

West Virginia Teachers' Retirement System

Actuarial Valuation as of July 1, 2018

February 2019



9401 James Avenue
Suite 140
Bloomington, MN 55431

February 28, 2019

West Virginia Consolidated Public Retirement Board
West Virginia Teachers' Retirement System
4101 MacCorkle Avenue, SE
Charleston, WV 25304

Dear Board Members:

We respectfully present our report on the actuarial valuation of the West Virginia Teachers' Retirement System (TRS) as of July 1, 2018. This valuation presents the liabilities of the plan as of the valuation date and the projected Employer contribution for fiscal year 2020.

The valuation results indicate:

- The State contribution to TRS for fiscal year 2020 is \$413,728,000. The State appropriation needed for fiscal year 2020 for the Teachers' Retirement Plans (TRS and TDC) under the School Aid Formula is \$389,193,000.
- The funded percentage of the actuarial accrued liability at the valuation date is 69.6% (on an actuarial value of assets basis), compared to 67.1% for the prior year.

This report contains supporting data and background information pertaining to the development of costs and related liabilities of the plan. The valuation is based on membership data as of June 30, 2018 maintained by the West Virginia Consolidated Public Retirement Board and financial information received from the West Virginia Investment Management Board.

This report presents fairly the actuarial position of the West Virginia Teachers' Retirement System (TRS) as of July 1, 2018 in accordance with Actuarial Standards of Practice (ASOPs) applied on a basis consistent with that of the preceding valuation. In our opinion, the assumptions used in preparing the liabilities and costs are individually reasonable in respect to TRS experience and represent our best estimate of anticipated experience under TRS. The assumptions were developed in accordance with the guidance set forth in applicable Actuarial Standards of Practice, including ASOPs 27 and 35. In particular, the mortality assumptions were developed in accordance with the recommendation that an appropriate margin for future improvement in mortality beyond the measurement date be included.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, changes expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions, or applicable law or regulations. An analysis of the potential range of such future differences is beyond the scope of this report.

Where presented, references to “funded percentage” and “unfunded accrued liability” typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded percentages and unfunded accrued liabilities. Moreover, the funded percentage presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the plan if the plan were to settle (i.e., purchase annuities to cover) a portion or all of its liabilities.

The valuation results are based on liabilities used for funding purposes only. Measurements made for financial reporting purposes under GASB Statements Nos. 67 and 68 are reported separately.

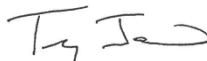
Use of this report for any other purpose may not be appropriate and may result in mistaken conclusions due to failure to understand applicable assumptions, methodologies, or inapplicability of the report for that purpose. Because of the risk of misinterpretation of actuarial results, Buck should be asked to review any statement to be made on the basis of results contained in this report. Buck will accept no liability for any such statement made without such prior review.

We are Fellows of the Society of Actuaries and Members of the American Academy of Actuaries. We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report. This report has been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about it.

Buck Global, LLC



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Table of Contents

- 1. Summary of Valuation.....1
- 2. Summary of Plan Provisions.....18
- 3. Actuarial Assumptions and Methods.....21
- Appendix - Detailed Assumptions23

1. Summary of Valuation

This report presents the results of the July 1, 2018 actuarial valuation of the West Virginia Teachers' Retirement System and includes the projected employer contribution requirement for FY 2020. A summary of the plan features, a summary of the method, factors and assumptions, and supplementary membership tables used in the valuation are also included.

Valuation Results

The West Virginia Teachers' Retirement System (TRS) is a defined benefit plan covering education employees hired prior to July 1, 1991, or hired on and after July 1, 2005, and prior Teachers' Defined Contribution Plan (TDC) members who elected to transfer from TDC to TRS effective July 1, 2008 or August 1, 2008. The plan provides unreduced monthly benefits to Tier 1 members upon retirement after 35 years of service, or at age 60 after completing 5 years of service, or at age 55 after completing 30 years of service. Tier 2 members are eligible for unreduced monthly benefits upon retirement at age 62 after completing 10 years of service. The plan also provides reduced early retirement benefits, benefits in the event of disability or death while active, and deferred benefits to members who terminate prior to retirement, providing plan eligibility conditions are met.

The plan is funded through member contributions of 6% of payroll and employer contributions sufficient to provide for any remaining normal cost (after member contributions are accounted for) and to amortize the unfunded liability as a level-dollar amount starting from FY 2009.

The major purpose of this valuation is to determine the amount of appropriation needed for FY 2020 for West Virginia's Teachers Retirement Plans under the School Aid Formula (SAF), which is determined to be \$389,193,000. Two components of the SAF determination are calculated in the valuation process: the contributions required from the State for TRS, and a projection of the State's contributions to TDC, both for FY 2020.

The State's contribution to TRS is based on an actuarial valuation of the provisions of the State code and the participant data, in consideration of the assets held in trust for TRS. The details of the TRS contribution for FY 2020 are shown in Table 1.

The State's TRS contribution for FY 2020, assuming a mid-year payment, consists of three separate components:

- The State share of the normal cost,
- The amount needed to fund the unfunded actuarial accrued liability, net of the liability for recent benefit changes, over a 40-year period which began in 1994 (as required by Section 18-9A-6a of the State code), and
- The amount required to separately amortize the liability for recent benefit changes. For FY 2020, there are no separate amortizations.

The total State TRS contribution on this basis is \$413,728,000.

Starting with FY 2009, the annual amortization payment toward the unfunded liability is determined as a level-dollar amount that is amortized over a 40-year period from July 1, 1994. In prior years, the amortization was determined as a level percentage of the projected total education payroll. The total amount contributed to the plan from FY 2009 forward will fund the normal cost plus interest and principal on the unfunded liability, fully amortizing the unfunded liability by the end of FY 2034.

Table 2 presents the development of the School Aid Formula, separately identifying the TRS contribution based on the original 40-year amortization period, any special payments toward the additional unfunded due to recent plan improvements, and other specific components. Detailed projections of the balance of the 40-year funding program under the level-dollar amortization schedule, net of any separately funded improvements, are shown in Tables 3 and 4.

1. Summary of Valuation

The projected TDC contribution for FY 2020 for the School Aid Formula is based on projected payroll for that participant population. The split of both the TRS and the TDC contributions is based on information provided by the state Education Department. The projected fire insurance premium tax shown in Table 2 was provided by the Department of Administration.

Comments on Valuation Results

Table 1 presents the development of the valuation results as of July 1, 2018 and, for comparison purposes, July 1, 2017. Based on the prior year's projections, the expected unfunded actuarial accrued liability as of July 1, 2018 was \$3.419 billion. The actual unfunded liability at the valuation date is \$3.280 billion, a decrease of \$0.139 billion.

The decrease in the unfunded liability was primarily due to the following:

- The return on assets for the year ending June 30, 2018 was approximately 9.5% on a market value basis and 7.9% on an actuarial value basis. The return on the actuarial value basis was slightly more than the prior year's valuation assumption of 7.50% and decreased the unfunded liability by approximately \$30 million.
- Contributions greater than expected decreased the unfunded liability by approximately \$28 million.
- The combined impact of turnover, mortality, and retirement experience decreased the unfunded liability by approximately \$81 million.

Tables 3 and 4 present projections of the unfunded accrued liability, net of any separately funded liability, to June 30, 2034. Table 3 illustrates the expected pattern of change in the unfunded liability over the remaining 16-year period. The unfunded liability is expected to decrease steadily to zero at the end of the period. Table 4 presents the expected funding progress toward the unfunded actuarial accrued liability based on the funding policy. This table illustrates the expected dollar amount of change in this component of the unfunded liability from year to year.

Table 5 presents a cash flow projection of expected asset balances, contributions, disbursements, and earnings over the period to FY 2034. Under the plan sponsor's funding policy of contributing the actuarially determined contribution, and under the assumption that there are no future experience gains or losses, future expected plan contributions are expected to decline as a percent of pay until the plan is fully funded, at which time they will decrease to a lower level percent of pay. The System's funded percentage is expected to increase and eventually reach 100%.

The valuation results were determined using an interest rate of 7.5% with an underlying inflation assumption of 3.0%.

Plan Membership

A summary of plan membership, with a comparison to the prior year, follows:

Group	July 1, 2018	July 1, 2017
Actives	33,174	34,318
Retirees & Beneficiaries	36,394	35,964
Terminated Vested	3,169	2,767
Terminated Non-Vested	<u>5,251</u>	<u>4,165</u>
Total	77,988	77,214

Table 8 presents a reconciliation of plan membership during the year. Table 9 presents detailed information on the categories of plan membership.

