



Cavanaugh Macdonald
CONSULTING, LLC

The experience and dedication you deserve

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

**Long Term Disability Plan
under the Defined Contribution Retirement Plan**



**Actuarial Valuation
As of June 30, 2018**





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

October 1, 2018

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 Long-Term Disability Plan under the Defined Contribution Retirement Plan (DCRP), prepared as of June 30, 2018.

The purpose of this report is to provide a summary of the funded status of the Plan as of June 30, 2018. While not verifying the data at source, the actuary performed tests for consistency and reasonability. The valuation indicates that the plan is over 100% funded.

The promised benefits of the Plan are included in the actuarially calculated contribution rates which are developed using the Entry Age Normal Cost Method. 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 3.50% 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 Plan and on actuarial assumptions that are internally consistent and reasonably based on the actual experience of the Plan.



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', with a stylized, cursive script.

Edward A. Macdonald, ASA, FCA, MAAA
President

A handwritten signature in blue ink, appearing to read 'Todd B. Green', with a stylized, cursive script.

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

A handwritten signature in blue ink, appearing to read 'Matthew Yonz', with a stylized, cursive script.

Matthew Yonz, ASA, FCA, MAAA
Actuary



Montana Public Employees' Retirement System DCRP Long-Term Disability Plan

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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:

VALUATION DATE	June 30, 2018	June 30, 2017
Active members	2,690	2,541
Disabled Members	8	3
Retirees and Beneficiaries	0	0
Terminated Vested Members	0	0
Terminated Non-Vested Members	0	0
Total	2,698	2,544
Covered Payroll of Active Members	\$ 139,065,638	\$ 129,157,695
Average Salaries from Covered Payroll	\$ 51,697	\$ 50,829
Annual Retirement Allowances for Disabled Members	\$ 81,392	\$ 25,829
Assets		
Market Value of Assets	\$ 4,455,481	\$ 3,456,936
Actuarial Accrued Liability (AAL)	\$ 4,354,320	\$ 3,967,262
Unfunded Actuarial Accrued Liability	\$ (101,161)	\$ 510,326
Funded Ratio	102.32%	87.14%
Market Value Rate of Return	7.24%	0.02%
Annual Cost		
Statutory Funding Rate	0.30%	0.30%
Total Normal Rate	0.30%	0.28%
Employee Contribution Rate	<u>0.00%</u>	<u>0.00%</u>
Employer Normal Rate	0.30%	0.28%
Employer Contribution Rate		
Normal Rate	0.30%	0.28%
Administrative Expense Load	0.00%	0.00%
UAAL Rate	<u>0.00%</u>	<u>0.02%</u>
Total Rate	<u>0.30%</u>	<u>0.30%</u>
Amortization Period	0 years	19 years
Employer Contribution Rate Necessary to Amortize UAAL over 30 Years		
Normal Rate	0.30%	0.28%
Administrative Expense Load	0.00%	0.00%
UAAL Rate (30-Year Rate)	<u>0.00%</u>	<u>0.01%</u>
Total Rate	<u>0.30%</u>	<u>0.29%</u>
Shortfall/(Surplus)	(0.00)%	(0.01)%



Section I: Summary of Results

As a result of this actuarial valuation of the benefits in effect under the DCRP Long-Term Disability Plan as of June 30, 2018, the statutory employer contributions are sufficient to amortize the Unfunded Actuarial Accrued Liability (UAAL) of the Plan. The Funded Ratio is 102.32%.

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 Plan. This report uses the market value of assets for all calculations.

Additional Details

MCA 19-3-2117 requires each employer to contribute 0.30% of total compensation paid to the long-term disability plan trust fund.

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 7.24% net of investment and operating expenses, which is 3.74% greater than the actuarial assumption of 3.50%. The chart below shows the annual returns for the past five years.

Year	Market Return	Assumed Rate of Return	Market Return over Assumption
7/1/2012 to 6/30/2013	0.25%	3.50%	(3.25)%
7/1/2013 to 6/30/2014	0.14	3.50	(3.36)
7/1/2014 to 6/30/2015	0.13	3.50	(3.37)
7/1/2015 to 6/30/2016	0.38	3.50	(3.12)
7/1/2016 to 6/30/2017	0.02	3.50	(3.48)
7/1/2017 to 6/30/2018	7.24	3.50	3.74

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

The Plan earned \$114,485 less than anticipated by the 3.50% assumption in the year ended June 30, 2017, and \$146,925 more than anticipated by the 3.50% assumption in the year ended June 30, 2018.

Amortization of the UAAL

Since the plan is over 100% funded, a contribution is not required to amortize the unfunded liability.



Section I: Summary of Results

Funding and Benefits Policy

The Montana Public Employees' Retirement Board 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. 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 Plan are determined using the Entry Age Normal Cost Method and are compared to the market value of assets. The contributions provided for in statute are sufficient to fully amortize the unfunded actuarial accrued liability within a 0-year period. The current statutory rate is adequate to 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 UAL."

b) Analysis: The contributions provided for in statute are sufficient to fully amortize the unfunded actuarial accrued liability within a 0 year period. This ensures that the System is financially sound and will be able to pay all promised benefits and achieve a well-funded status with a range of safety to absorb market volatility without creating a UAL.

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."

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 UAL.



Section I: Summary of Results

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 Plan.

