations, the Supplemental Contribution of 4.72% of MUS-RP payroll was assumed to cease in 2033. It is our understanding the contribution will not stop unless legislative action is taken. The university supplemental contribution rate has varied from time to time. Recently it has varied as follows:

<b>Supplemental University Contribution Rate</b>	<b>Fiscal Years Ending</b>
2.81%	June 30, 1998
3.12%	June 30, 1999
3.42%	June 30, 2000
3.73%	June 30, 2001
4.04%	June 30, 2002 to June 30, 2007
4.72%	After June 30, 2007

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 Findings.



**Teachers' Retirement System  
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**Table 8**

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

	<b>July 1, 2018 Total</b>	<b>July 1, 2017 Total</b>
Service retirement	7.75%	7.66%
Disability retirement	0.09%	0.08%
Survivors' benefits	0.25%	0.31%
Vested retirement	0.52%	0.50%
Refund of member contributions	<u>1.35%</u>	<u>1.27%</u>
Total Normal Rate	<u><u>9.96%</u></u>	<u><u>9.82%</u></u>
Employee Normal Rate	8.15%	8.15%
Employer Normal Rate	1.81%	1.67%
Administrative Expense Load	0.36%	0.33%

The normal rate for members hired on or after July 1, 2013 is 9.40%. As current members retire or terminate from the System and are replaced by new hires, the normal rate of the System will decline which will increase the amount of the employer contribution that is used to eliminate the unfunded actuarial accrued liability.



**Teachers' Retirement System  
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**Table 9**

**Unfunded Actuarial Accrued Liability  
(Dollar amounts in millions)**

	<b>July 1, 2018</b>	<b>July 1, 2017</b>
A. Actuarial present value of all future benefits for present and former members and their survivors (Table 7)	\$ 6,624.6	\$ 6,251.5
B. Less actuarial present value of total future normal costs for present members	<u>620.2</u>	<u>614.7</u>
C. Actuarial accrued liability	\$ 6,004.4	\$ 5,636.8
D. Less assets available for benefits	<u>4,094.4</u>	<u>3,973.5</u>
E. Unfunded actuarial accrued liability	\$ 1,910.0	\$ 1,663.3



**Teachers' Retirement System  
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**Section 5**

**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 10 shows the System had a positive cash flow for the year ended June 30, 2018. The System’s total cash flow including benefits payments, administrative expenses and investment earnings was \$197.3 million. Of the \$197.3 million, (\$361.2) million was due to benefit payments and expenses, which were offset by \$214.8 in contributions and \$343.7 in investment returns. Table 11 shows the System is projected to have a positive cash flow in all future years.

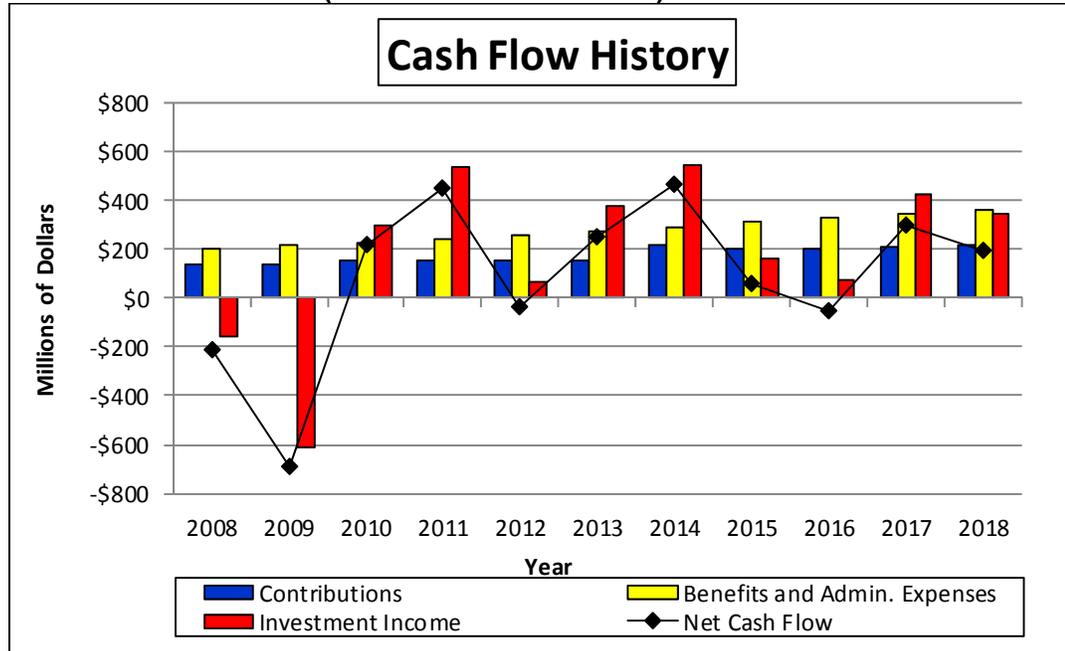
As long as the System had a positive cash flow, there was no need to plan where the funds would come from to pay benefits since benefits could be paid by incoming contributions. A negative cash flow, as defined above, requires planning what funds will be used to pay the difference between benefits and contributions. We are providing these projections to aid in developing the investment strategy for the System’s assets.