1. Summary of Valuation

Tables 10(a) and 10(b) present the number and total annual compensation of actives, separately for Teachers and Non-Teachers (including State), by 5-year age and service groups as of July 1, 2018.

Table 11 presents the number and average monthly benefits of retirees and beneficiaries included in the valuation distributed by 5-year age groups. Table 12 shows a similar distribution for terminated vested participants entitled to deferred benefits.

1. Summary of Valuation

Development of Valuation Results (000's omitted)

Valuation Date	July 1, 2018	July 1, 2017
1. Present Value of Future Benefits		
a. Active	\$ 4,378,868	\$ 4,532,839
b. Inactive - Retirees	7,155,087	7,014,986
- Disabled Retirees	209,250	210,930
- Beneficiaries	258,719	247,174
- Vested Terminated	138,028	147,079
- Non-Vested Terminated	<u>23,375</u>	<u>17,522</u>
c. Total	\$ 12,163,327	\$ 12,170,530
2. Actuarial Accrued Liability	\$ 10,778,022	\$ 10,727,223
3. Actuarial Value of Assets	<u>7,497,885</u>	<u>7,193,080</u>
4. Unfunded Actuarial Accrued Liability (UAL)	\$ 3,280,137	\$ 3,534,143
5. Annual Normal Cost Rate: Type 1 (Pre 7/1/1991 Group)		
a. Present Value of Future Normal Costs	\$ 50,845	\$ 64,321
b. Present Value of Future Pay	\$ 476,459	\$ 601,847
c. Normal Cost Rate as a % of Payroll	10.67%	10.69%
d. Employee share	6.00%	6.00%
e. Employer share	4.67%	4.69%
f. TRS FY 2019 (2018) Normal Cost Payroll	\$ 145,204	\$ 174,987
g. Employer FY 2019 (2018) Normal Cost (BOY)	\$ 6,781	\$ 8,207
h. TRS FY 2020 (2019) Normal Cost Payroll	\$ 117,783	\$ 144,916
i. Employer FY 2020 (2019) Normal Cost (BOY)	\$ 5,500	\$ 6,797
6. Annual Normal Cost Rate: Type 3 (Post 6/30/2005 Group)		
a. Present Value of Future Normal Costs	\$ 1,334,461	\$ 1,378,985
b. Present Value of Future Pay	\$ 12,608,072	\$ 12,982,697
c. Normal Cost Rate as a % of Payroll	10.58%	10.62%
d. Employee share	6.00%	6.00%
e. Employer share	4.58%	4.62%
f. TRS FY 2019 (2018) Normal Cost Payroll	\$ 1,259,382	\$ 1,282,156
g. Employer FY 2019 (2018) Normal Cost (BOY)	\$ 57,680	\$ 59,236
h. TRS FY 2020 (2019) Normal Cost Payroll	\$ 1,339,503	\$ 1,366,347
i. Employer FY 2020 (2019) Normal Cost (BOY)	\$ 61,349	\$ 63,125

1. Summary of Valuation

Table 1 (continued)
Development of Valuation Results (000's omitted)

Valuation Date	July 1, 2018	July 1, 2017
7. Employer Contribution for FY 2019 and FY 2020, (FY 2018 and FY 2019), assumes mid-year contribution:		
a. FY 2019 (2018)	<u>FY 2019</u>	<u>FY 2018</u>
i. TRS and TDC Payroll	\$ 1,534,725	\$ 1,587,715
ii. FY 2019 (2018) TRS Contribution		
A. Normal Cost	66,835	69,926
B. Amortization components:		
- Original UAL over 40 years as a level-dollar amount	<u>346,075</u>	<u>361,315</u>
C. Total	\$ 412,910	\$ 431,241
iii. FY 2019 (2018) Contribution as a % of Payroll	26.90%	27.16%
b. FY 2020 (2019)	<u>FY 2020</u>	<u>FY 2019</u>
i. TRS and TDC Payroll	\$ 1,583,837	\$ 1,638,522
ii. FY 2020 (2019) TRS Contribution		
A. Normal Cost	69,311	72,496
B. Amortization components:		
- Original UAL over 40 years as a level-dollar amount	<u>344,417</u>	<u>360,707</u>
C. Total	\$ 413,728	\$ 433,203
iii. FY 2020 (2019) Contribution as a % of Payroll	26.12%	26.44%
iv. FY 2020 (2019) SAF appropriation ¹	\$ 389,193	\$ 407,259
v. FY 2020 (2019) SAF appropriation as a % of Payroll	24.57%	24.86%

¹ The School Aid Formula retirement allocation includes the amount that the State appropriates for the Teachers Defined Contribution Plan and required payments toward the TRS Unfunded Actuarial Accrued Liabilities. It does NOT include amounts contributed to TRS by nonstate groups or the fire premium tax.

1. Summary of Valuation

Table 2

Development of School Aid Formula Appropriation for Fiscal Year 2020 (000's omitted)

TRS Contribution for FY 2020	\$ 413,728
+ 7.50% x School Aid Formula (TDC only) ¹	7,113
- 15.0% x County Portion of the Old Group TRS payroll ²	(4,535)
- 7.5% x County Portion of the New Group TRS payroll ³	(25,652)
- Fire Tax Per Code Section 33-3-14(d)	(2,991)
+ State payment equal to TDC forfeitures ⁴	<u>1,530</u>
Subtotal of Standard SAF Appropriation	\$ 389,193
Special Payments for Benefit Improvements under H.B. 3145	<u>-</u>
Total FY 2020 SAF Appropriation	\$ 389,193

¹ School Aid Formula for TDC only is 73.89% of FY 2020 TDC pay for County employees plus FY 2020 TDC pay for State employees = 73.89% x \$121,436 + \$5,115 = \$94,844.

² County portion of the Old Group TRS payroll is 26.11% of FY 2020 TRS pay for County employees = 26.11% x \$115,795 = \$30,234.

³ County portion of the New Group TRS payroll is 26.11% of FY 2020 TRS pay for County employees = 26.11% x \$1,309,970 = \$342,033.

⁴ Actual amount to be released from the TDC suspense account at 6/30/2018 per Code Section 18-7A-18a(b).

1. Summary of Valuation

Table 3
Projection of Unfunded Accrued Liability and Annual Contributions (000's omitted)

FY Ending 6/30	Unfunded AAL BOY ¹	Employer Normal Cost (MOY) ²		Projected Payroll			Total Type 1 Employer Contribution (MOY) ³		Total Type 3 Employer Contribution (MOY)	
		Type 1	Type 3	Type 1 TRS	Type 3 TRS	TRS+TDC	% of Payroll	Amount	% of Payroll	Amount
2019	\$ 3,280,137	\$ 7,047	\$ 65,449	\$ 145,204	\$ 1,259,382	\$ 1,534,725	23.96%	\$ 367,754	4.26%	\$ 65,449
2020	3,152,158	5,703	63,608	117,783	1,339,503	1,583,837	22.11%	350,120	4.02%	63,608
2021	3,031,471	4,694	67,209	96,944	1,415,335	1,634,519	21.36%	349,111	4.11%	67,209
2022	2,901,732	3,822	70,767	78,919	1,490,272	1,686,824	20.64%	348,239	4.20%	70,767
2023	2,762,263	3,047	74,330	62,933	1,565,284	1,740,802	19.96%	347,464	4.27%	74,330
2024	2,612,334	2,411	77,851	49,794	1,639,428	1,796,508	19.31%	346,828	4.33%	77,851
2025	2,451,160	1,881	81,373	38,850	1,713,593	1,853,996	18.68%	346,298	4.39%	81,373
2026	2,277,898	1,448	84,898	29,908	1,787,831	1,913,324	18.08%	345,865	4.44%	84,898
2027	2,091,641	1,099	88,447	22,688	1,862,576	1,974,551	17.50%	345,516	4.48%	88,447
2028	1,891,415	815	92,014	16,826	1,937,693	2,037,736	16.94%	345,232	4.52%	92,014
2029	1,676,172	594	95,629	12,270	2,013,823	2,102,944	16.41%	345,011	4.55%	95,629
2030	1,444,786	425	99,296	8,788	2,091,040	2,170,238	15.89%	344,842	4.58%	99,296
2031	1,196,046	300	103,038	6,179	2,169,858	2,239,686	15.39%	344,717	4.60%	103,038
2032	928,650	208	106,848	4,302	2,250,073	2,311,356	14.91%	344,625	4.62%	106,848
2033	641,200	141	110,750	2,906	2,332,249	2,385,319	14.44%	344,558	4.64%	110,750
2034	332,191	95	114,742	1,960	2,416,303	2,461,649	14.00%	344,512	4.66%	114,742

¹ Net of any separately funded liability for benefit increases.

