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Minnesota Legislative Commission on Pensions and Retirement

Replication of the July 1, 2016 Actuarial Valuation of the Teachers Retirement Association of Minnesota Retirement Plan

Prepared by Deloitte Consulting LLP

April 2017

Contents

Actuarial Valuation Opinion

This report presents the results of the actuarial valuation replication of the Teachers Retirement Association of Minnesota ("TRA") Retirement Plan ("the Plan") as of July 1, 2016 in accordance with Minnesota Statutes, Section 356.214, Subdivision 4, as directed by the Minnesota Legislative Commission on Pensions and Retirement ("LCPR" or "the Commission").

This actuarial valuation replication has been prepared based upon participant data and financial information provided by TRA and their retained actuary as of July 1, 2016. We have analyzed the data and other information provided for reasonableness, but we have not independently audited the data. We have no reason to believe the data or other information provided is not complete and accurate, and know of no further information that is essential to the preparation of the actuarial valuation.

All costs, liabilities, rates of interest, and other factors underlying these actuarial computations have been determined on the basis of the same actuarial assumptions and methods used by the retained actuary, It is our opinion that these assumptions and methods are reasonable (or consistent with authoritative guidance) for the purposes described herein.

Future actuarial measurements may differ significantly from current measurements 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 operations 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.

Our scope for this replication report did not include analyzing the potential range of such future measurements, and we did not perform that analysis.

This report is prepared solely for the benefit and internal use of the LCPR and the State of Minnesota. This report is not intended for the benefit of any other party and may not be relied upon by any third party for any purpose, and Deloitte Consulting accepts no responsibility or liability with respect to any party other than the LCPR and the State of Minnesota in accordance with its statutory and regulatory requirements.

The undersigned with actuarial credentials collectively meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

To the best of our knowledge, no employee of the Deloitte U.S. Firms (Deloitte & Touche LLP, Deloitte Consulting LLP, Deloitte Financial Advisory Service LLP, and Deloitte Tax LLP) is an officer or director of TRA. In addition, we are not aware of any relationship between the Deloitte U.S. Firms and TRA that may impair or appear to impair the objectivity of the work detailed in this report.

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Executive Summary

Replication Overview

Process and Scope

This actuarial replication report has been prepared per Minnesota Statute Section 356.214, Subdivision 4. The LCPR has engaged Deloitte Consulting, LLP to perform a replication of the July 1, 2016 actuarial valuation of the Teachers Retirement Association of Minnesota.

The primary purpose of this report is to test the census and financial data, plan provisions, and actuarial assumptions and methods being used by the retained actuary in its July 1, 2016 valuation report by independently performing an actuarial valuation based on the same source data and the statutory plan provisions.

The replication valuation is initially performed without consideration of the retained actuary's report or sample lives. We program the valuation model based on our understanding of applicable assumptions and plan provisions. Once complete, we compare our liability and normal cost results to those of the retained actuary. We also request detailed sample life output to reconcile any differences in the results. If appropriate, we made modifications to our valuation model based on this analysis.

The result of our calculations and the retained actuary's are compared in this report. Because actuarial valuations are complex and rely upon the actuary's chosen actuarial valuation software, differences are expected. Differences greater than 2% of Present Value of Benefits or 5% of Actuarial Accrued Liability are specifically addressed; although some differences that do not meet this threshold are also discussed. We understand, as noted above, that the valuation process is sufficiently complex as to result in variations of this magnitude among actuaries valuing identical benefits and assumptions.

In addition to our independent determination of liabilities and costs, we reviewed the retained actuary's report for completeness and potential improvements. The process by which actuarial valuations are completed is highly technical and not every step can be documented in a valuation report. Where we believe additional documentation may be beneficial to the reader, we've suggested a more robust disclosure. In addition to process oriented commentary, we've considered industry best practices in communicating complex financial concepts to key stakeholders. Additional recommendations have been made based on our research with the goal of providing information that would be valuable to the reader within acknowledged time and resource constraints.

All of the steps above have been completed in accordance with the requirements of Minnesota Statutes and the Standards for Actuarial Work adopted by the LCPR. Our work is also governed by applicable actuarial standards of practice published by the Actuarial Standards Board.

Replication Overview

Summary of Key Findings

In general, we found the actuarial liability and contribution calculations completed by the retained actuary to be consistent with ours within a reasonable threshold. Minor differences are identified below. We are satisfied with the aggregate July 1, 2016 actuarial valuation results as reported by the retained actuary. We believe that they represent a reasonable estimate of the present value of future benefits, accrued liability, and normal cost of the Plan.