**Teachers' Retirement System  
State of Montana**

**Table 10**

**Cash Flow History  
(Dollar amounts in millions)**



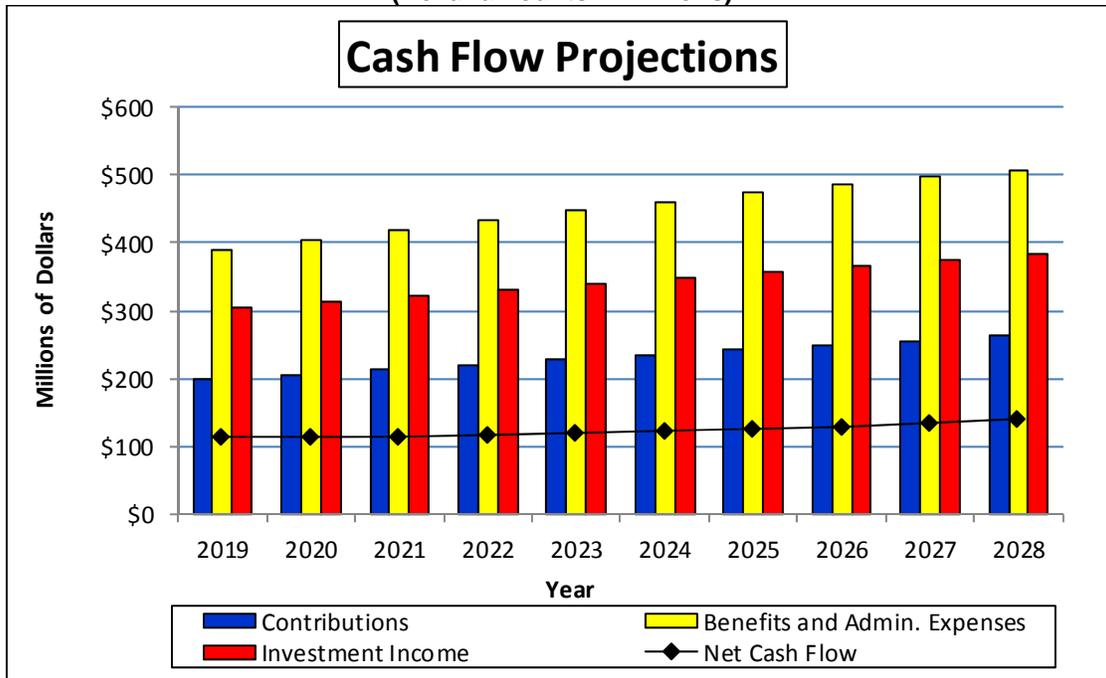
Year Ended June 30	Historical Cash Flows			
	Contributions	Benefits & Administrative Expenses	Investment Income	Net Cash Flow
2008	\$ 141.0	\$ 203.6	\$ (153.3)	\$ (215.9)
2009	138.3	217.0	(612.8)	(691.5)
2010	152.3	226.3	295.0	221.0
2011	153.3	241.4	539.0	450.9
2012	152.0	258.6	66.3	(40.3)
2013	154.5	275.4	373.7	252.8
2014	154.5	292.1	540.3	467.0
2015	202.9	311.2	165.7	57.4
2016	205.3	328.4	71.5	(51.6)
2017	210.5	343.7	427.0	293.8
2018	214.8	361.2	343.7	197.3



**Teachers' Retirement System  
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**Table 11**

**Cash Flow Projections  
(Dollar amounts in millions)**



Year Ended June 30	Projected Cash Flows			
	Contributions	Benefits & Administrative Expenses	Assumed Investment Income	Net Cash Flow
2019	\$ 199.9	\$ 389.8	\$ 304.9	\$ 115.0
2020	206.4	404.8	313.2	114.8
2021	213.2	419.5	321.6	115.3
2022	220.2	433.4	329.9	116.7
2023	227.5	446.8	338.5	119.2
2024	235.0	460.4	347.2	121.8
2025	241.9	473.4	356.1	124.6
2026	248.9	485.8	365.2	128.3
2027	256.2	497.3	374.7	133.6
2028	263.7	507.9	384.6	140.4



**Teachers' Retirement System  
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**Section 6**

**Actuarial Gains or Losses**

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

The developments of the gains or losses related to the actuarial liability and the assets are shown in Table 12. The results of our analysis of the financial experience of the System in the three most recent regular actuarial valuations are presented in Table 13. 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 assumption studies.

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



**Teachers' Retirement System  
State of Montana**

**Table 12**

**Analysis of Actuarial Gains or Losses\***

<b>A. ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS</b>	
1. Actual Actuarial Accrued Liability as of June 30, 2017:	\$ 5,636,841,900
2. Normal Cost for this Plan Year (Including Expenses):	76,009,950
3. Interest on items 1 and 2 $[(1+2) \times 7.75\%]$ :	442,746,018
4. Benefit Payments for this Plan Year (Including Expenses):	(361,183,971)
5. Interest on item $[4 \times 7.75\% \times .5]$	(13,995,879)
6. Expected Actuarial Accrued Liability as of June 30, 2018:	<u>\$ 5,780,418,018</u>
7. Changes due to:	
a. Assumption changes:	\$ 206,321,172
b. Plan amendments:	0
c. Funding Method:	0
d. Actuarial (Gain) / Loss:	\$ 17,694,921
8. Actual Actuarial Accrued Liability as of June 30, 2018:	<u><u>\$ 6,004,434,112</u></u>
9. Items Affecting Calculation of Actuarial Accrued Liability:	
a. Benefit provisions reflected in the actuarial accrued liability (see Appendix B)	
b. Actuarial assumptions and methods used to determine actuarial accrued liability (see Appendix A)	
<b>B. ASSET (GAIN) / LOSS ANALYSIS</b>	
1. Actuarial Value of Assets as of June 30, 2017:	\$ 3,973,519,183
2. Interest on item $[1 \times 7.75\%]$	307,947,737
3. Contributions for this Plan Year	214,833,474
4. Interest on item $[3. \times 7.75\% \times .5]$	8,324,797
5. Benefit Payments for this Plan Year (Including Expenses)	(361,183,971)
6. Interest on item $[5. \times 7.75\% \times .5]$	(13,995,879)
7. Expected Actuarial Value of Assets as of June 30, 2018:	<u>\$ 4,129,445,341</u>
8. Actuarial Value of Assets as of June 30, 2018:	<u>\$ 4,094,392,530</u>
9. (Gain) / Loss	<u>\$ 35,052,811</u>
<b>C. UNFUNDED ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS</b>	
1. Actual Unfunded Actuarial Accrued Liability as of June 30, 2017:	\$ 1,663,322,717
2. Normal Cost for this Plan Year (Including Expenses):	76,009,950
3. Contributions for this Plan Year:	(214,833,474)
4. Interest on items 1 - 3: $[(1+2) \times 7.75\% + (3 \times 7.75\% \times .5)]$	126,473,484
5. Expected Unfunded Actuarial Accrued Liability as of June 30, 2018:	<u>\$ 1,650,972,677</u>
6. Changes due to:	
a. Assumption changes:	\$ 206,321,172
b. Plan amendments:	-
c. Funding Method:	-
d. Actuarial (Gain) / Loss:	52,747,732
7. Actual Unfunded Actuarial Accrued Liability as of June 30, 2018:	<u><u>\$ 1,910,041,582</u></u>

\* 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.