² Net of member contributions.

³ Net of any amortization amounts for separately funded benefit increases.

1. Summary of Valuation

Table 4
Funding Progress of Unfunded Actuarial Accrued Liability Under Current Funding Policy (000's omitted)

FY Ending 6/30	Unfunded AAL BOY¹	Interest on Unfunded at 7.50%	MOY Contribution Toward Unfunded²	Unfunded Funding Progress³
2019	\$ 3,280,137	\$ 246,010	\$ 360,707	\$ 127,979
2020	3,152,158	236,412	344,417	120,687
2021	3,031,471	227,360	344,417	129,739
2022	2,901,732	217,630	344,417	139,469
2023	2,762,263	207,170	344,417	149,929
2024	2,612,334	195,925	344,417	161,174
2025	2,451,160	183,837	344,417	173,262
2026	2,277,898	170,842	344,417	186,257
2027	2,091,641	156,873	344,417	200,226
2028	1,891,415	141,856	344,417	215,243
2029	1,676,172	125,713	344,417	231,386
2030	1,444,786	108,359	344,417	248,740
2031	1,196,046	89,703	344,417	267,396
2032	928,650	69,649	344,417	287,450
2033	641,200	48,090	344,417	309,009
2034	332,191	24,914	344,417	332,185

¹ Net of any separately funded liability for benefit increases.

² Net of employer contribution toward normal cost and any separately funded benefit increases.

³ Equals (MOY Contribution) x 1.03682 - (Interest on Unfunded)

1. Summary of Valuation

Table 5
Cash Flow Projection FY 2019 Through FY 2034 (000's omitted)

FY Ending	MV Assets	Expected			Net Income	MV Assets
6/30	Beg. of Year	Contributions	Benefits	Earnings		End of Year
2019	\$ 7,720,609	\$ 517,478	\$ 871,739	\$ 566,001	\$ 211,740	\$ 7,932,349
2020	7,932,349	501,165	864,509	581,547	218,203	8,150,552
2021	8,150,552	507,057	878,913	597,599	225,743	8,376,295
2022	8,376,295	513,157	890,919	614,312	236,550	8,612,845
2023	8,612,845	519,487	899,697	631,963	251,753	8,864,598
2024	8,864,598	526,032	906,547	650,834	270,319	9,134,917
2025	9,134,917	532,818	911,999	671,157	291,976	9,426,893
2026	9,426,893	539,827	915,246	693,193	317,774	9,744,667
2027	9,744,667	547,079	917,667	717,204	346,616	10,091,283
2028	10,091,283	554,517	918,842	743,431	379,106	10,470,389
2029	10,470,389	562,206	919,974	772,105	414,337	10,884,726
2030	10,884,726	570,128	920,470	803,454	453,112	11,337,838
2031	11,337,838	578,317	920,679	837,731	495,369	11,833,207
2032	11,833,207	586,736	920,669	875,194	541,261	12,374,468
2033	12,374,468	595,417	920,519	916,114	591,012	12,965,480
2034	12,965,480	604,350	919,505	960,806	645,651	13,611,131

1. Summary of Valuation

Table 6a
Valuation Assets as of June 30, 2018 (000's omitted)

	June 30, 2018	June 30, 2017
Assets		
Cash with State Treasurer	\$ 851	\$ 77
Investments at Fair Value	7,691,788	7,259,593
Contributions Receivable	26,023	28,967
Participant Loans Receivable	2,070	2,204
Miscellaneous Revenue Receivable	-	-
Total Assets	<u>\$ 7,720,732</u>	<u>\$ 7,290,841</u>
Liabilities		
Accrued Expenses and Other Payables	<u>123</u>	<u>379</u>
Market Value of Assets	\$ 7,720,609	\$ 7,290,462
Adjustment for Deferred Gains / (Losses)	<u>222,724</u>	<u>97,382</u>
Actuarial Value of Assets	\$ 7,497,885	\$ 7,193,080

Table 6b
Four-Year Asset Smoothing as of June 30, 2018 (000's omitted)

FY Ending 6/30	Gain/(Loss) on Actuarial Value of Assets	Percent Deferred	Gain/(Loss) Deferred as of June 30, 2018	Gain/(Loss) Recognized for FY ending June 30, 2018
2018	\$ 152,152	75%	\$ 114,114	\$ 38,038
2017	479,349	50%	239,675	119,837
2016	(524,259)	25%	(131,065)	(131,065)
2015	-	0%	-	-
			<u>\$ 222,724</u>	<u>\$ 26,810</u>

1. Summary of Valuation

Table 7

Statement of Changes in Market Value of Assets for Year ended June 30, 2018 (000's omitted)

Market Value of Assets - Beginning of Year	\$	7,290,462
Post Valuation Adjustment		-
Market Value of Assets - After Adjustment	\$	7,290,462
Additions:		
Contributions:		
Member	\$	89,128
Employer		124,515
School Aid Formula		312,684
Make Up Contributions		-
Special Appropriations		34,638
Voluntary Special Contribution Members		-
Special Contribution Required Employers		-
Contribution Delinquency Fees		-
§33-3-14(d) Fees		-
Subtotal	\$	560,965
Investment Income:		
Net Appreciation in Fair Value ¹		657,226
Investment income		31,047
Subtotal	\$	688,273
Other Income		3,046
Total	\$	1,252,284
Deductions and Transfers:		
Benefit Expense	\$	806,511
Refunds of Contributions		9,591
Administrative Expenses		6,035
TDC to TRS Accounts for Transfers		-
Transfers to/(from) other plans		-
Total	\$	822,137
Net Increase	\$	430,147
Market Value of Assets - End of Year	\$	7,720,609
Investment Return for Year:		
Valuation purposes (assumes mid-year transactions and offsets investment income by investment and administrative expenses)		9.52%
Per Investment Management Board (time-weighted, excluding administrative expense)		9.7%

¹ Net of Investment Expense

1. Summary of Valuation

Table 8
Reconciliation of Plan Participants

	Active	Non-Vested Terms	Vested Terms	Service Retirees	Disabled Retirees	Beneficiaries	Total
Census as of July 1, 2017	34,318	4,165	2,767	31,126	2,196	2,642	77,214
New Entrants	2,019	375	-	-	-	225	2,619
Returned to Active Status	807	(273)	(534)	-	-	-	-
Terminated Non-Vested	(1,291)	1,291	-	-	-	-	-
Terminated Vested	(1,250)	-	1,250	-	-	-	-
Withdrew Contributions	(191)	(242)	(128)	-	-	-	(561)
Retired	(1,148)	-	(143)	1,291	-	-	-
Disabled	(49)	-	(26)	-	75	-	-
Deceased	(40)	(16)	(37)	(930)	(93)	(137)	(1,253)
Certain Period Expired	-	-	-	-	-	(5)	(5)
Adjustments	(1)	(49)	20	4	-	-	(26)
Census as of July 1, 2018	33,174	5,251	3,169	31,491	2,178	2,725	77,988

1. Summary of Valuation

Table 9
Summary of Membership

	July 1, 2018 Valuation	July 1, 2017 Valuation
Active Members:		
Teachers	19,623	23,137
Non-Teachers (including State)	13,551	11,181
Total	<u>33,174</u>	<u>34,318</u>
Inactive Members:		
Service Retirees	31,491	31,126
Disabled Retirees	2,178	2,196
Beneficiaries	2,725	2,642
Vested Terminated	3,169	2,767
Non-Vested Terminated	5,251	4,165
Total	<u>44,814</u>	<u>42,896</u>
Total Members	77,988	77,214

1. Summary of Valuation

Table 10(a)
Distribution of the Number and Total Annual Compensation of Active Teachers as of July 1, 2018