Impact of Assuming 1.00% Lower Investment Return	
	<u>Funded Ratio</u>
Current Assumption 3.50%	102.32%
Lower Assumption 2.50%	<u>95.11%</u>
Increase / (Decrease)	(7.21)%
	<u>Amortization Period</u>
	<u>Increase / (Decrease)</u>
Current Assumption 3.50%	0 Years
Lower Assumption 2.50%	<u>Does not amortize</u>
Increase / (Decrease)	N/A
Impact of Assuming 0.50% Lower Investment Return	
	<u>Funded Ratio</u>
Current Assumption 3.50%	102.32%
Lower Assumption 3.00%	<u>98.61%</u>
Increase / (Decrease)	(3.71)%
	<u>Amortization Period</u>
	<u>Increase / (Decrease)</u>
Current Assumption 3.50%	0 Years
Lower Assumption 3.00%	<u>Does not amortize</u>
Increase / (Decrease)	N/A



Section I: Summary of Results

Impact of Assuming 0.50% Higher Investment Return	
	<u>Funded Ratio</u>
Current Assumption 3.50%	102.32%
Lower Assumption 4.00%	<u>106.25%</u>
Increase / (Decrease)	3.93%
	<u>Amortization Period</u>
	<u>Increase / (Decrease)</u>
Current Assumption 3.50%	0 Years
Lower Assumption 4.00%	<u>0 Years</u>
Increase / (Decrease)	0 Years
Impact of Assuming 1.00% Higher Investment Return	
	<u>Funded Ratio</u>
Current Assumption 3.50%	102.32%
Lower Assumption 4.50%	<u>110.38%</u>
Increase / (Decrease)	8.06%%
	<u>Amortization Period</u>
	<u>Increase / (Decrease)</u>
Current Assumption 3.50%	0 Years
Lower Assumption 4.50%	<u>0 Years</u>
Increase / (Decrease)	0 Years

The future funding status of the Plan will be determined by the Plan's experience. The Plan'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 Plan. The entry age normal cost method will help to provide a more orderly funding of the Plan'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

There have been no assumption changes since the previous valuation.

Benefit Changes

There have been no benefit changes since the previous valuation.

Contribution Changes

There have been no contribution changes since the previous valuation.

Method Changes

There have been no method changes since the previous valuation.



Section I: Summary of Results

Impact of Changes

The following table summarizes how experience has changed the UAAL since the June 30, 2017 Actuarial Valuation. Further detail can be found in Table 9.

Changes in the Unfunded Actuarial Accrued Liability (UAAL)

June 30, 2017 Valuation UAAL	\$ 510,326
Normal Cost	379,023
Contributions	(430,725)
Interest	<u>23,589</u>
Expected June 30, 2018 UAAL	\$ 482,213
Experience (Gain)/Loss on Actuarial Liabilities	\$ (90,785)
Experience (Gain)/Loss on Actuarial Assets	(492,589)
Assumption & Method Changes	<u>0</u>
Total (Gain) / Loss	<u>\$ (583,374)</u>
June 30, 2018 Valuation UAAL	\$ (101,161)

Summary

- * The Plan's investment return of 7.24% for the year ended June 30, 2018 is greater than the actuarial assumption of 3.50%. This represents an asset gain of \$492,589 due to investment return being greater than anticipated. As of June 30, 2018, the market value of assets was \$4,455,481.
- * Contributions are sufficient to amortize the unfunded actuarial accrued liability. Prior to this valuation, the contribution was not sufficient to amortize the unfunded accrued liability. Experience gains and a prior period adjustment of \$332,205 in the market value of assets attributed to the decrease in the unfunded accrued liability.
- * The funding of the Plan 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 3.50% assumption are expected to have significant impacts on the Plan's funding progress. In the long term, the favorable experience is needed to offset the less favorable experience.



Section II: Assets

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, 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 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 historical asset returns for the last 5 years including which was greater or less than the actuarial investment return assumption. Table 4 summarizes the historical asset values on a market value basis, to the extent it was available. Additional data can be included in this table for future reports, if provided by the Plan.

**Section II: Assets**

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

	<u>2018</u>	<u>2017</u>
ASSETS		
Cash and Short Term Investments	\$ 330,794	\$ 302,356
Securities Lending Collateral	\$ -	\$ -
Receivables:		
Interest Receivable	\$ 510	\$ 248
Accounts Receivable	13,943	20,325
Due from Other Funds	-	5,272
Due from Primary Government	-	-
Notes Receivable	-	-
Total Receivables	<u>\$ 14,453</u>	<u>\$ 25,845</u>
Investments, at fair value:		
Investment Pools	4,110,614	3,129,535
Other Investments	-	-
Total Investments	<u>\$ 4,110,614</u>	<u>\$ 3,129,535</u>
Capital Assets		
Property and Equipment, at cost, net of Accumulated Depreciation	\$ -	\$ -
Intangible Assets, at cost, net of Amortization Expense	-	-
Total Capital Assets	<u>\$ -</u>	<u>\$ -</u>
TOTAL ASSETS	<u>\$ 4,455,861</u>	<u>\$ 3,457,736</u>
LIABILITIES		
Securities Lending Liability	\$ -	\$ -
Accounts Payable	-	800
Unearned Revenue	380	-
Due to Other Funds	-	-
Compensated Absences	-	-
OPEB Implicit Rate Subsidy LT	-	-
TOTAL LIABILITIES	<u>\$ 380</u>	<u>\$ 800</u>
NET POSITION - RESTRICTED FOR PENSION BENEFITS	<u>\$ 4,455,481</u>	<u>\$ 3,456,936</u>