The following key findings were identified during the process of our review:

- Census Data: TRA directly provided us with the census data. We made modifications that we deemed necessary and appropriate. Later in the process, we received the retained actuary's modified database, which matched ours. Therefore, we identified no errors in the data collection and reconciliation process.

- Plan Provisions: The plan provisions as identified in state statute were programmed into our valuation software and compared to those valued by the retained actuary. All benefits appear consistent, with the following exceptions:

    - The death benefit provided in the event a member dies after termination but prior to commencing benefits was not valued. Valuing this benefit would have increased liability by approximately $55 million, or 11.6% of the liability associated with the termination decrement. This represents 0.2% of the overall total liability. *Although minor relative to the size of total liability, we recommend that the actuary include the value of this benefit in future valuations.*

    - Minnesota statutes require that the actuarial factors used to adjust benefits for optional benefit forms be consistent with the results of the most recent experience study. The optional benefit form actuarial equivalent factors used to measure the system's actuarial liabilities for valuation purposes were based on the plan factors in effect on the valuation date, which have not yet been updated to reflect the most recent experience study. *We recommend that the system consider updating their actuarial equivalence factors for benefit administration purposes to reflect the updated valuation assumptions.* We do not expect this change to have a significant impact on the valuation results.

- Actuarial Assumptions and Methods: The actuarial assumptions and methods prescribed by state statute were programmed into our valuation software along with those assumptions chosen by the Fund and disclosed in the report. The assumptions used in the valuation were updated as recommended in the 2015 experience study and approved by the Commission for the July 1, 2016 valuation. All assumptions appear consistent with state statute and documented assumptions, with the following exception:

    - Benefits for terminated vested participants were valued using the mortality assumption applied to retired members for both the periods prior to and after benefit commencement instead of the active mortality assumption for the period prior to benefit commencement. Modifying this assumption would impact liability by approximately $2 million, or 0.3% of the liability associated with the termination decrement. This represents <0.1% of the overall total liability. *We recommend that the actuary apply the active mortality assumption to vested terminated participants for the period prior to benefit commencement.*

- Actuarial Value of Assets: We calculated the Fund's Actuarial Value of Assets independent of the retained actuary, and our results matched.

- Liability Results: Our valuation results were reasonably close to the retained actuary's valuation results. We were 1.0% higher on the basis of Present Value of Future Benefits and 0.6% higher on the basis of the Actuarial Accrued Liability. As is typical, differences do exist in how those liabilities are split by decrement and status group. The results in this report reflect the combination of the Basic and Coordinated plans.

- Normal Cost Results: Our valuation results produced a normal cost that is 3.4% higher than that of the retained actuary. As a percent of pay, our normal cost rate was 0.3% higher than that of the retained actuary. Normal cost differences can vary due to attribution method, and age and service rounding. It is not uncommon for greater differences in normal cost than in total liability numbers, as is the case in this replication.

- Valuation Report: The actuarial valuation was reviewed in its entirety, and we have found the report to satisfy the requirements of ASOP No. 41 and Minnesota Statutes, Section 356.215.

  We recommend that the Commission consider adding the following reporting requirements to the Standards for Actuarial Work:

  - *Demonstrating the sensitivity of the discount rate assumption by providing the following key metrics using a discount rate 1% higher and 1% lower than the prescribed rate:*
    - Actuarial Accrued Liability
    - Unfunded Actuarial Accrued Liability
    - Funded Ratio
    - Contribution Sufficiency/Deficiency

  - *Disclosing the sensitivity of the threshold year for higher post-retirement benefit increases by showing the same metrics listed above if the threshold is reached immediately and if the threshold is never reached.*