Attained Age	Years of Eligibility Service												Total Count / Total Comp		
	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 & over						
Under 25	Count / Total Comp 433 15,946,005														Count / Total Comp 433 15,946,005
25 - 29	Count / Total Comp 1,697 66,401,673	Count / Total Comp 418 17,838,592													Count / Total Comp 2,115 84,240,264
30 - 34	Count / Total Comp 840 33,876,985	Count / Total Comp 1,550 69,499,500	Count / Total Comp 338 16,147,857	Count / Total Comp 63,997											Count / Total Comp 2,729 119,588,339
35 - 39	Count / Total Comp 673 28,091,261	Count / Total Comp 958 44,224,380	Count / Total Comp 1,321 65,672,226	Count / Total Comp 133 6,979,266	Count / Total Comp 1 47,231										Count / Total Comp 3,086 145,014,365
40 - 44	Count / Total Comp 535 22,702,015	Count / Total Comp 643 30,454,939	Count / Total Comp 765 39,017,274	Count / Total Comp 566 30,647,802	Count / Total Comp 68 3,960,153										Count / Total Comp 2,577 126,782,183
45 - 49	Count / Total Comp 419 17,906,006	Count / Total Comp 532 25,001,148	Count / Total Comp 586 29,816,876	Count / Total Comp 477 26,332,173	Count / Total Comp 417 24,428,842	Count / Total Comp 80 4,819,987									Count / Total Comp 2,511 128,305,031
50 - 54	Count / Total Comp 280 12,619,644	Count / Total Comp 354 17,200,443	Count / Total Comp 427 22,244,709	Count / Total Comp 319 17,696,006	Count / Total Comp 293 17,435,042	Count / Total Comp 436 26,643,334	Count / Total Comp 246 15,602,578								Count / Total Comp 2,355 129,441,758
55 - 59	Count / Total Comp 188 8,801,362	Count / Total Comp 256 12,724,882	Count / Total Comp 310 16,030,877	Count / Total Comp 276 15,143,372	Count / Total Comp 200 11,750,740	Count / Total Comp 290 17,821,784	Count / Total Comp 477 31,385,902	Count / Total Comp 165 11,248,132	Count / Total Comp 1 68,064						Count / Total Comp 2,163 124,975,115
60 - 64	Count / Total Comp 90 4,317,677	Count / Total Comp 135 6,981,288	Count / Total Comp 172 9,326,637	Count / Total Comp 174 9,823,854	Count / Total Comp 128 7,462,298	Count / Total Comp 107 6,486,878	Count / Total Comp 134 8,914,932	Count / Total Comp 182 12,326,395	Count / Total Comp 73 5,108,166						Count / Total Comp 1,195 70,748,126
65 - 69	Count / Total Comp 30 1,638,831	Count / Total Comp 46 2,390,187	Count / Total Comp 53 2,737,180	Count / Total Comp 52 2,911,358	Count / Total Comp 31 1,854,654	Count / Total Comp 37 2,385,748	Count / Total Comp 33 2,438,440	Count / Total Comp 24 1,884,243	Count / Total Comp 68 4,947,895						Count / Total Comp 374 23,188,537
70 & over	Count / Total Comp 8 361,356	Count / Total Comp 12 609,048	Count / Total Comp 12 634,957	Count / Total Comp 4 200,436	Count / Total Comp 3 199,836	Count / Total Comp 9 526,246	Count / Total Comp 17 1,065,906	Count / Total Comp 6 358,108	Count / Total Comp 14 996,684						Count / Total Comp 85 4,952,578
Total	Count / Total Comp 5,193 212,662,814	Count / Total Comp 4,904 226,924,407	Count / Total Comp 3,984 201,628,595	Count / Total Comp 2,002 109,798,264	Count / Total Comp 1,141 67,138,796	Count / Total Comp 959 58,683,977	Count / Total Comp 907 59,407,759	Count / Total Comp 377 25,816,878	Count / Total Comp 156 11,120,809						Count / Total Comp 19,623 973,182,300

1. Summary of Valuation

**Table 10(b)
Distribution of the Number and Total Annual Compensation of Active Non-Teachers (including State Employees) as of July 1, 2018**

Attained Age	Years of Eligibility Service										Total Count / Total Comp	
	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 & over			
Under 25	Count / Total Comp 115 / 2,850,318											Count / Total Comp 115 / 2,850,318
25 - 29	Count / Total Comp 294 / 7,213,040	Count / Total Comp 50 / 1,502,270										Count / Total Comp 344 / 8,715,310
30 - 34	Count / Total Comp 337 / 8,651,125	Count / Total Comp 179 / 6,445,258	Count / Total Comp 51 / 2,225,142	Count / Total Comp 1 / 37,261								Count / Total Comp 568 / 17,358,786
35 - 39	Count / Total Comp 482 / 11,644,713	Count / Total Comp 267 / 8,514,345	Count / Total Comp 200 / 8,812,791	Count / Total Comp 29 / 1,635,607								Count / Total Comp 978 / 30,607,457
40 - 44	Count / Total Comp 616 / 14,816,265	Count / Total Comp 487 / 13,821,666	Count / Total Comp 286 / 10,341,351	Count / Total Comp 130 / 6,300,008	Count / Total Comp 18 / 844,873							Count / Total Comp 1,537 / 46,124,162
45 - 49	Count / Total Comp 660 / 15,987,981	Count / Total Comp 599 / 16,962,899	Count / Total Comp 510 / 16,378,124	Count / Total Comp 214 / 8,268,162	Count / Total Comp 126 / 6,469,455	Count / Total Comp 19 / 939,751	Count / Total Comp 2 / 94,439					Count / Total Comp 2,130 / 65,100,810
50 - 54	Count / Total Comp 538 / 13,179,802	Count / Total Comp 601 / 16,681,606	Count / Total Comp 628 / 19,229,999	Count / Total Comp 319 / 11,053,460	Count / Total Comp 186 / 7,780,487	Count / Total Comp 132 / 7,267,429	Count / Total Comp 96 / 5,428,476	Count / Total Comp 7 / 367,322				Count / Total Comp 2,507 / 80,988,582
55 - 59	Count / Total Comp 449 / 10,671,353	Count / Total Comp 535 / 14,281,040	Count / Total Comp 535 / 16,062,182	Count / Total Comp 426 / 13,990,126	Count / Total Comp 323 / 12,066,906	Count / Total Comp 168 / 7,332,364	Count / Total Comp 155 / 8,848,502	Count / Total Comp 113 / 6,835,913	Count / Total Comp 5 / 304,443			Count / Total Comp 2,709 / 90,392,830
60 - 64	Count / Total Comp 281 / 6,786,512	Count / Total Comp 319 / 8,764,993	Count / Total Comp 364 / 10,844,459	Count / Total Comp 307 / 10,106,532	Count / Total Comp 257 / 9,179,217	Count / Total Comp 135 / 5,732,843	Count / Total Comp 103 / 5,373,472	Count / Total Comp 82 / 4,658,699	Count / Total Comp 40 / 2,577,655			Count / Total Comp 1,888 / 64,024,382
65 - 69	Count / Total Comp 75 / 1,887,031	Count / Total Comp 117 / 3,019,683	Count / Total Comp 103 / 3,084,744	Count / Total Comp 84 / 2,720,914	Count / Total Comp 69 / 2,447,385	Count / Total Comp 40 / 1,582,058	Count / Total Comp 32 / 1,448,484	Count / Total Comp 16 / 752,143	Count / Total Comp 24 / 1,524,021			Count / Total Comp 560 / 18,466,464
70 & over	Count / Total Comp 25 / 567,083	Count / Total Comp 45 / 1,279,178	Count / Total Comp 58 / 1,563,205	Count / Total Comp 27 / 809,396	Count / Total Comp 17 / 658,627	Count / Total Comp 13 / 464,758	Count / Total Comp 6 / 259,679	Count / Total Comp 12 / 459,706	Count / Total Comp 12 / 713,113			Count / Total Comp 215 / 6,774,747
Total	Count / Total Comp 3,872 / 94,255,223	Count / Total Comp 3,199 / 91,272,937	Count / Total Comp 2,735 / 88,541,999	Count / Total Comp 1,537 / 54,921,467	Count / Total Comp 996 / 39,446,951	Count / Total Comp 507 / 23,319,202	Count / Total Comp 394 / 21,453,053	Count / Total Comp 230 / 13,073,784	Count / Total Comp 81 / 5,119,232			Count / Total Comp 81 / 431,403,847

1. Summary of Valuation

Table 11
Distribution of the Number and Average Monthly Benefits of Retired Participants as of July 1, 2018