**Section II: Assets**

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

	<u>2018</u>	<u>2017</u>
ADDITIONS		
Contributions:		
Employer	\$ 430,725	\$ 392,100
Plan Member	-	-
Other	-	-
Total Contributions	<u>\$ 430,725</u>	<u>\$ 392,100</u>
Misc Income	\$ -	\$ -
Investment Income:		
Net Appreciation/(Depreciation) in Fair Value of Investments	\$ 298,827	\$ (7)
Investment Earnings	4,826	2,289
Security Lending Income	-	7
Investment Income/(Loss)	<u>\$ 303,653</u>	<u>\$ 2,289</u>
Investment Expense	(15,654)	(1,712)
Security Lending Expense	-	(3)
Net Investment Income/(Loss)	<u>\$ 287,999</u>	<u>\$ 574</u>
Total Additions	<u>\$ 718,724</u>	<u>\$ 392,674</u>
DEDUCTIONS		
Benefit Payments	\$ 52,383	\$ 54,135
Refunds/Distributions	-	-
Refunds to Other Plans	-	-
Transfers to DCRP	-	-
Transfers to MUS-RP	-	-
OPEB Expense	-	-
Administrative Expense	-	-
Total Deductions	<u>\$ 52,383</u>	<u>\$ 54,135</u>
NET INCREASE (DECREASE) IN PLAN NET ASSETS	\$ 666,341	\$ 338,539
NET POSITION - RESTRICTED FOR PENSION BENEFITS BEGINNING OF YEAR	\$ 3,456,936	\$ 3,118,397
ADJUSTMENT	332,205	-
END OF YEAR	<u><u>\$ 4,455,481</u></u>	<u><u>\$ 3,456,936</u></u>



**Table 3:
Historical Investment Returns***

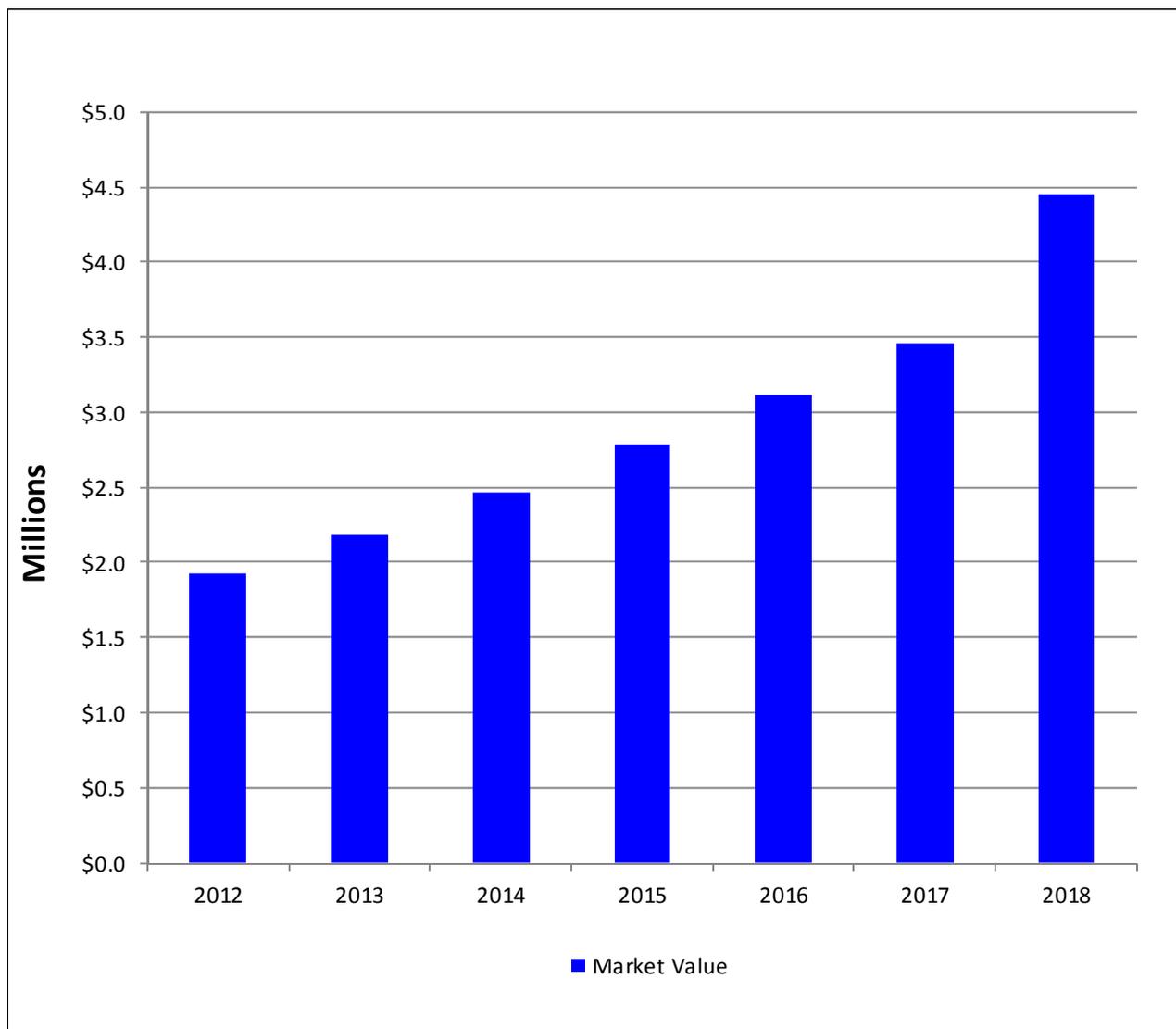
Fiscal Year Ending	Market Returns	Assumed Rate of Return	Market Return Over Assumption
June 30, 2014	0.14%	3.50%	(3.36)%
June 30, 2015	0.13%	3.50%	(3.37)%
June 30, 2016	0.38%	3.50%	(3.12)%
June 30, 2017	0.02%	3.50%	(3.48)%
June 30, 2018	7.24%	3.50%	3.74%
5 Year Average	1.54%		(1.96)%

* 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 Plan.