**Teachers' Retirement System  
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**Table 13**

**Historical Actuarial Gains or Losses\***  
(Dollar amounts in millions)

	UAAL (Gain)/Loss		
	June 30, 2018	June 30, 2017	June 30, 2016
<b>Investment Income</b>			
Investment income was (greater) less than expected based on actuarial value of assets.	\$ 35.1	\$ (18.2)	\$ (36.9)
<b>Pay Increases</b>			
Pay increases were (less) greater than expected.	(24.2)	(14.6)	(16.1)
<b>Age &amp; Service Retirements</b>			
Members retired at (older) younger ages or with (less) greater final average pay than expected	22.4	4.8	5.3
<b>Disability Retirements</b>			
Disability claims were (less) greater than expected	0.3	0.6	0.4
<b>Death-in-Service Benefits</b>			
Survivor claims were (less) greater than expected	(2.6)	(3.9)	(3.3)
<b>Withdrawal From Employment</b>			
(More) less reserves were released by withdrawals than expected	8.0	6.5	5.7
<b>Death After Retirement</b>			
Retirees (died younger) lived longer than expected	12.6	13.8	9.1
<b>Data Adjustments and Benefit Payment Timing</b>			
Service purchases, data corrections, etc.	(0.4)	(1.3)	(5.3)
<b>Other</b>			
Miscellaneous (gains) and losses	1.5	(0.9)	(1.5)
<b>Total (Gain) or Loss During Period From Financial Experience</b>	\$ 52.7	\$ (13.2)	\$ (42.6)
<b>Non-Recurring Items.</b>			
Changes in actuarial assumptions and methods	206.3	-	(12.4)
Changes in benefits caused a (gain) loss	-	-	-
<b>Composite (Gain) Loss During Period</b>	\$ 259.0	\$ (13.2)	\$ (55.0)

\* 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.



## **Teachers' Retirement System State of Montana**

### **Appendix A**

#### **Actuarial Procedures and Assumptions**

The assumptions for investment return, price inflation, wage inflation, mortality, retirement and withdrawal have been updated to reflect the experience study for the period ending July 1, 2017 adopted by the Board on May 18, 2018.

The current asset valuation method was adopted for the July 1, 2007 valuation.

Tables A-3 through A-6 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.

### **Employer Contributions**

At the time of this valuation, the total employer contribution rate for normal costs and amortization of the UAAL was 11.36% of members' salaries. The employer contribution rate will increase by 0.10% each year beginning July 1, 2014 until the total employer contribution rate equals 11.96%.

### **Administrative and Investment Expenses**

The investment expenses of the System are assumed to be funded by investment earnings in excess of 7.50% per year.

Administrative expenses are assumed to equal 0.36% of covered payroll.

### **Valuation of Assets - Actuarial Basis**

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. The actuarial value of assets is not allowed to be greater than 120% or less than 80% of the market assets. (Adopted effective July 1, 2007.)

### **Investment Earnings**

The annual rate of investment earnings of the assets of the System is assumed to be 7.50% per year net of investment expenses, compounded annually. (Adopted effective May 18, 2018)

### **Interest on Member Contributions**

Interest on member contributions is assumed to accrue at a rate of 5% per annum, compounded annually. This assumption was set as of July 1, 2004.

### **Postretirement Benefit Increases**

Tier 1 Members:

On January 1 of each year, the retirement allowance payable is increased by 1.5% if the retiree has received benefits for at least 36 months prior to January 1 of the year in which the adjustment is to be made.

Tier 2 Members:

On January 1 of each year, the retirement allowance payable is assumed to increase by 1.5% if the retiree has received benefits for at least 36 months prior to January 1 of the year in which the adjustment is to be made.



### **Future Salaries**

The rates of annual salary increase assumed for the purpose of the valuation are illustrated in Table A-2. In addition to increases in salary due to merit and longevity, this scale includes an assumed 3.25% annual rate of increase in the general wage level of the membership. The merit and longevity increases for the MUS members did not show a pattern of increasing or decreasing with service at the time of our most recent study. Therefore, the MUS members have a flat 1% merit and longevity assumption. The general wage increase assumption was adopted May 18, 2018 and the merit and longevity scales were adopted July 1, 2002.

Montana University System (MUS) members are assumed to have a 0.63% higher average final compensation to account for the larger than average annual compensation increases observed in the years immediately preceding retirement.

### **Service Retirement**

Table A-3 shows the annual assumed rates of retirement among members eligible for service retirement. Separate rates are used when a member is eligible for reduced benefits, for the first year a member is eligible for full benefits, and for the years following the first year a member is eligible for full benefits. The rates for General Members were adopted May 18, 2018. The rates for University Members were adopted May 18, 2018.

### **Disablement**

The rates of disablement used in this valuation are illustrated in Table A-4. These rates were adopted May 13, 2010.

### **Mortality**

The mortality rates used in this valuation are illustrated in Table A-5. A written description of each table used is included in Table A-1. These rates were adopted May 18, 2018.

### **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 A-6. These rates were adopted May 18, 2018.

### **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 A-7 shows the assumed probability of retaining membership in the System among members terminating with five or more years of service. These rates were adopted July 1, 2002.

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.



### **Part-Time Employees**

The valuation data for active members identify part-time members. For part-time members earning more than \$1,000, total credited service is adjusted based on the ratio of actual earnings to annualized earnings. The liability and normal cost calculations for these members are based on the adjusted service and actual earnings for the prior year.

Part-time members earning less than \$1,000 during the last year were valued at their current member contribution balance.

### **Montana University System Retirement Program (MUS-RP)**

MUS-RP payroll as of June 30, 2018 was \$249,317,895.

Effective for fiscal years after June 30, 2007, the MUS-RP contribution rate is 4.72%, pursuant to MCA 19-20-621. It is our understanding the contribution will not stop unless legislative action is taken.

### **Buybacks, Purchase of Service, and Military Service**

The active liabilities and normal cost (excluding liabilities and normal cost in respect of Return of Employee Contributions) were increased to 100.5% of their original value to fund this additional service based on a study of the System's experience for the five calendar years 1995 through 1999. Effective July 1, 2008.