Current Age	Service Retirees			Disabled Retirees			Beneficiaries			Total		
	Count	Avg. Age	Avg. Mo. Benefit	Count	Avg. Age	Avg. Mo. Benefit	Count	Avg. Age	Avg. Mo. Benefit	Count	Avg. Age	Avg. Mo. Benefit
under 35	-	-	-	-	-	-	13	29	1,163	13	29	1,163
35 - 39	-	-	-	4	37	796	7	38	1,367	11	37	1,159
40 - 44	-	-	-	9	42	754	24	42	886	33	42	850
45 - 49	-	-	-	27	47	683	41	47	774	68	47	738
50 - 54	13	53	1,919	97	53	1,022	66	52	789	176	53	1,001
55 - 59	1,082	58	3,072	232	57	1,071	109	57	1,084	1,423	57	2,593
60 - 64	4,772	62	2,618	474	62	1,046	231	62	1,200	5,477	62	2,422
65 - 69	8,797	67	2,397	530	67	988	396	67	1,336	9,723	67	2,277
70 - 74	6,570	72	2,028	427	72	911	408	72	1,157	7,405	72	1,915
75 - 79	4,228	77	1,624	262	77	743	437	77	1,062	4,927	77	1,528
80 - 84	2,968	82	1,273	75	81	559	392	82	877	3,435	82	1,213
85 - 89	1,926	87	1,068	25	87	404	339	87	795	2,290	87	1,020
90 - 94	869	92	949	13	91	396	197	92	701	1,079	92	897
95 & over	266	97	828	3	96	393	65	97	559	334	97	772
Total	31,491	72	2,032	2,178	67	935	2,725	75	1,020	36,394	72	1,891
Total Annual Benefits			767,999,151			24,444,400			33,338,122			825,781,673

1. Summary of Valuation

Table 12
Distribution of the Number and Average Monthly Benefits
of Participants Entitled to Deferred Benefits as of July 1, 2018

Current Age	Deferred Vested		
	Count	Avg. Age	Avg. Mo. Benefit
under 35	439	32	450
35 - 39	449	37	558
40 - 44	329	42	629
45 - 49	412	47	677
50 - 54	499	52	795
55 - 59	621	57	814
60 - 64	325	61	610
65 - 69	85	66	631
70 - 74	8	71	791
75 - 79	2	77	306
80 & over	-	-	-
Total	3,169	48	661
Total Annual Benefits			25,136,130

2. Summary of Plan Provisions

System Name

The State Teachers' Retirement System (TRS)

Effective Date

Originally enacted effective July 1, 1941.

Member

Membership includes any employee hired before July 1991, or on or after July 1, 2005, in the public schools, state institutions of higher education, certain state departments, and the Board of Regents, and members of the Teachers' Defined Contribution Plan (TDC) who elected to transfer at July 1 or August 1, 2008. Other members of TDC or TIAA-CREF are not eligible for TRS.

Tier 2 provisions apply for employees who are hired for the first time on or after July 1, 2015.

Final Average Salary

Final Average Salary is the average of the member's 5 highest fiscal years of total earnings from covered employment during the member's last 15 years of service.

Contributions

Member Contributions

Members contribute 6.0% of their pay to the retirement system.

Employer Contributions – State

- 15.0% of the payroll of State-employed members,
- 15.0% of School Aid Formula (SAF) covered payroll of county-employed members,
- 7.5% of SAF-covered payroll of members of the TDC Plan,
- a certain percentage of fire insurance premiums paid by state residents, and
- under Code Section 18-9-A-6a, beginning in fiscal year 1996, an amount determined by the State Actuary as being needed to eliminate the TRS Unfunded Liability within 40 years of June 30, 1994.

Employer Contributions – County

15.0% of the payroll of TRS members hired before July 1, 1991 and 7.5% of the payroll for TRS members hired on or after July 1, 2005, and prior TDC members who transferred into TRS at July 1, 2008 or August 1, 2008, who are employed by county boards of education, which is not covered under the School Aid Formula.

Service

Credited Service

Credited Service is granted for each day the member performs work and contributes to the System. At most one year of Credited Service may be earned in any one school year. Credited Service may be granted under certain guidelines for other State employment, for military service, and for out-of-state teaching service.

Contributory Service

Service credited for years in which a member contributes to the retirement system. Contributory service is counted for both eligibility and benefit determination.

Military Service

For Tier 1 members, in a period when a federal Selective Service Act was in effect, Active service in the U.S. military up to 25% of the amount of a member's Contributory Service (but not more than 10 years) will be counted for both eligibility and benefit determination under the retirement system.

2. Summary of Plan Provisions

Tier 2 members may purchase up to 5 years of active military service with the Armed Forces or National Guard.

Purchased Service

Service in parochial school or with other states' teacher retirement systems may count for benefits (but not eligibility), provided that the member pays TRS double the amount contributed during the first year of employment times the number of years credited plus interest and cashes out his rights to any future benefits under his prior retirement system.

Unused Leave

A Tier 1 retiring member may choose to receive pension credited service for days of sick or annual leave unused at the time of retirement. Credited Service is granted at the rate of twice the actual number of unused days.

Tier 2 members are not eligible to apply unused sick or annual leave for additional credited service.

Service Retirement

Eligibility

A Tier 1 member may retire with an unreduced pension (1) at any age with 35 years of Credited Service, or (2) at age 60 with 5 years of Credited Service. A Tier 1 member may retire with 30 years of Credited Service at any age, with the pension reduced actuarially if retiring before age 55.

A Tier 2 member may retire with an unreduced pension at age 62 with 10 years of Credited Service. A Tier 2 member may retire (1) at age 60 with 10 years of Credited Service, (2) at age 57 with 20 years of Credited Service, or (3) at age 55 with 30 years of Credited Service, with the pension reduced actuarially if retiring before age 62.

Amount

The normal form of benefit is a single life annuity paid monthly, in an amount equal to 2.0% of Final Average Salary times years of Credited Service. Other forms of benefit may be elected, subject to actuarial reduction, including a cash refund annuity, 50% or 100% joint and survivor annuities, and a 10-year certain and life annuity.

Disability Retirement

Eligibility

A member may be eligible to receive a disability retirement benefit after completing 10 years of Credited Service, if the member is disabled for 6 months, unable to perform his regular occupation and the Retirement Board expects the disability to be permanent.

Amount

An annual disability benefit amount, payable monthly as a cash refund annuity, is equal to 2.0% of the member's Final Average Salary times the total years of Credited Service to date of disability.

Deferred Vested Benefit

Eligibility

A Tier 1 member leaving employment with 5 years of Contributory Service may elect to receive either a refund of contributions or a deferred pension commencing at age 62. If a member has 20 years of Contributory Service, the deferral age is age 60.

A Tier 2 member leaving employment with 10 years of Contributory Service may elect to receive either a refund of contributions or a deferred pension commencing at age 64. If a member has 20 years of Contributory Service, the deferral age is age 63.

2. Summary of Plan Provisions

Amount

An annuity defined as described under "Service Retirement."

Pre-Retirement Death Benefits

Eligibility

The surviving spouse of a deceased member who had attained age 50 and completed 25 years of Credited Service is eligible for the Surviving Spouse Benefit. If a member dies prior to attaining age 50 or completing 25 years of Credited Service a Lump Sum Death Benefit is payable to the beneficiary.

Amount

To the Surviving Spouse

The surviving spouse receives an annuity payable as if the member had retired on the date of death with a 100% joint and survivor pension.

Lump Sum Death Benefit

The sum of the accumulated member contributions with interest and accumulated member contributions without interest is paid to the member's beneficiary or estate.

Refund of Contributions

Eligibility

A member who leaves employment and is not eligible for any other benefit will receive a refund of his contributions to the retirement system.

Amount

A lump sum of the member's accumulated contributions, with compound interest computed on any contributed amount from the end of the fiscal year in which contributed to the date of distribution of the lump sum (but in no case beyond 5 years after the end of the fiscal year during which the member left service). For purposes of this benefit, interest is computed at a 4.0% annual rate.

Post-Retirement Cost-of-Living Adjustments

Ad hoc cost-of-living increases in pensions are periodically granted by the State Legislature. However, the retirement system makes no automatic provision for such increases.

- Effective July 1, 2001 retirees age 65 and over who were retired for at least 5 years received a percentage increase in benefits as follows:
 - Eligible retirees age 65 to age 70 received a 5% increase, and
 - Eligible retirees over age 70 received a 10% increase.

However, if the retiree originally retired under an early retirement window the percentage increase was limited to 3%.

- Effective July 1, 2006, retirees age 70 and over who were retired for at least 5 years received a 3% increase in retirement benefits.
- Effective July 1, 2008, all retirees and applicable beneficiaries thereof who retired with 20 or more years of service and are receiving a primary retiree pension of \$600 or less per month received a thirteenth check single payment of \$600.
- Effective July 1, 2011, a select group of retirees received a thirteenth check single payment of \$1,200.

3. Actuarial Assumptions and Methods

Valuation Date

July 1, 2018

Funding Method

The valuation is prepared under the Entry Age Normal Cost Method with individually computed accrued liabilities. The Normal Cost is computed in aggregate. Entry is based on adjusted date of hire (i.e. valuation date minus known past service).