Section II: Assets

**Table 4:
Market Value of Assets**





Section III: Actuarial Present Value of Future Benefits

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 Plan as of the valuation date. In this section, the discussion will focus on the commitments of the Plan, which will be referred to as its actuarial liabilities.

Table 5 contains an analysis of the actuarial present value of all future benefits for contributing members, for retirees, and for beneficiaries. The analysis is given by type of benefit.

The actuarial liabilities summarized in Table 5 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 to age 65 for disabilities occurring prior to age 60, and for five years for disabilities occurring after age 60, or normal retirement age (age 65). PERS DC members hired after July 1, 2011 will be eligible for a disability benefit until they reach age 70.

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



Section III: Actuarial Present Value of Future Benefits

**Table 5:
Actuarial Present Value of Future Benefits for Active Members,
Retirees, and Beneficiaries**

	<u>June 30, 2018</u> <u>Total</u>	<u>June 30, 2017</u> <u>Total</u>
A. Active Members Liability Due to the Probability of		
Retirement	\$ -	\$ -
Disability	8,927,698	8,753,270
In-Service Death	-	-
Termination	-	-
	<hr/>	<hr/>
Total	\$ 8,927,698	\$ 8,753,270
B. Inactive Members and Annuitants		
Service Retirement	\$ -	\$ -
Disability Retirement	506,826	214,931
Beneficiaries	-	-
Vested Terminated Members	-	-
Refund of Member Contributions	-	-
	<hr/>	<hr/>
Total	<u>\$ 506,826</u>	<u>\$ 214,931</u>
C. Grand Total	\$ 9,434,524	\$ 8,968,201



Section IV: Employer Contributions

Employer Contributions

In the previous two sections, attention has been focused on the assets and the present value of all future benefits of the Plan. A comparison of Tables 2 and 5 indicates that there is a shortfall in current 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 3.50%, net of investment and operating expenses.

We have determined the normal cost rates separately by type of benefit under the Plan. These are summarized in Table 6. In Table 6 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 7 shows how the UAAL was derived for the Plan. 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 6:
Normal Cost Contribution Rates
As Percentages of Salary**

	<u>June 30, 2018</u> Total	<u>June 30, 2017</u> Total
Service retirement	0.00%	0.00%
Disability retirement	0.30%	0.28%
Survivors' benefits	0.00%	0.00%
Vested retirement	<u>0.00%</u>	<u>0.00%</u>
Total Normal Rate	<u>0.30%</u>	<u>0.28%</u>
Employee Normal Rate	0.00%	0.00%
Employer Normal Rate	0.30%	0.28%
Administrative Expense Load	0.00%	0.00%
Rate Available to Amortize the Unfunded Accrued Actuarial Liability	<u>0.00%</u>	<u>0.02%</u>
Statutory Rate	0.30%	0.30%



Section IV: Employer Contributions

**Table 7:
Unfunded Actuarial Accrued Liability**

	<u>June 30, 2018</u>	<u>June 30, 2017</u>
A. Actuarial present value of all future benefits for present members and retirees and their survivors (Table 5)	\$ 9,434,524	\$ 8,968,201
B. Less actuarial present value of total future normal costs for present members	<u>\$ 5,080,204</u>	<u>\$ 5,000,939</u>
C. Actuarial accrued liability	\$ 4,354,320	\$ 3,967,262
D. Less assets available for benefits	<u>\$ 4,455,481</u>	<u>\$ 3,456,936</u>
E. Unfunded actuarial accrued liability	\$ (101,161)	\$ 510,326



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.

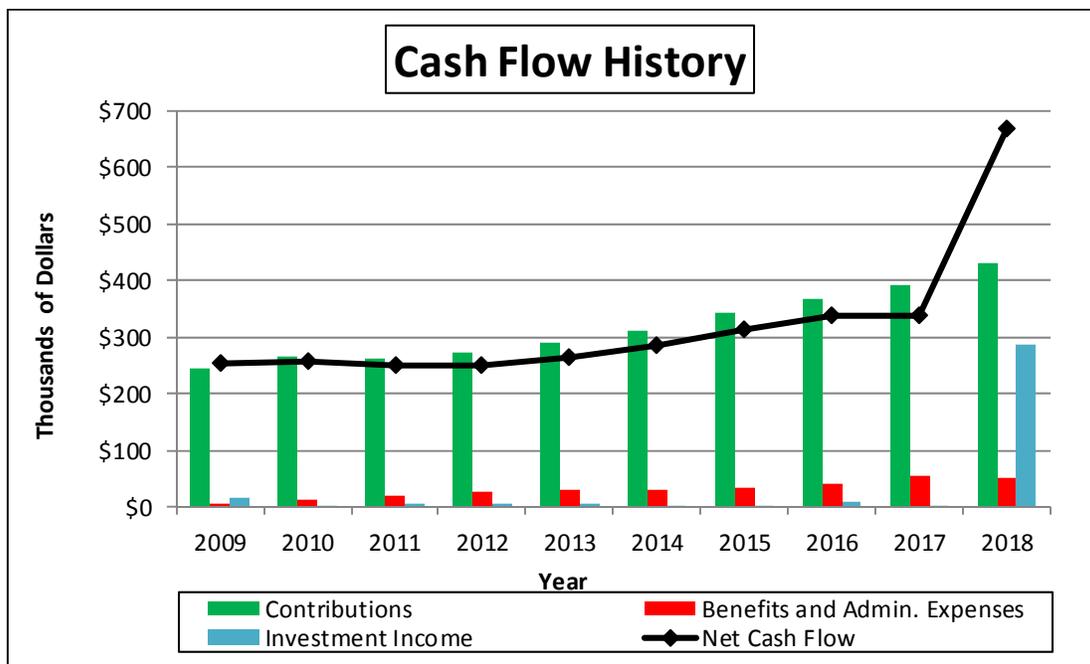
Table 8 shows the Plan had a positive cash flow for the year ended June 30, 2018. The Plan’s total cash flow including benefits payments, administrative expenses and investment earnings was \$666.3 thousand. Of the \$666.3 thousand, \$288 thousand was due to investment returns.