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

If death occurs in active status, all members are assumed to have an eligible surviving spouse and two children. The spouse is assumed to be the same age as the member. For members who die prior to age 50, dependent children are assumed to be eight years old. For members who die after age 50 but prior to age 55, children are assumed to be 13 years old. Members who die after age 55 are assumed to have no dependent children under the age of 18.

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

New records with no birth date are assumed to be 25 years old. Records that are not new and have no birth date used the same birth date as the prior year's valuation.



**Teachers' Retirement System  
State of Montana  
Table A-1  
Summary of Valuation Assumptions**

I. Economic assumptions		
A.	General wage increases* (Adopted May 18, 2018)	3.25%
B.	Investment return (Adopted May 18, 2018)	7.50%
C.	Price Inflation Assumption (Adopted May 18, 2018)	2.50%
D.	Growth in membership	0.00%
E.	Postretirement benefit increases (Starting three years after retirement)	
	Tier One	1.50%
	Tier Two	1.50%
F.	Interest on member accounts (Adopted July 1, 2004)	5.00%
II. Demographic assumptions		
A.	Individual salary increase due to promotion and longevity (General Member assumptions adopted July 1, 2002) (University Member assumptions adopted July 1, 2000)	Table A-2
B.	Retirement (adopted May 18, 2018)	Table A-3
C.	Disablement (adopted May 13, 2010)	Table A-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 Healthy Combined Mortality Table projected to 2022 adjusted for partial credibility setback for two years (adopted May 18, 2018).	Table A-5
E.	Mortality among disabled members For Males: RP 2000 Disabled Mortality Table, set back three years, with mortality improvements projected by Scale BB to 2022 (adopted May 18, 2018). For Females: RP 2000 Disabled Mortality Table, set forward two years, with mortality improvements projected by Scale BB to 2022 (May 18, 2018).	Table A-5
F.	Other terminations of employment (adopted May 18, 2018)	Table A-6
G.	Probability of retaining membership in the System upon vested termination (adopted July 1, 2002)	Table A-7

\* Montana University System (MUS) members are assumed to have a 0.63% higher average final compensation to account for the larger than average annual compensation increases observed in the years immediately preceding retirement.



**Teachers' Retirement System  
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**Table A-2**

**Future Salaries**

Years of Service	General Members			University Members		
	Individual Merit & Longevity	General Wage Increase	Total Salary Increase	Individual Merit & Longevity	General Wage Increase	Total Salary Increase
1	4.51%	3.25%	7.76%	1.00%	3.25%	4.25%
2	4.09	3.25	7.34	1.00	3.25	4.25
3	3.46	3.25	6.71	1.00	3.25	4.25
4	2.94	3.25	6.19	1.00	3.25	4.25
5	2.52	3.25	5.77	1.00	3.25	4.25
6	2.21	3.25	5.46	1.00	3.25	4.25
7	1.89	3.25	5.14	1.00	3.25	4.25
8	1.68	3.25	4.93	1.00	3.25	4.25
9	1.47	3.25	4.72	1.00	3.25	4.25
10	1.31	3.25	4.56	1.00	3.25	4.25
11	1.16	3.25	4.41	1.00	3.25	4.25
12	1.00	3.25	4.25	1.00	3.25	4.25
13	0.84	3.25	4.09	1.00	3.25	4.25
14	0.68	3.25	3.93	1.00	3.25	4.25
15	0.58	3.25	3.83	1.00	3.25	4.25
16	0.47	3.25	3.72	1.00	3.25	4.25
17	0.37	3.25	3.62	1.00	3.25	4.25
18	0.26	3.25	3.51	1.00	3.25	4.25
19	0.21	3.25	3.46	1.00	3.25	4.25
20	0.16	3.25	3.41	1.00	3.25	4.25
21	0.11	3.25	3.36	1.00	3.25	4.25
22 & Up	0.00	3.25	3.25	1.00	3.25	4.25



**Teachers' Retirement System  
State of Montana**

**Table A-3**

**Retirement  
Annual Rates**

Age	General Members			University Members		
	Eligible for Reduced Benefits	First Year Eligible for Full Benefits	Thereafter	Eligible for Reduced Benefits	First Year Eligible for Full Benefits	Thereafter
45		16.0%	8.0%		17.0%	8.0%
46		16.0	8.0		17.0	8.0
47		16.0	8.0		17.0	8.0
48		16.0	8.0		17.0	8.0
49	*	16.0	6.0	*	17.0	8.0
50	6.0%	9.0	5.5	7.0%	17.0	8.0
51	6.0	6.0	6.3	7.0	17.0	8.0
52	6.0	6.0	8.0	7.0	17.0	8.0
53	6.0	6.0	7.3	7.0	17.0	8.0
54	7.0	6.0	8.2	7.0	17.0	8.0
55	7.0	6.0	9.8	7.0	15.0	8.0
56	7.0	9.0	11.3	7.0	15.0	8.0
57	7.0	13.5	12.5	7.0	15.0	8.0
58	7.0	18.5	13.1	7.0	15.0	8.0
59	7.0	18.5	14.8	7.0	15.0	8.0
60	*	13.5	20.0	*	15.0	8.5
61		21.0	24.0		14.0	15.0
62		21.0	23.0		20.0	15.0
63		21.0	23.0		14.0	15.0
64		30.0	27.5		20.0	19.5
65		30.0	39.0		28.0	26.0
66		30.0	25.0		21.0	19.5
67		30.0	25.0		21.0	21.5
68		30.0	25.0		21.0	19.5
69		30.0	25.0		21.0	19.5
70		**	**		**	**

\* All benefits are unreduced after attaining age 60. Reduced benefits are not available before age 50.

\*\* Immediate retirement is assumed at age 70 or over.