Basis for Assumptions

Experience studies are performed at least once in every 5-year period. This valuation was prepared on the basis of assumptions that were recommended to and adopted by the Board based on the experience study covering the period from July 1, 2010, to June 30, 2015. These assumptions will remain in effect for valuation purposes until such time as the Board adopts revised assumptions.

Interest Rate and Expenses

The valuation interest assumption is 7.5% per annum, with no loading for system expenses.

Salary Scales

The salary scales are shown in the Appendix. Salary scales include an assumed underlying inflation rate of 3.00%. The ranges of projected salary increases are as follows:

- Teachers 3.00% to 6.00% per year
- Non-Teachers 3.00% to 6.50% per year

Pre-Retirement Mortality

RP-2000 Non-Annuitant table, projected with Scale AA on a fully generational basis

Post-Retirement Mortality

- Healthy males 97% of RP-2000 Healthy Annuitant table, projected with Scale AA on a fully generational basis
- Healthy females 94% of RP-2000 Healthy Annuitant table, projected with Scale AA on a fully generational basis
- Disabled males 96% of RP-2000 Disabled Annuitant table, projected with Scale AA on a fully generational basis
- Disabled females 101% of RP-2000 Disabled Annuitant table, projected with Scale AA on a fully generational basis

Withdrawal from Service

Withdrawal rates are shown in the Appendix. Withdrawal rates are assumed to cease upon eligibility for retirement. All withdrawal is assumed to result in refund of contributions if non-vested or a deferred annuity if vested.

Disablement Rates

Disablement rates are shown in the Appendix.

Retirement Rates

Retirement rates are shown in the Appendix.

3. Actuarial Assumptions and Methods

Family Composition

It is assumed that 85% of males and 80% of females are married, with husbands 3 years older than wives. Remarriage rates are not used.

Accrual of Future Service

It is assumed that all active members will accrue 1 year of service for each future year of employment.

Noncontributory Service Loadings

The load factor assumptions for non-contributory service (military, parochial or out-of-state teaching, transferred PERS service, and unused sick leave) are as follows:

	<u>Tier 1</u>	<u>Tier 2</u>
• Male – Teachers	7.75%	0.50%
• Male – Non-Teachers	4.50%	0.50%
• Female – Teachers	4.50%	0.00%
• Female – Non-Teachers	3.25%	0.00%

Asset Valuation Method

4-year 25% level smoothing of actuarial gain or (loss) on trust fund return:

- Implemented over 4 years, prospectively commencing July 1, 2016 for the experience for the trust year ending June 30, 2016.
- Actuarial gain or (loss) on assets is calculated as the difference between the expected return under valuation assumptions based on the smoothed Actuarial Value of Assets and the actual trust fund return.
- Actuarial gain or (loss) is recognized at 25% of the original amount each year until fully recognized in the fourth year.
- Total accumulated deferred gain or (loss) amounts are used to adjust the reported Market Value of Assets to determine the Actuarial Value of Assets.

System Contributions

Both employee and employer contributions to the System are assumed to be paid in the middle of the year.

Appendix – Detailed Assumptions

Salary Scales

Age	Teachers	Non-Teachers and State	Age	Teachers	Non-Teachers and State
19	6.000%	6.500%	45	4.286%	4.474%
20	6.000	6.500	46	4.200	4.400
21	6.000	6.500	47	4.114	4.326
22	6.000	6.375	48	4.029	4.253
23	6.000	6.250	49	3.943	4.179
24	6.000	6.125	50	3.857	4.105
25	6.000	6.000	51	3.771	4.032
26	5.914	5.900	52	3.686	3.958
27	5.829	5.800	53	3.600	3.884
28	5.743	5.726	54	3.565	3.811
29	5.657	5.653	55	3.529	3.737
30	5.571	5.579	56	3.494	3.663
31	5.486	5.505	57	3.459	3.589
32	5.400	5.432	58	3.424	3.516
33	5.314	5.358	59	3.388	3.442
34	5.229	5.284	60	3.353	3.368
35	5.143	5.211	61	3.318	3.295
36	5.057	5.137	62	3.282	3.221
37	4.971	5.063	63	3.247	3.147
38	4.886	4.989	64	3.212	3.074
39	4.800	4.916	65	3.176	3.000
40	4.714	4.842	66	3.141	3.000
41	4.629	4.768	67	3.106	3.000
42	4.543	4.695	68	3.071	3.000
43	4.457	4.621	69	3.035	3.000
44	4.371	4.547	70	3.000	3.000

Appendix – Detailed Assumptions

Withdrawal Rates for Teachers (less than 1 year)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.15000	0.15000	36	0.23000	0.23000	53	0.32714	0.32714
20	0.15000	0.15000	37	0.23571	0.23571	54	0.33286	0.33286
21	0.15000	0.15000	38	0.24143	0.24143	55	0.33857	0.33857
22	0.15000	0.15000	39	0.24714	0.24714	56	0.34429	0.34429
23	0.15571	0.15571	40	0.25286	0.25286	57	0.35000	0.35000
24	0.16143	0.16143	41	0.25857	0.25857	58	0.35000	0.35000
25	0.16714	0.16714	42	0.26429	0.26429	59	0.35000	0.35000
26	0.17286	0.17286	43	0.27000	0.27000	60	0.35000	0.35000
27	0.17857	0.17857	44	0.27571	0.27571	61	0.35000	0.35000
28	0.18429	0.18429	45	0.28143	0.28143	62	0.35000	0.35000
29	0.19000	0.19000	46	0.28714	0.28714	63	0.35000	0.35000
30	0.19571	0.19571	47	0.29286	0.29286	64	0.35000	0.35000
31	0.20143	0.20143	48	0.29857	0.29857	65	0.35000	0.35000
32	0.20714	0.20714	49	0.30429	0.30429	66	0.35000	0.35000
33	0.21286	0.21286	50	0.31000	0.31000	67	0.35000	0.35000
34	0.21857	0.21857	51	0.31571	0.31571	68	0.35000	0.35000
35	0.22429	0.22429	52	0.32143	0.32143	69	0.35000	0.35000

Withdrawal Rates for Teachers (1 to 2 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.13860	0.11000	36	0.12316	0.09800	53	0.10441	0.08343
20	0.13860	0.11000	37	0.12206	0.09714	54	0.10331	0.08257
21	0.13860	0.11000	38	0.12095	0.09629	55	0.10221	0.08171
22	0.13860	0.11000	39	0.11985	0.09543	56	0.10110	0.08086
23	0.13750	0.10914	40	0.11875	0.09457	57	0.10000	0.08000
24	0.13639	0.10829	41	0.11765	0.09371	58	0.10000	0.08000
25	0.13529	0.10743	42	0.11654	0.09286	59	0.10000	0.08000
26	0.13419	0.10657	43	0.11544	0.09200	60	0.10000	0.08000
27	0.13309	0.10571	44	0.11434	0.09114	61	0.10000	0.08000
28	0.13198	0.10486	45	0.11323	0.09029	62	0.10000	0.08000
29	0.13088	0.10400	46	0.11213	0.08943	63	0.10000	0.08000
30	0.12978	0.10314	47	0.11103	0.08857	64	0.10000	0.08000
31	0.12867	0.10229	48	0.10993	0.08771	65	0.10000	0.08000
32	0.12757	0.10143	49	0.10882	0.08686	66	0.10000	0.08000
33	0.12647	0.10057	50	0.10772	0.08600	67	0.10000	0.08000
34	0.12537	0.09971	51	0.10662	0.08514	68	0.10000	0.08000
35	0.12426	0.09886	52	0.10551	0.08429	69	0.10000	0.08000

Appendix – Detailed Assumptions

Withdrawal Rates for Teachers (2 to 3 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.10000	0.10000	36	0.06550	0.06200	53	0.06500	0.05000
20	0.10000	0.10000	37	0.06500	0.06000	54	0.06500	0.05000
21	0.10000	0.10000	38	0.06500	0.05800	55	0.06500	0.05000
22	0.10000	0.10000	39	0.06500	0.05600	56	0.06500	0.05000
23	0.09400	0.09600	40	0.06500	0.05400	57	0.06500	0.05000
24	0.08800	0.09200	41	0.06500	0.05200	58	0.06500	0.05000
25	0.08200	0.08800	42	0.06500	0.05000	59	0.06500	0.05000
26	0.07600	0.08400	43	0.06500	0.05000	60	0.06500	0.05000
27	0.07000	0.08000	44	0.06500	0.05000	61	0.06500	0.05000
28	0.06950	0.07800	45	0.06500	0.05000	62	0.06500	0.05000
29	0.06900	0.07600	46	0.06500	0.05000	63	0.06500	0.05000
30	0.06850	0.07400	47	0.06500	0.05000	64	0.06500	0.05000
31	0.06800	0.07200	48	0.06500	0.05000	65	0.06500	0.05000
32	0.06750	0.07000	49	0.06500	0.05000	66	0.06500	0.05000
33	0.06700	0.06800	50	0.06500	0.05000	67	0.06500	0.05000
34	0.06650	0.06600	51	0.06500	0.05000	68	0.06500	0.05000
35	0.06600	0.06400	52	0.06500	0.05000	69	0.06500	0.05000