As long as the Plan 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 Plan’s assets.



Section V: Cash Flows

**Table 8:
Cash Flow History
(Dollar amounts in thousands)**



Year Ended June 30	Historical Cash Flows			
	Contributions	Benefits & Administrative Expenses	Investment Income	Net Cash Flow
2009	\$ 245.0	\$ 7.0	\$ 16.0	\$ 254.0
2010	265.0	14.0	4.0	255.0
2011	262.0	19.0	5.0	248.0
2012	273.0	27.0	5.0	251.0
2013	288.4	29.5	5.1	264.0
2014	311.3	29.5	3.3	285.1
2015	343.4	35.4	3.4	311.4
2016	368.0	41.8	11.1	337.3
2017	392.1	54.1	0.6	338.6
2018	430.7	52.4	288.0	666.3



Section VI: Actuarial Gains of Losses

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 9. 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 assumption studies.

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



Section VI: Actuarial Gains of Losses

**Table 9:
Analysis of Actuarial (Gains) or Losses***

A. ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS	
1. Actual Actuarial Accrued Liability as of June 30, 2017:	\$ 3,967,262
2. Normal Cost for this Plan Year (Including Expenses):	379,023
3. Interest on items 1 and 2 [(1+2) x 3.50%]:	152,120
4. Benefit Payments for this Plan Year (Including Expenses):	(52,383)
5. Interest on item [4 x 3.50% x .5]:	(917)
6. Expected Actuarial Accrued Liability as of June 30, 2018:	<u>\$ 4,445,105</u>
7. Changes due to:	
a. Assumption Changes:	0
b. Plan Amendments:	0
c. Funding Method:	0
d. Actuarial (Gain) / Loss:	<u>\$ (90,785)</u>
8. Actual Actuarial Accrued Liability as of June 30, 2018:	<u>\$ 4,354,320</u>
9. Items Affecting Calculation of Actuarial Accrued Liability:	
a. Benefit provisions reflected in the actuarial accrued liability (see Appendix C)	
b. Actuarial assumptions and methods used to determine actuarial accrued liability (see Appendix B)	
B. ASSET (GAIN) / LOSS ANALYSIS	
1. Actuarial Value of Assets as of June 30, 2017:	\$ 3,456,936
2. Interest on item [1 x 3.50%]:	120,993
3. Contributions for this Plan Year:	430,725
4. Interest on item [3. x 3.50% x .5]:	7,538
5. Benefit Payments for this Plan Year (Including Expenses):	(52,383)
6. Interest on item [5. x 3.50% x .5]:	(917)
7. Expected Actuarial Value of Assets as of June 30, 2018:	<u>\$ 3,962,892</u>
8. Actuarial Value of Assets as of June 30, 2018:	<u>\$ 4,455,481</u>
9. (Gain) / Loss	<u>\$ (492,589)</u>
C. UNFUNDED ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS	
1. Actual Unfunded Actuarial Accrued Liability as of June 30, 2017:	\$ 510,326
2. Normal Cost for this Plan Year (Including Expenses):	379,023
3. Contributions for this Plan Year:	(430,725)
4. Interest on items 1 - 3: [(1+2) x 3.50% + (3 x 3.50% x .5)]:	23,589
5. Expected Unfunded Actuarial Accrued Liability as of June 30, 2018:	<u>\$ 482,213</u>
6. Changes due to:	
a. Assumption Changes:	-
b. Plan Amendments:	-
c. Funding Method:	-
d. Actuarial (Gain) / Loss:	<u>\$ (583,374)</u>
7. Actual Unfunded Actuarial Accrued Liability as of June 30, 2018:	<u>\$ (101,161)</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.



Section VI: Actuarial Gains of Losses

**Table 10:
Historical Actuarial (Gains) or Losses***

	UAAL (Gain)/Loss		
	June 30, 2018	June 30, 2017	June 30, 2016
Investment Income			
Investment income was (greater) less than expected based on actuarial value of assets.	\$ (492,589)	\$ 114,485	\$ 91,932
Pay Increases			
Pay increases were (less) greater than expected.	(229,962)	92,969	57,240
Age & Service Retirements			
Members retired at (older) younger ages or with (less) greater final average pay than expected	(22,845)	(5,511)	(401)
Disability Retirements			
Disability claims were (less) greater than expected	102,251	(251,583)	(120,568)
Death-in-Service Benefits			
Survivor claims were (less) greater than expected	5,871	4,617	3,975
Withdrawal From Employment			
(More) less reserves were released by withdrawals than expected	(21,438)	2,551	(426)
Death After Retirement			
Retirees (died younger) lived longer than expected	(73,553)	(160,422)	(70,855)
Data Adjustments and Benefit Payment Timing			
Service purchases, data corrections, etc.	150,674	67,178	82,710
Other			
Miscellaneous (gains) and losses	(1,783)	78,112	(18,973)
Total (Gain) or Loss During Period From Financial Experience	\$ (583,374)	\$ (57,604)	\$ 24,634
Non-Recurring Items.			
Changes in actuarial assumptions and methods	-	73,717	-
Changes in benefits caused a (gain) loss	-	-	-
Composite (Gain) Loss During Period	\$ (583,374)	\$ 16,113	\$ 24,634

* 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 Methods

The assumptions and methods utilized in the valuation were developed in the six-year experience study for the period ending 2016.