**Teachers' Retirement System  
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**Table A-4**

**Disablement  
Annual Rates**

Age	All Members
25	.005%
30	.005
35	.008
40	.028
45	.044
50	.063
55	.084
60	.100



**Teachers' Retirement System  
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**Table A-5**

**Mortality  
Annual Rates**

Age	Contributing Members, Service Retired Members and Beneficiaries		Disabled Members	
	Men	Women	Men	Women
25	0.03%	0.02%	2.11%	0.70%
30	0.04	0.02	2.11	0.70
35	0.06	0.03	2.11	0.70
40	0.09	0.05	2.11	0.70
45	0.12	0.08	2.11	0.84
50	0.17	0.12	2.34	1.26
55	0.26	0.19	2.95	1.59
60	0.45	0.31	3.47	1.82
65	0.76	0.54	3.65	2.37
70	1.22	0.96	3.94	3.25
75	2.07	1.64	4.90	4.51
80	3.55	2.68	6.51	6.23
85	6.11	4.45	8.61	8.67
90	10.72	7.65	11.22	12.99
95	18.58	13.27	17.59	19.63



**Teachers' Retirement System  
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**Table A-6**

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

<u>Years of Service</u>	<u>Full-time Members</u>	<u>Part-time Members</u>
1	31.7%	36.0%
2	17.4	26.7
3	11.4	24.0
4	10.5	22.0
5	8.0	20.5
6	6.7	19.3
7	5.5	18.2
8	4.1	16.9
9	3.7	15.1
10	3.3	14.2
11	3.0	13.5
12	2.7	12.5
13	2.5	12.0
14	2.3	11.0
15	2.2	10.1
16	2.0	10.1
17	1.9	9.9
18	1.8	9.1
19	1.7	9.0
20	1.6	9.0
21	1.5	9.0
22	1.4	9.0
23	1.4	9.0
24	1.3	9.0



**Teachers' Retirement System  
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**Table A-7**

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

<u>Age</u>	<u>Probability of Retaining Membership</u>
25	54%
30	54
35	58
40	58
45	60
50	70
55	75



**Teachers' Retirement System  
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**Appendix B**

**Summary of Benefit Provisions**

**Effective Date**

September 1, 1937.

**Vesting Period**

Five years. No benefits are payable unless the member has a vested right, except the return of employee contributions with interest.

**Tier One Member**

A person who became a member before July 1, 2013 and who has not withdrawn the member's account balance.

**Tier Two Member**

A person who became a member on or after July 1, 2013, or who after withdrawing the member's account balance, became a member again after July 1, 2013.

**Final Compensation**

Tier One Members

Average of highest three consecutive years of earned compensation.

Tier Two Members

Average of highest five consecutive years of earned compensation.

**Normal Form of Benefits**

Life only annuity. All benefits cease upon death; however, in no event will the member receive less than the amount of employee contributions with interest.



## **Normal Retirement Benefits**

### Tier One Members

**Eligibility:** 25 years of service or age 60 with five years of service.

**Benefit:** The retirement benefit is equal to 1/60 of final compensation for each year of service.

### Tier Two Members

**Eligibility:** Age 55 with 30 years of service or age 60 with five years of service.

**Benefit:** A member age 60 with at least 30 years of creditable service will receive a retirement allowance equal to 1.85% of final compensation for each year of service. Otherwise, the multiplier used to calculate the retirement allowance will equal 1/60 of final compensation for each year of service.

## **Early Retirement Benefits**

### Tier One Member

**Eligibility:** Five years of service and age 50.

**Benefit:** The retirement benefit is calculated in the same manner as described for normal retirement, but the benefit is actuarially reduced by the lesser of the number of years equal to the age of the participant at the early retirement subtracted from age 60 or the number of years of service at early retirement subtracted from 25 years of service.

### Tier Two Member

**Eligibility:** Five years of service and age 55.

**Benefit:** The retirement benefit is calculated in the same manner as described for normal retirement, but the benefit is actuarially reduced by the lesser of the number of years equal to the age of the participant at the early retirement subtracted from age 60 or the number of years of service at early retirement subtracted from 30 years of service.



#### Death Benefit

Eligibility: Five years of service.

Benefit: The death benefit is equal to 1/60 of final compensation for each year of service accrued at date of death, with an actuarial adjustment based on the relation of the member's age at death to the beneficiary's age. A monthly benefit of \$200 is paid to each child until age 18. In addition, a lump-sum benefit of \$500 is paid upon the death of an active or retired member.

#### Disability Benefit

Eligibility: Five years of service.

Benefit: The disability benefit is equal to 1/60 of final compensation for each year of service accrued at date of disability. The minimum benefit is 1/4 of the final compensation. A Tier Two Member is not eligible for a disability retirement if the member is or will be eligible for a service retirement on or before the member's date of determination.

#### Withdrawal Benefits

With less than five years of service, the accumulated employee contributions with interest are returned. With more than five years, the member may elect a refund of contributions with interest or leave the contributions and interest in the System and retain a vested right to retirement benefits.

#### Contributions

Tier One Member: 7.15% of compensation. Tier One members are required to contribute a Supplemental Contribution equal to an additional 1% of compensation. The Board may decrease the Supplemental Contribution if the average funded ratio of the System based on the last three actuarial valuations is equal to or greater than 90% and the period necessary to amortize the unfunded liabilities of the System based on the most recent actuarial valuation is less than 15 years. Following one or more decreases in the supplemental contribution the Board may increase the supplemental contribution to a rate not to exceed 1% if the average funded ratio of the System based on the last three annual actuarial valuations is equal to or less than 80% and the period necessary to amortize all liabilities of the System based on the most recent annual actuarial valuation is greater than 20 years.



Tier Two Member: 8.15% of compensation. The Board may require a Tier Two member to contribute a Supplemental Contribution if the average funded ratio of the System based on the last three actuarial valuations is equal to or less than 80% and the period necessary to amortize the unfunded actuarial accrued liability is greater than 20 years and a State or employer contribution rate increase or a flat dollar contribution to the System has been enacted which is equivalent to or greater than the Supplemental Contribution Rate imposed by the Board. A single Tier Two Supplemental Contribution Rate increase cannot exceed 0.5% of compensation and in total cannot exceed 9.15% of compensation. The Board may decrease the Supplemental Contribution if the average funded ratio of the System based on the previous three annual actuarial valuations is equal to or greater than 90%; and the period necessary to amortize the unfunded actuarial accrued liability is less than 15 years.