Withdrawal Rates for Teachers (3 to 4 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.08000	0.08000	36	0.05200	0.05000	53	0.03000	0.05000
20	0.08000	0.08000	37	0.04900	0.05000	54	0.03000	0.05000
21	0.08000	0.08000	38	0.04600	0.05000	55	0.03000	0.05000
22	0.08000	0.08000	39	0.04300	0.05000	56	0.03000	0.05000
23	0.08000	0.07600	40	0.04000	0.05000	57	0.03000	0.05000
24	0.08000	0.07200	41	0.03800	0.05000	58	0.03000	0.05000
25	0.08000	0.06800	42	0.03600	0.05000	59	0.03000	0.05000
26	0.07600	0.06400	43	0.03400	0.05000	60	0.03000	0.05000
27	0.07200	0.06000	44	0.03200	0.05000	61	0.03000	0.05000
28	0.06800	0.05600	45	0.03000	0.05000	62	0.03000	0.05000
29	0.06400	0.05200	46	0.03000	0.05000	63	0.03000	0.05000
30	0.06000	0.05133	47	0.03000	0.05000	64	0.03000	0.05000
31	0.05900	0.05067	48	0.03000	0.05000	65	0.03000	0.05000
32	0.05800	0.05000	49	0.03000	0.05000	66	0.03000	0.05000
33	0.05700	0.05000	50	0.03000	0.05000	67	0.03000	0.05000
34	0.05600	0.05000	51	0.03000	0.05000	68	0.03000	0.05000
35	0.05500	0.05000	52	0.03000	0.05000	69	0.03000	0.05000

Appendix – Detailed Assumptions

Withdrawal Rates for Teachers (4 to 5 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.06000	0.06000	36	0.04390	0.04200	53	0.02860	0.02250
20	0.06000	0.06000	37	0.04300	0.04001	54	0.02770	0.02250
21	0.06000	0.06000	38	0.04210	0.03800	55	0.02680	0.02250
22	0.06000	0.06000	39	0.04120	0.03600	56	0.02590	0.02250
23	0.06000	0.06000	40	0.04030	0.03401	57	0.02500	0.02250
24	0.06000	0.06000	41	0.03940	0.03200	58	0.02500	0.02250
25	0.06000	0.06000	42	0.03850	0.03000	59	0.02500	0.02250
26	0.05600	0.06000	43	0.03760	0.03000	60	0.02500	0.02250
27	0.05200	0.06000	44	0.03670	0.03000	61	0.02500	0.02250
28	0.05110	0.05801	45	0.03580	0.03000	62	0.02500	0.02250
29	0.05020	0.05600	46	0.03490	0.02850	63	0.02500	0.02250
30	0.04930	0.05400	47	0.03400	0.02700	64	0.02500	0.02250
31	0.04840	0.05201	48	0.03310	0.02550	65	0.02500	0.02250
32	0.04750	0.05000	49	0.03220	0.02400	66	0.02500	0.02250
33	0.04660	0.04800	50	0.03130	0.02250	67	0.02500	0.02250
34	0.04570	0.04601	51	0.03040	0.02250	68	0.02500	0.02250
35	0.04480	0.04400	52	0.02950	0.02250	69	0.02500	0.02250

Withdrawal Rates for Teachers (greater than 5 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.03200	0.03200	36	0.02141	0.01920	53	0.01440	0.01040
20	0.03200	0.03200	37	0.02082	0.01840	54	0.01520	0.01120
21	0.03120	0.03120	38	0.02022	0.01760	55	0.01600	0.01200
22	0.03040	0.03040	39	0.01963	0.01680	56	0.01600	0.01200
23	0.02960	0.02960	40	0.01904	0.01600	57	0.01600	0.01200
24	0.02880	0.02880	41	0.01843	0.01520	58	0.01600	0.01200
25	0.02800	0.02800	42	0.01782	0.01440	59	0.01600	0.01200
26	0.02720	0.02720	43	0.01722	0.01360	60	0.01600	0.01200
27	0.02640	0.02640	44	0.01661	0.01280	61	0.01600	0.01200
28	0.02560	0.02560	45	0.01600	0.01200	62	0.01600	0.01200
29	0.02480	0.02480	46	0.01520	0.01120	63	0.01600	0.01200
30	0.02400	0.02400	47	0.01440	0.01040	64	0.01600	0.01200
31	0.02360	0.02320	48	0.01360	0.00960	65	0.01600	0.01200
32	0.02320	0.02240	49	0.01280	0.00880	66	0.01600	0.01200
33	0.02280	0.02160	50	0.01200	0.00800	67	0.01600	0.01200
34	0.02240	0.02080	51	0.01280	0.00880	68	0.01600	0.01200
35	0.02200	0.02000	52	0.01360	0.00960	69	0.01600	0.01200

Appendix – Detailed Assumptions

Withdrawal Rates for Non-Teachers and State (less than 1 year)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.18000	0.24750	36	0.14160	0.19470	53	0.10080	0.13860
20	0.18000	0.24750	37	0.13920	0.19140	54	0.09840	0.13530
21	0.17760	0.24420	38	0.13680	0.18810	55	0.09600	0.13200
22	0.17520	0.24090	39	0.13440	0.18480	56	0.09360	0.12870
23	0.17280	0.23760	40	0.13200	0.18150	57	0.09120	0.12540
24	0.17040	0.23430	41	0.12960	0.17820	58	0.08880	0.12210
25	0.16800	0.23100	42	0.12720	0.17490	59	0.08640	0.11880
26	0.16560	0.22770	43	0.12480	0.17160	60	0.08400	0.11550
27	0.16320	0.22440	44	0.12240	0.16830	61	0.08400	0.11550
28	0.16080	0.22110	45	0.12000	0.16500	62	0.08400	0.11550
29	0.15840	0.21780	46	0.11760	0.16170	63	0.08400	0.11550
30	0.15600	0.21450	47	0.11520	0.15840	64	0.08400	0.11550
31	0.15360	0.21120	48	0.11280	0.15510	65	0.08400	0.11550
32	0.15120	0.20790	49	0.11040	0.15180	66	0.08400	0.11550
33	0.14880	0.20460	50	0.10800	0.14850	67	0.08400	0.11550
34	0.14640	0.20130	51	0.10560	0.14520	68	0.08400	0.11550
35	0.14400	0.19800	52	0.10320	0.14190	69	0.08400	0.11550

Withdrawal Rates for Non-Teachers and State (1 to 2 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.13000	0.17550	36	0.09600	0.08640	53	0.06000	0.05400
20	0.13000	0.17550	37	0.09200	0.08280	54	0.06000	0.05400
21	0.12800	0.17280	38	0.08800	0.07920	55	0.06000	0.05400
22	0.12600	0.17010	39	0.08400	0.07560	56	0.05800	0.05220
23	0.12400	0.16740	40	0.08000	0.07200	57	0.05600	0.05040
24	0.12200	0.16470	41	0.07800	0.07020	58	0.05400	0.04860
25	0.12000	0.16200	42	0.07600	0.06840	59	0.05200	0.04680
26	0.11800	0.15930	43	0.07400	0.06660	60	0.05000	0.04500
27	0.11600	0.15660	44	0.07200	0.06480	61	0.05000	0.04500
28	0.11400	0.14436	45	0.07000	0.06300	62	0.05000	0.04500
29	0.11200	0.13212	46	0.06800	0.06120	63	0.05000	0.04500
30	0.11000	0.11988	47	0.06600	0.05940	64	0.05000	0.04500
31	0.10800	0.10764	48	0.06400	0.05760	65	0.05000	0.04500
32	0.10600	0.09540	49	0.06200	0.05580	66	0.05000	0.04500
33	0.10400	0.09360	50	0.06000	0.05400	67	0.05000	0.04500
34	0.10200	0.09180	51	0.06000	0.05400	68	0.05000	0.04500
35	0.10000	0.09000	52	0.06000	0.05400	69	0.05000	0.04500