Tables B-3 through B-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 was supplied by the System and has been accepted for valuation purposes without audit.

Valuation of Assets

Market value of assets

Investment Earnings

The annual rate of investment earnings of the assets of the System is assumed to be 3.50% per year net of investment expenses, compounded annually.

Postretirement Benefit Increases

None.

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 3.50% annual rate of increase in the general wage level of the membership.

Service Retirement

Table B-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.



Appendix A: Actuarial Methods

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.

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.

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	3.50%
B. Investment return	3.50%
C. Price inflation assumption	2.75%
D. Growth in membership	0.00%
E. Administrative Expenses as a percentage of payroll	0.00%
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 Employee and Annuitant Mortality Table projected to 2020 using Scale BB, set back one year for males.	Table B-5
E. Mortality among disabled members For Males and Females: RP 2000 Combined Mortality Table with no projections.	Table B-5
F. Other terminations of employment	Table B-6



Table B-2

Future Salaries

Years of Service	(a) Individual Merit & Longevity	(b) General Wage Increase	(1+(a))*(1+(b)) Total Salary Increase
0	4.80%	3.50%	8.47%
1	3.80	3.50	7.43
2	2.80	3.50	6.40
3	2.00	3.50	5.57
4	1.40	3.50	4.95
5	0.80	3.50	4.33
6	0.40	3.50	3.91
7	0.00	3.50	3.50
8 & Up	0.00	3.50	3.50



Appendix B: Actuarial Assumptions

Table B-3
Retirement
Annual Rates

Age	All Members
50	3.0%
51	3.0
52	3.0
53	3.0
54	3.0
55	3.0
56	4.0
57	5.0
58	5.0
59	6.0
60	8.0
61	15.0
62	25.0
63	15.0
64	15.0
65	30.0
66	30.0
67	25.0
68	25.0
69	25.0
70 & Over	100.0

Members hired before July 1, 2001 are assumed to retire at the assumed rates once reaching the earlier of age 50 with five years of service or age 65 regardless of service.

Members hired on or after July 1, 2001 are assumed to retire at the assumed rates once reaching the earlier of age 55 with five years of service or age 70 regardless of service.

These rates are the same as the retirement rates used in the PERS-DB actuarial valuation for members not eligible for unreduced retirement benefits.



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	0.0354%	0.0195%	0.0376%	0.0207%
30	0.0388	0.0249	0.0444	0.0264
35	0.0661	0.0447	0.0773	0.0475
40	0.0961	0.0665	0.1079	0.0706
45	0.1316	0.1058	0.1508	0.1124
50	0.1879	0.1578	0.2138	0.1676
55	0.3010	0.2458	0.3624	0.2717
60	0.5271	0.4135	0.6747	0.5055
65	0.9041	0.7624	1.2737	0.9706
70	1.4636	1.3151	2.2206	1.6742
75	2.5057	2.2077	3.7834	2.8106
80	4.2816	3.6037	6.4368	4.5879
85	7.3750	6.0833	11.0757	7.7446
90	13.0721	10.5549	18.3408	13.1682
95	21.7835	17.2452	26.7491	19.4509



Table B-6

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

Years of Service	All Members
0	30.0%
1	22.5
2	15.0
3	12.5
4	10.0
5	10.0
6	8.0
7	8.0
8	6.0
9	6.0
10	6.0
11	4.0
12	4.0
13	4.0
14	4.0
15 & Over	2.0

No termination rates are assumed after age 50 with five years of service for either males or females.



Appendix C: Summary of Benefit Provisions

Type of Plan	<ul style="list-style-type: none">• Multiple-employer cost sharing OPEB
Membership eligibility	<ul style="list-style-type: none">• Employees of the State and local governments that have contracted for PERS coverage.• Certain employees of the university system and school districts, not covered by a separate retirement system governed by Title 19 of Montana Code Annotated.• Employees must have elected to be a member of the defined contribution retirement plan.
Member contributions	<ul style="list-style-type: none">• None
Employer contributions	<ul style="list-style-type: none">• 0.30% of each eligible member's compensation, for those employers participating in the PERS-DCRP
Compensation period used in benefit calculation	<ul style="list-style-type: none">• HAC = Highest Average Compensation• Hired prior to July 1, 2011: HAC is average of the highest 36 consecutive months (or shorter period of total service) of compensation paid by member.• Hired on or after July 1, 2011: HAC is average of the highest 60 consecutive months (or shorter period of total service) of compensation paid to member.• Hired on or after July 1, 2013: 110% annual cap on compensation considered as part of a member's HAC



Appendix C: Summary of Benefit Provisions

Disability eligibility and benefit

- 5 years membership service
- For members hired **on or before** June 30, 2011, **or** hired **on or before** February 24, 1991 **and** so elected:
- **Less than 25 years** of membership service:
1.785% of HAC multiplied by service credit, or
 - **At least 25 years** of membership service:
2% of HAC multiplied by service credit; and
 - Benefit is payable to the later of age 65 or for five years.
- For members hired **on or after** July 1, 2011:
- **Between 5 and 10 years** of membership service:
1.5% of HAC x years of service credit; or
 - **Between 10 and 30 years** of membership service:
1.785% of HAC x years of service credit; or
 - **30 years** of membership service **or more**:
2% of HAC x years of service credit; and
 - Benefit is payable to age 70 for disabilities occurring prior to age 65, or no more than five years for disabilities occurring after age 65.