Employer: 9.96% of compensation. Employers are required to contribute a supplemental contribution equal to 1% for fiscal year 2014 and increase by 0.1% each fiscal year through 2024. The Board may decrease the Employer Supplemental Contribution if the average funded ratio of the System based on the last three actuarial valuations is equal to or greater than 90% and the period necessary to amortize the unfunded actuarial accrued liability based on the most recent valuation is less than 15 years and the GABA has been increased to the maximum allowable. Following one or more decreases in the Supplemental Contribution Rate the Board may increase the Supplemental Contribution Rate to a rate not to exceed 1% if the average funded ratio of the System based on the last three actuarial valuations is equal to or less than 80% and the period necessary to amortize the unfunded actuarial accrued liability is greater than 20 years.

MCA 19-20-604 specifies that the employer contribution rate will be reduced by 0.11% when the amortization period of the System's UAAL is 10 years or less according to the System's latest actuarial valuation.

State Supplemental Contribution: \$25 million per year on an annual basis payable on July 1<sup>st</sup> of each year.

Re-employed Retirees: Each employer is required to contribute 9.85% of total compensation paid to all re-employed TRS retirees employed in a TRS reportable position. This amount shall increase by 1.00% for fiscal year 2014 and increase by



0.10% each fiscal year through 2024 until the total employer contribution is equal to 11.85% of re-employed retiree compensation.

Interest on Member contributions

Effective July 1, 2018, the interest credited on member contributions increased from 0.75% to 1.40% per annum.

Guaranteed Annual Benefit Adjustment (GABA)

On January 1 of each year, if the retiree has received benefits for at least 36 months prior to January 1 of the year in which the adjustment is to be made, for Tier One Members, the retirement allowance will be increased by 1.5%.

For Tier Two Members, the retirement allowance will be increased by an amount equal to or greater than 0.5% but no more than 1.5% if the most recent actuarial valuation shows the System to be at least 90% funded and the provisions of the increase is not projected to cause the funded ratio to be less than 85%.



**Teachers' Retirement System  
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**Appendix C**

**Valuation Data**

This valuation is based upon the membership of the System as of July 1, 2018. 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.

<u>Active Members</u>	<u>Number</u>	<u>Annual Salaries in Millions</u>
Full-Time Members	13,027	\$ 706.4
Part-Time Members*	<u>5,619</u>	<u>86.1</u>
Total Contributing Members*	18,646	\$ 792.5
Active Members with Annual Compensation less than \$1,000	621	
Total Active Members	19,267	

\* Excludes part-time members with annual compensation less than \$1,000.

Table C-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 C-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.
- Child beneficiaries.
- Terminated vested members.

Table C-3 is a reconciliation of membership data from July 1, 2017 to July 1, 2018.



The following is a summary of retired members and beneficiaries currently receiving benefits:

Type of Annuitant	Number	Annual Benefits in Thousands	Average Annual Benefits
Service Retirement	13,958	\$ 338,768	\$ 24,271
Survivors of Deceased Retired Members	<u>1,285</u>	<u>21,443</u>	<u>16,687</u>
Total Service Retirement (including survivors)	15,243	\$ 360,211	\$ 23,631
Disability Retirement	201	2,419	12,032
Survivors of Deceased Active Members	473	5,322	11,250
Child Beneficiaries	<u>16</u>	<u>38</u>	<u>2,400</u>
Total Annuitants	15,933	\$ 367,990	\$ 23,096

Terminated Members with Contributions Not Withdrawn	Number
Vested Terminated Members	1,772
Non-Vested Terminated Members	<u>13,967</u>
Total Terminated Members	15,739



**Teachers' Retirement System  
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**Table C-1**

**Active Members Distribution of  
Full-Time Employees and Salaries  
as of July 1, 2018**

**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	42	177	63	11										293
25 to 29	38	240	310	529	287									1,404
30 to 34	29	119	133	303	737	172	1							1,494
35 to 39	30	116	107	242	531	676	121							1,823
40 to 44	19	86	76	179	362	427	569	106						1,824
45 to 49	19	56	70	127	280	322	379	520	96					1,869
50 to 54	11	48	44	87	163	219	241	323	385	73				1,594
55 to 59	12	35	41	71	129	180	197	223	274	221	72			1,455
60 to 64	8	30	20	54	67	85	132	153	148	119	131	26		973
65 to 69	4	13	9	10	17	20	28	24	39	29	21	18		232
70 and up	4	4	2	4	4	4	3	5	8	10	4	14		66
<b>Totals</b>	<b>216</b>	<b>924</b>	<b>875</b>	<b>1,617</b>	<b>2,577</b>	<b>2,105</b>	<b>1,671</b>	<b>1,354</b>	<b>950</b>	<b>452</b>	<b>228</b>	<b>58</b>		<b>13,027</b>



**Teachers' Retirement System  
State of Montana**

**Table C-1**

**Active Members Distribution of  
Full-Time Employees and Salaries  
as of July 1, 2018**

**Annual Salaries in Thousands**

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	875	5,960	2,078	420										9,332
25 to 29	821	8,582	11,473	20,758	12,524									54,157
30 to 34	572	4,384	5,800	12,912	34,194	9,267	41							67,170
35 to 39	692	4,437	4,560	10,705	26,571	38,921	7,543							93,429
40 to 44	408	3,353	3,284	7,737	18,265	25,247	36,506	6,996						101,796
45 to 49	392	2,319	3,001	5,806	13,940	18,802	24,465	35,747	6,629					111,101
50 to 54	294	1,916	2,078	4,323	8,493	12,251	14,987	21,633	27,396	5,151				98,521
55 to 59	216	1,441	1,840	3,292	6,607	10,156	12,418	14,505	19,373	15,464	5,065			90,376
60 to 64	193	1,422	898	2,718	3,547	4,443	8,127	9,878	10,262	8,342	9,366	1,966		61,162
65 to 69	109	513	348	518	1,038	1,029	1,814	1,552	2,685	2,180	1,637	1,418		14,840
70 and up	108	250	49	193	242	207	178	324	556	791	323	1,244		4,466
<b>Totals</b>	<b>4,680</b>	<b>34,577</b>	<b>35,410</b>	<b>69,380</b>	<b>125,421</b>	<b>120,323</b>	<b>106,078</b>	<b>90,634</b>	<b>66,901</b>	<b>31,929</b>	<b>16,391</b>	<b>4,628</b>		<b>706,351</b>