Appendix – Detailed Assumptions

Withdrawal Rates for Non-Teachers and State (2 to 3 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.12000	0.11200	36	0.07520	0.07504	53	0.04000	0.04480
20	0.12000	0.11200	37	0.07200	0.07168	54	0.04000	0.04480
21	0.12000	0.11200	38	0.06880	0.06832	55	0.04000	0.04480
22	0.12000	0.11200	39	0.06560	0.06496	56	0.04000	0.04480
23	0.11680	0.11200	40	0.06240	0.06160	57	0.04000	0.04480
24	0.11360	0.11200	41	0.05920	0.05824	58	0.04000	0.04480
25	0.11040	0.11200	42	0.05600	0.05488	59	0.04000	0.04480
26	0.10720	0.10864	43	0.05280	0.05152	60	0.04000	0.04480
27	0.10400	0.10528	44	0.04960	0.04816	61	0.04000	0.04480
28	0.10080	0.10192	45	0.04640	0.04480	62	0.04000	0.04480
29	0.09760	0.09856	46	0.04320	0.04480	63	0.04000	0.04480
30	0.09440	0.09520	47	0.04000	0.04480	64	0.04000	0.04480
31	0.09120	0.09184	48	0.04000	0.04480	65	0.04000	0.04480
32	0.08800	0.08848	49	0.04000	0.04480	66	0.04000	0.04480
33	0.08480	0.08512	50	0.04000	0.04480	67	0.04000	0.04480
34	0.08160	0.08176	51	0.04000	0.04480	68	0.04000	0.04480
35	0.07840	0.07840	52	0.04000	0.04480	69	0.04000	0.04480

Withdrawal Rates for Non-Teachers and State (3 to 4 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.08000	0.09000	36	0.05200	0.04680	53	0.05000	0.04050
20	0.08000	0.09000	37	0.05000	0.04410	54	0.05000	0.04050
21	0.08000	0.09000	38	0.05000	0.04140	55	0.05000	0.04050
22	0.08000	0.09000	39	0.05000	0.03870	56	0.05000	0.04050
23	0.08000	0.09000	40	0.05000	0.03600	57	0.05000	0.04050
24	0.08000	0.09000	41	0.05000	0.03420	58	0.05000	0.04050
25	0.08000	0.09000	42	0.05000	0.03240	59	0.05000	0.04050
26	0.07600	0.09000	43	0.05000	0.03060	60	0.05000	0.04050
27	0.07200	0.09000	44	0.05000	0.02880	61	0.05000	0.04050
28	0.06800	0.08244	45	0.05000	0.02700	62	0.05000	0.04050
29	0.06400	0.07488	46	0.05000	0.02700	63	0.05000	0.04050
30	0.06000	0.06732	47	0.05000	0.02700	64	0.05000	0.04050
31	0.05900	0.05976	48	0.05000	0.02970	65	0.05000	0.04050
32	0.05800	0.05220	49	0.05000	0.03240	66	0.05000	0.04050
33	0.05700	0.05130	50	0.05000	0.03510	67	0.05000	0.04050
34	0.05600	0.05040	51	0.05000	0.03780	68	0.05000	0.04050
35	0.05500	0.04950	52	0.05000	0.04050	69	0.05000	0.04050

Appendix – Detailed Assumptions

Withdrawal Rates for Non-Teachers and State (4 to 5 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.04500	0.06750	36	0.03450	0.04275	53	0.03450	0.02250
20	0.04500	0.06750	37	0.03450	0.04050	54	0.03450	0.02250
21	0.04350	0.06525	38	0.03450	0.03825	55	0.03450	0.02250
22	0.04200	0.06300	39	0.03450	0.03600	56	0.03450	0.02138
23	0.04050	0.06075	40	0.03450	0.03375	57	0.03450	0.02025
24	0.03900	0.05850	41	0.03450	0.03263	58	0.03450	0.01913
25	0.03750	0.05625	42	0.03450	0.03150	59	0.03450	0.01800
26	0.03750	0.05625	43	0.03450	0.03038	60	0.03450	0.01688
27	0.03750	0.05625	44	0.03450	0.02925	61	0.03450	0.01688
28	0.03750	0.05625	45	0.03450	0.02813	62	0.03450	0.01688
29	0.03750	0.05625	46	0.03450	0.02700	63	0.03450	0.01688
30	0.03750	0.05625	47	0.03450	0.02588	64	0.03450	0.01688
31	0.03600	0.05400	48	0.03450	0.02475	65	0.03450	0.01688
32	0.03450	0.05175	49	0.03450	0.02363	66	0.03450	0.01688
33	0.03450	0.04950	50	0.03450	0.02250	67	0.03450	0.01688
34	0.03450	0.04725	51	0.03450	0.02250	68	0.03450	0.01688
35	0.03450	0.04500	52	0.03450	0.02250	69	0.03450	0.01688

Withdrawal Rates for Non-Teachers and State (greater than 5 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.04000	0.02800	36	0.02903	0.02352	53	0.01758	0.01366
20	0.04000	0.02800	37	0.02768	0.02065	54	0.01694	0.01383
21	0.03900	0.02765	38	0.02633	0.01960	55	0.01629	0.01400
22	0.03800	0.02730	39	0.02498	0.01855	56	0.01565	0.01400
23	0.03700	0.02695	40	0.02363	0.01750	57	0.01500	0.01400
24	0.03600	0.02660	41	0.02295	0.01680	58	0.01500	0.01400
25	0.03500	0.02625	42	0.02228	0.01610	59	0.01500	0.01400
26	0.03400	0.02590	43	0.02160	0.01540	60	0.01500	0.01400
27	0.03300	0.02555	44	0.02093	0.01470	61	0.01500	0.01400
28	0.03369	0.02744	45	0.02025	0.01400	62	0.01500	0.01400
29	0.03438	0.02933	46	0.01958	0.01383	63	0.01500	0.01400
30	0.03507	0.03122	47	0.01890	0.01366	64	0.01500	0.01400
31	0.03576	0.03311	48	0.01823	0.01350	65	0.01500	0.01400
32	0.03645	0.03500	49	0.01755	0.01333	66	0.01500	0.01400
33	0.03443	0.03213	50	0.01688	0.01316	67	0.01500	0.01400
34	0.03240	0.02926	51	0.01755	0.01333	68	0.01500	0.01400
35	0.03038	0.02639	52	0.01823	0.01350	69	0.01500	0.01400

Appendix – Detailed Assumptions

Disability Rates

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.00000	0.00000	33	0.00128	0.00102	47	0.00298	0.00236
20	0.00008	0.00006	34	0.00144	0.00115	48	0.00334	0.00257
21	0.00014	0.00012	35	0.00160	0.00128	49	0.00371	0.00279
22	0.00021	0.00017	36	0.00168	0.00134	50	0.00407	0.00301
23	0.00027	0.00022	37	0.00176	0.00141	51	0.00444	0.00330
24	0.00034	0.00027	38	0.00184	0.00147	52	0.00480	0.00360
25	0.00040	0.00032	39	0.00192	0.00154	53	0.00496	0.00389
26	0.00048	0.00038	40	0.00200	0.00160	54	0.00512	0.00419
27	0.00056	0.00045	41	0.00208	0.00166	55	0.00528	0.00448
28	0.00064	0.00051	42	0.00216	0.00173	56	0.00544	0.00499
29	0.00072	0.00058	43	0.00224	0.00179	57	0.00560	0.00550
30	0.00080	0.00064	44	0.00232	0.00186	58	0.00560	0.00602
31	0.00096	0.00077	45	0.00240	0.00192	59	0.00560	0.00653
32	0.00112	0.00090	46	0.00269	0.00214	60	0.00560	0.00704
						61+	0.00000	0.00000

Retirement Rates

Age	Teachers		Non-Teachers and State	
	Male	Female	Male	Female
54	0.000	0.000	0.000	0.000
55	0.250	0.275	0.300	0.200
56	0.175	0.175	0.200	0.175
57	0.175	0.200	0.175	0.150
58	0.200	0.200	0.150	0.150
59	0.200	0.200	0.150	0.175
60	0.200	0.250	0.150	0.175
61	0.250	0.200	0.150	0.175
62	0.350	0.275	0.350	0.250
63	0.250	0.250	0.250	0.200
64	0.250	0.250	0.175	0.200
65	0.400	0.300	0.300	0.300
66	0.300	0.350	0.225	0.250
67	0.250	0.300	0.225	0.225
68	0.250	0.300	0.225	0.225
69	0.250	0.300	0.225	0.225
70+	1.000	1.000	1.000	1.000