Members cannot receive distributions from their individual defined contribution account while receiving payments from the PERS-DCRP Disability OPEB. Participants may choose to receive a distribution from their individual account instead of applying for and receiving a disability benefit.

Survivor's benefit

- Disability benefits cease after death of a member, and their beneficiary is entitled to death benefits only as provided from the member's vested defined contribution account balance.

Form of payment

- Normal form of payment is an annuity
- No other forms of payment are available

Post retirement benefit increases

- None

Changes since last valuation

- None



Appendix D: Valuation Data

Valuation Data

This valuation is based upon the membership of the Plan as of June 30, 2018. Membership data was supplied by the Plan and has been accepted for valuation purposes without audit. However, tests were performed to ensure that the data is sufficiently accurate for valuation purposes.

The salaries used in the tables and charts which follow are different than the salaries used for the Summary of Results on page 1. The valuation projected salaries to be paid for the following fiscal year, whereas the Summary of Results, 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	2,163	\$ 125,136,863
Part-Time Members	<u>527</u>	<u>\$ 13,370,250</u>
Total Active Members	2,690	\$ 138,507,113

Table D-1 contains summaries of the data for active 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, 2017 to June 30, 2018.



Appendix D: Valuation Data

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

<u>Type of Annuitant</u>	<u>Number</u>	<u>Annual Benefits</u>	<u>Average Annual Benefits</u>
Service Retirement	0	\$ -	\$ -
Survivors and Beneficiaries	<u>0</u>	<u>-</u>	<u>-</u>
Total Retirees and Beneficiaries	0	\$ -	\$ -
Disability Retirement	<u>8</u>	<u>81,392</u>	<u>10,174</u>
Total Annuitants	8	\$ 81,392	\$ 10,174

<u>Terminated Members with Contributions Not Withdrawn</u>	<u>Number</u>
Vested Terminated Members	0
Non-Vested Terminated Members	<u>0</u>
Total Terminated Members	0



**Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 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	13	12	3	4	1								33
25 to 29	25	46	40	39	4								154
30 to 34	26	44	47	63	50	15							245
35 to 39	16	24	37	59	90	66	11						303
40 to 44	23	31	32	46	66	90	23	5					316
45 to 49	20	27	30	40	68	86	35	20	1				327
50 to 54	15	26	27	32	51	66	35	21	6				279
55 to 59	8	23	24	28	69	71	37	19	7	2			288
60 to 64	9	7	10	20	38	46	18	9		1			158
65 to 69	3	4		7	15	14	7	1	1				52
70 and up	1			2	1	3	1						8
Totals	159	244	250	340	453	457	167	75	15	3	-	-	2,163



Appendix D: Valuation Data

**Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 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	285	549	133	154	44									1,165
25 to 29	617	2,150	1,782	2,093	223									6,865
30 to 34	932	2,505	2,516	3,639	2,863	807								13,262
35 to 39	419	1,286	2,107	3,556	5,633	4,643	765							18,408
40 to 44	657	1,784	1,855	2,802	3,966	6,110	1,787	431						19,392
45 to 49	672	1,425	1,572	2,283	4,237	6,608	2,474	1,467	48					20,787
50 to 54	458	1,260	1,549	1,743	2,990	4,290	2,426	1,419	354					16,488
55 to 59	238	1,431	1,238	1,384	4,085	4,384	2,368	1,338	496	93				17,054
60 to 64	222	335	423	1,115	2,060	2,913	912	574		50				8,604
65 to 69	73	204		464	824	714	359	36	53					2,726
70 and up	23			89	56	116	101							385
Totals	4,595	12,930	13,176	19,321	26,982	30,585	11,192	5,264	950	143	-	-		125,137

The salary shown in the above chart was used for valuation purposes and assumes pay increases for the year.



Appendix D: Valuation Data

**Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2018**

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	21,942	45,720	44,216	38,513	44,100								35,293
25 to 29	24,692	46,745	44,541	53,661	55,819								44,580
30 to 34	35,857	56,932	53,539	57,754	57,268	53,787							54,132
35 to 39	26,178	53,565	56,948	60,275	62,585	70,348	69,501						60,752
40 to 44	28,571	57,547	57,973	60,908	60,095	67,887	77,711	86,184					61,368
45 to 49	33,616	52,787	52,412	57,074	62,313	76,842	70,686	73,347	47,566				63,569
50 to 54	30,511	48,465	57,372	54,460	58,623	65,000	69,328	67,556	58,944				59,097
55 to 59	29,692	62,236	51,593	49,419	59,206	61,740	64,011	70,404	70,787	46,503			59,216
60 to 64	24,628	47,893	42,307	55,760	54,218	63,322	50,642	63,765		50,258			54,455
65 to 69	24,199	51,063		66,285	54,917	51,020	51,237	35,555	52,862				52,422
70 and up	22,668			44,304	56,465	38,751	101,085						48,135
Totals	28,901	52,991	52,702	56,825	59,564	66,925	67,018	70,182	63,307	47,755			57,853

The salary shown in the above chart was used for valuation purposes and assumes pay increases for the year.