**Teachers' Retirement System  
State of Montana**

**Table C-1**

**Active Members Distribution of  
Full-Time Employees and Salaries  
as of July 1, 2018**

**Average Annual Salary**

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	20,839	33,671	32,978	38,154										31,851
25 to 29	21,597	35,758	37,009	39,240	43,637									38,573
30 to 34	19,736	36,838	43,607	42,613	46,397	53,877	41,341							44,960
35 to 39	23,073	38,249	42,615	44,234	50,040	57,575	62,342							51,250
40 to 44	21,499	38,987	43,217	43,224	50,454	59,126	64,158	65,998						55,809
45 to 49	20,617	41,415	42,878	45,713	49,787	58,390	64,552	68,744	69,054					59,444
50 to 54	26,691	39,914	47,235	49,684	52,106	55,939	62,187	66,976	71,158	70,559				61,808
55 to 59	17,996	41,168	44,877	46,361	51,217	56,425	63,034	65,043	70,703	69,974	70,352			62,114
60 to 64	24,088	47,416	44,888	50,327	52,942	52,270	61,566	64,563	69,337	70,105	71,494	75,613		62,859
65 to 69	27,334	39,434	38,718	51,766	61,034	51,473	64,772	64,658	68,858	75,158	77,939	78,763		63,966
70 and up	26,875	62,580	24,734	48,348	60,536	51,801	59,213	64,773	69,474	79,147	80,805	88,879		67,671
Totals	21,666	37,421	40,468	42,906	48,670	57,160	63,482	66,938	70,422	70,639	71,891	79,793		54,222



**Teachers' Retirement System  
State of Montana**

**Table C-1**

**Active Members Distribution of  
Part-Time Employees  
as of July 1, 2018**

**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	204	68	16	6										294
25 to 29	189	131	72	59	22									473
30 to 34	155	101	62	64	76	14								472
35 to 39	167	155	104	105	90	52	5							678
40 to 44	131	141	95	119	107	55	37	5						690
45 to 49	102	98	81	100	135	75	35	24	5					655
50 to 54	69	74	60	93	114	110	54	28	15	1				618
55 to 59	90	57	43	83	116	114	97	47	17	9	2			675
60 to 64	58	71	39	70	82	87	73	57	37	4	2			580
65 to 69	57	27	21	41	51	31	37	20	12	2	3	1		303
70 and up	24	17	17	27	39	25	20	6	3	2	1			181
Totals	1,246	940	610	767	832	563	358	187	89	18	8	1		5,619



**Teachers' Retirement System  
State of Montana**

**Table C-2**

**Distribution of Inactive Lives**

**Members Receiving Service Retirement Benefits as of July 1, 2018**

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits in Thousands</u>	<u>Average Annual Benefits</u>
<50	17	\$ 488	\$ 28,726
50 to 54	162	4,312	26,618
55 to 59	606	16,897	27,883
60 to 64	1,940	47,942	24,713
65 to 69	3,653	90,898	24,883
70 to 74	3,248	82,482	25,395
75 to 79	2,074	50,435	24,318
80 to 84	1,195	26,687	22,332
85 to 89	699	13,445	19,234
90 and up	364	5,183	14,238
Totals	13,958	\$ 338,769	\$ 24,271

**Members Receiving Disability Retirement Benefits as of July 1, 2018**

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits in Thousands</u>	<u>Average Annual Benefits</u>
<50	13	\$ 166	\$ 12,784
50 to 54	16	255	15,924
55 to 59	21	283	13,473
60 to 64	29	350	12,058
65 to 69	44	541	12,299
70 to 74	33	365	11,064
75 to 79	17	186	10,934
80 to 84	14	148	10,592
85 to 89	7	70	9,982
90 and up	7	55	7,804
Totals	201	\$ 2,419	\$ 12,032



**Teachers' Retirement System  
State of Montana**

**Table C-2**

**Distribution of Inactive Lives**

**Survivors of Deceased Retired Members as of July 1, 2018**

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits in Thousands</u>	<u>Average Annual Benefits</u>
<50	73	\$ 684	\$ 9,377
50 to 54	30	249	8,289
55 to 59	37	495	13,368
60 to 64	75	1,067	14,228
65 to 69	142	2,268	15,971
70 to 74	203	3,929	19,356
75 to 79	228	4,657	20,426
80 to 84	193	3,526	18,267
85 to 89	174	2,798	16,083
90 and up	130	1,770	13,616
Totals	1,285	\$ 21,443	\$ 16,687

**Survivors of Deceased Active Members as of July 1, 2018**

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits in Thousands</u>	<u>Average Annual Benefits</u>
<50	102	\$ 777	\$ 7,621
50 to 54	22	247	11,219
55 to 59	38	288	7,570
60 to 64	63	765	12,137
65 to 69	75	1,112	14,826
70 to 74	65	747	11,495
75 to 79	43	639	14,868
80 to 84	24	240	9,980
85 to 89	24	332	13,836
90 and up	17	175	10,299
Totals	473	\$ 5,322	\$ 11,250



**Teachers' Retirement System  
State of Montana**

**Table C-2**

**Distribution of Inactive Lives**

**Terminated Vested Members as of July 1, 2018**

<u>Age</u>	<u>Number of Persons</u>
<25	
25 to 29	10
30 to 34	84
35 to 39	206
40 to 44	210
45 to 49	260
50 to 54	318
55 to 59	404
60 to 64	200
65 to 69	72
70 and above	<u>8</u>
Total	1,772

**Child Beneficiaries as of July 1, 2018**

<u>Age</u>	<u>Number of Persons</u>
<5	
5 to 6	3
7 to 8	1
9 to 10	1
11 to 12	1
13 to 14	3
15 to 16	4
17 to 18	<u>3</u>
Total	16



**Teachers' Retirement System  
State of Montana**

**Table C-3**

**Data Reconciliation**

	<u>Active Contributing Members*</u>	<u>Terminated Vested Members</u>	<u>Service Retired Members</u>	<u>Disabled Members</u>	<u>Survivors and Beneficiaries</u>
<b>July 1, 2017 Valuation</b>	18,384	1,779	13,630	203	1,733
Refunds and Non-Vested Terminations	(1,205)	(48)			
Change to Annual Pay Under \$1,000	10	10			
Vested Terminations	(204)	204			
Service Retirements	(562)	(84)	646		
Disability Retirements	(9)	(1)		10	
Deaths with Beneficiary	(8)	(3)	(99)		110
Deaths without Beneficiary			(218)	(12)	(81)
New Entrants	1,715				
Rehires	500	(80)	(7)		
Other	25	(5)	6		12
<b>July 1, 2018 Valuation</b>	18,646	1,772	13,958	201	1,774

\* Excludes active members with annual compensation less than \$1,000



**Teachers' Retirement System  
State of Montana**

**Appendix D**

**Comparative Schedules**

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

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

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

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



**Teachers' Retirement System  
State of Montana**

**Table D-1**

**Active Membership Data**

Valuation Date (July 1)	Full-Time Members	Part-Time Members**	Total Contributing Members**	Part-Time Members Annual Compensation less than \$1,000	Annual Full-Time Salaries in Thousands	Average Full-Time Annual Salary	Average Age**	Average Years of Service**	Average Hire Age**
1998	13,545	4,647	18,192	776	459,191	33,901	44.0	12.1	31.9
2000	13,289	4,245	17,534	886	477,160	35,906	44.5	12.2	32.3
2002	12,796	4,650	17,446	723	486,204	37,997	45.0	12.2	32.8
2004	12,601	5,013	17,614	637	510,808	40,537	45.6	12.2	33.4
2005	12,523	5,019	17,542	697	523,909	41,836	45.8	12.4	33.4
2006	12,715	4,840	17,555	544	549,268	43,198	46.0	12.5	33.5
2007	12,634	4,994	17,628	548	568,351	44,986	46.2	12.5	33.7
2008	12,694	5,077	17,771	521	592,514	46,677	46.1	12.3	33.8
2009	12,673	5,270	17,943	513	613,077	48,377	46.2	12.4	33.8
2010	12,711	5,642	18,353	600	630,444	49,598	45.9	12.2	33.8
2011	12,506	5,400	17,906	578	633,005	50,616	46.2	12.4	33.8
2012	12,202	5,534	17,736	636	622,140	50,987	46.0	12.4	33.6
2013	12,229	5,387	17,616	633	628,832	51,421	45.8	12.2	33.6
2014	12,286	5,428	17,714	558	712,802	51,967	45.6	11.6	34.0
2015	12,468	5,337	17,805	511	729,653	52,551	45.4	11.3	34.1
2016	12,769	5,563	18,332	716	673,891	52,776	45.2	10.9	34.3
2017	12,808	5,576	18,384	533	689,638	53,844	45.0	10.8	34.2
2018	13,027	5,619	18,646	621	706,351	54,222	45.0	10.6	34.4

\* Not available.

\*\* Excludes part-time active members with annual compensation less than \$1,000.



**Teachers' Retirement System  
State of Montana**

**Table D-2**

**Retired and Inactive Membership Data**

Valuation Date (July 1)	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
1998	8,362	99,040	11,844	69.6	57.3	*	1,190	8,158
2000	9,021	117,227	12,995	69.3	57.0	*	1,256	9,308
2002	9,768	139,131	14,244	69.1	56.8	*	1,485	8,231
2004	10,375	159,776	15,400	69.1	56.7	*	1,620	7,861
2005	10,664	170,129	15,954	69.3	56.7	*	1,649	8,569
2006	11,019	181,114	16,436	69.3	56.5	*	1,684	8,542
2007	11,356	195,237	17,192	69.3	56.6	*	1,671	8,963
2008	11,788	208,985	17,729	69.4	56.7	*	1,649	9,574
2009	12,036	219,267	18,218	69.7	57.5	25.5	1,640	9,868
2010	12,440	234,048	18,814	69.9	57.6	25.5	1,553	10,304
2011	12,899	250,500	19,420	70.0	57.8	25.5	1,580	10,727
2012	13,363	267,851	20,044	70.2	57.9	25.5	1,566	11,172
2013	13,868	284,333	20,503	70.4	58.0	25.5	1,566	11,710
2014	14,349	302,272	21,066	70.6	58.2	25.5	1,654	12,308
2015	14,839	321,511	21,667	70.9	58.3	25.4	1,664	12,839
2016	15,164	336,465	22,188	71.1	58.5	25.4	1,704	12,888
2017	15,566	352,005	22,614	71.4	58.6	25.3	1,779	13,712
2018	15,933	367,990	23,096	71.6	58.7	25.3	1,772	13,967

\* Not available.



**Teachers' Retirement System  
State of Montana**

**Table D-3**

**Contribution Rates**

Valuation Date (July 1)	Contribution Rates			Normal Cost Rate <sup>1</sup>	UAAL Rate <sup>2</sup>
	Employee	Employer	Total		
2002	7.15	7.58 <sup>3</sup>	14.73	10.33	4.40
2004	7.15	7.58	14.73	10.34	4.39
2005	7.15	7.58	14.73	10.35	4.38
2006	7.15	7.58	14.73	10.37	4.36
2007	7.15	9.58	16.73	10.40	6.33
2008	7.15	9.58	16.73	10.87	5.86
2009	7.15	9.96	17.11	10.69	6.42
2010	7.15	9.96	17.11	9.74	7.37
2011	7.15	9.96	17.11	9.64	7.47
2012	7.15	9.96	17.11	9.64	7.47
2013	8.15	10.96	19.11	9.20	9.91
2014	8.15	11.06	19.21	9.44	9.77
2015	8.15	11.16	19.31	9.49	9.82
2016	8.15	11.26	19.41	10.18	9.23
2017	8.15	11.36	19.51	10.15	9.36
2018	8.15	11.46	19.61	10.32	9.29

<sup>1</sup> Effective July 1, 2014, the Normal Cost Rate includes the administrative expense load.

<sup>2</sup> The UAAL rate is the amount available to amortize the UAAL. It is equal to the total contribution rate, minus the normal cost rate.

<sup>3</sup> The 1999 Legislation which passed the 1.5% GABA, also added a 0.11% state general fund contribution.



## **Teachers' Retirement System State of Montana**

### **Appendix E**

#### **Glossary**

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 Montana Teachers' 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.

**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.