Appendix D: Valuation Data

**Table D-1:
Active Members Distribution of
Part-Time Employees
as of June 30, 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	5	1	1	2										9
25 to 29	1	5	3	3	2									14
30 to 34	7	9	3	10	11	2								42
35 to 39	8	7	8	8	21	8								60
40 to 44	4	6	9	18	14	10	1							62
45 to 49	10	14	8	14	12	8	3							69
50 to 54	7	5	5	5	17	15	5	3						62
55 to 59	10	5	8	10	18	12	8	5	1					77
60 to 64	7	8	4	13	19	14	7	2	1					75
65 to 69		2	4	5	14	9	1	1	2					38
70 and up	2	2		2	5	5	1	1	1					19
Totals	61	64	53	90	133	83	26	12	5	-	-	-	-	527



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

Members Receiving Disability Retirement Benefits as of June 30, 2018

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits</u>	<u>Average Annual Benefits</u>
<50	2	\$ 10,909	\$ 5,455
50 to 54	1	\$ 8,260	8,260
55 to 59	1	\$ 5,576	5,576
60 to 64	3	\$ 52,514	17,505
65 to 69	1	\$ 4,132	4,132
70 to 74			
75 to 79			
80 to 84			
85 to 89			
90 and up			
Totals	8	\$ 81,392	\$ 10,174



**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 and for the Annual Financial Report.

	<u>Active Members</u>	<u>Disabled Members</u>
June 30, 2017 Valuation	2,541	3
Terminations	(225)	1
Service Retirements		
Disability Retirements	(2)	2
Deaths		
New Entrants	424	
Rehires	25	
Payment Stopped	(73)	(1)
Other		3
	<hr/>	<hr/>
June 30, 2018 Valuation	2,690	8



Appendix E: Comparative Schedules

Comparative Schedules

This section contains tables that summarize the experience of the Plan 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</u>	<u>Average Annual Salary</u>	<u>Average Age</u>	<u>Average Years of Service</u>	<u>Average Hire Age</u>
2018	2,690	139,065,638	51,697	46.4	7.4	39.0
2017	2,541	129,157,695	50,829	46.3	7.4	38.9
2016	2,409	114,883,091	47,689	46.1	6.8	39.3
2015	2,284	106,518,524	46,630			
2013	2,087	90,450,420	43,340			



**Table E-2:
Disabled Membership Data**

<u>Valuation Date (June 30)</u>	<u>Number</u>	<u>Annual Benefits</u>	<u>Average Annual Benefit</u>	<u>Average Current Age</u>
2018	8	81,392	10,174	57.7
2017	3	25,829	8,610	51.8
2016	6	49,269	8,212	53.2
2015	6	43,296	7,216	
2013	4	29,460	7,365	



Appendix E: Comparative Schedules

**Table E-3:
Contribution Rates**

Valuation Date (June 30)	Contribution Rates			Normal	UAAL
	Employee	Employer	Total	Cost Rate	Rate*
2018	0.00%	0.30%	0.30%	0.30%	0.00%
2017	0.00	0.30	0.30	0.28	0.02
2016	0.00	0.30	0.30	0.30	0.00
2015	0.00	0.30	0.30	0.32	(0.02)
2013	0.00	0.30	0.30	0.33	(0.03)

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



Appendix F: Accounting Statement Information

The information presented in the required supplementary schedules was determined as part of the actuarial valuation as of June 30, 2018. Additional information as of the latest actuarial valuation follows.

Valuation date	June 30, 2018
Actuarial cost method	Entry Age Normal
Amortization method	Open
Remaining amortization period	0 Years
Asset valuation method	Market Value
Actuarial assumptions:	
Investment rate of return*	3.50%
General wage growth*	3.50%
Merit salary increases	0.0% - 4.8%
*Includes inflation	2.75%



Appendix F: Accounting Statement Information

Schedule of Funding Progress (expressed in thousands)							
Valuation Date June 30,	Actuarial Value of Assets	Actuarial Liability (AAL)	Funded Ratio	Unfunded AAL (UAAL)	Covered Payroll	UAAL as a Percentage of Covered Payroll	
2018	\$ 4,455	\$ 4,354	102%	\$ (101)	\$ 139,066	(0)%	
2017	3,457	3,967	87%	510	129,158	0%	
2016	3,118	3,591	87%	473	114,883	0%	
2015	2,781	3,235	86%	454	113,750	0%	
2013	2,184	2,715	80%	531	90,128	1%	

Solvency Test Aggregate Accrued Liabilities for (expressed in thousands)								
Valuation Date June 30,	Active Member Contributions (1)	Retirees & Beneficiaries (2)	Active Member Employer Financed Contributions (3)	Actuarial Value of Reported Assets	Portion of Accrued Liability Covered by Reported Assets			
					(1)	(2)	(3)	
2018	\$ -	\$ 507	\$ 3,847	\$ 4,455	100%	100%	103%	
2017	-	215	3,752	3,457	100%	100%	86%	
2016	-	401	3,190	3,118	100%	100%	85%	
2015	-	405	2,830	2,781	100%	100%	84%	
2013	-	294	2,421	2,184	100%	100%	78%	



Appendix G: 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 Public Employees' Retirement System of Montana (PERS) Long-Term disability plan under the Defined Contribution Retirement Plan. 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 Gains and Losses

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.

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.



Appendix G: Glossary

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.