Summary of Results

	As of July 1, 2016		
	TRA Valuation	Deloitte Replication Valuation	Percent Difference
Contributions (% of Payroll)			
Statutory Contributions – Chapter 354	15.94%	15.94%	0.00%
Required Contributions – Chapter 356	18.72%	19.09%	0.37%
Sufficiency / (Deficiency)	(2.78%)	(3.15%)	(0.37%)
Funding Ratios (Dollars in Thousands)			
Assets			
Current assets (AVA)	$20,194,279	$20,194,279	0.00%
Current assets (MVA)	$19,420,131	$19,420,131	0.00%
Accrued Liability Funding Ratio			
Actuarial accrued liability	$26,716,216	$26,883,504	0.63%
Funding ratio (AVA)	75.59%	75.12%	(0.47%)
Funding ratio (MVA)	72.69%	72.24%	(0.45%)
Plan Participation			
Active Participants			
Number	80,530	80,530	0.00%
Projected annual earnings (Dollars in Thousands)	$4,858,593	$4,858,593	0.00%
Average projected annual earnings	$60,333	$60,333	0.00%
Average age	43.3	43.3	0.00%
Average service	11.9	11.9	0.00%
Service Retirements	57,891	57,891	0.00%
Survivors	5,091	5,091	0.00%
Disability Retirements	521	521	0.00%
Deferred Retirements	13,680	13,680	0.00%
Terminated Other Non-Vested	31,850	31,850	0.00%
Total	189,563	189,563	0.00%

Supporting Information

Inventory of Market Value of Assets as of June 30, 2016

The following table shows an inventory of assets for the current year.

Table 1 (Dollars in Thousands)

	Market Value as of June 30, 2016	
	TRA Valuation	Deloitte Replication Valuation
Cash and short term investments	$419,160	$419,160
Accounts Receivable	21,765	21,765
Fixed income pool	4,788,125	4,788,125
Alternative investments pool	2,482,640	2,482,640
Indexed equity pool	2,995,720	2,995,720
Domestic equity pool	5,996,792	5,996,792
Global equity pool	2,714,605	2,714,605
Securities lending collateral	2,748,476	2,748,476
Building`	6,694	6,694
Capital assets net of depreciation	$14,902	$14,902
Total Assets	**$22,188,879**	**$22,188,879**
Current Liabilities		
Accounts payable	9,136	9,136
Accrued compensated absences	111	111
Accrued expenses - building	4	4
Bonds payable	603	603
Bonds interest payable	12	12
Securities lending collateral	2,748,477	2,748,477
Total current liabilities	2,758,343	2,758,343
Long Term Liabilities		
Accrued compensated absences	808	808
Bonds payable	5,297	5,297
Total long term liabilities	6,105	6,105
Total Liabilities	**$2,764,448**	**2,764,448**
Net position restricted for pensions	**19,424,431**	**$19,424,431**
ELSA accounts payable	(4,300)	(4,300)
Net position restricted for pensions, after adjustment for ELSA accounts	**$19,420,131**	**19,420,131**

Reconciliation of Market Value of Assets as of June 30, 2016

The following table contains a summary of transactions during the year and develops an approximate actual rate of return on the Market Value of Assets.

Table 2 (Dollars in Thousands)

	TRA Valuation	Deloitte Replication Valuation
1. Net Position Restricted for Pensions as of July 1, 2015	**$20,441,993**	**$20,441,993**
Additions		
2. Contributions		
a. Member	$347,256	$347,256
b. Employer	$354,961	$354,961
c. Direct aid (state/city/district)	$35,587	$35,587
d. Earnings Limitation Savings Account (ELSA)	$1,961	$1,961
3. Investment income		
a. Investment appreciation in fair value	($9,471)	($9,471)
b. Less investmet expenses	($26,265)	($26,265)
4. Net income from securities lending	$12,064	$12,064
5. Other Income	$3,569	$3,569
6. Total Additions: (2) + (3) + (4) + (5)	**$719,662**	**$719,662**
Deductions		
7. Benefit payments		
a. Retirement benefits	($1,716,733)	($1,716,733)
c. Refunds	($11,290)	($11,290)
8. Administrative expenses	($11,338)	($11,338)
9. Total disbursements: (7) + (8)	**($1,739,361)**	**($1,739,361)**
10. Increase/(Decrease) in ELSA Account Value	($2,163)	($2,163)
11. Net Increase/(Decrease): (6) + (9) + (10)	**($1,021,862)**	**($1,021,862)**
12. Net Position Restricted for Pensions as of June 30, 2016: (1) + (11)	**$19,420,131**	**$19,420,131**

Actuarial Value of Assets as of June 30, 2016

The following table shows the development of the Actuarial Value of Assets.

Table 3 (Dollars in Thousands)

Development of Actuarial Value of Assets				TRA Valuation	Deloitte Replication Valuation
1 Market Value of Assets as of June 30, 2016				$19,420,131	$19,420,131
2 Determination of average balance					
a. Total assets available at beginning of year				$20,446,091	$20,446,091
b. Total assets available at end of year				$19,424,431	$19,424,431
c. Net investment income for fiscal year				($23,672)	($23,672)
d. Average balance: [(2a) + (2b) - (2c)] / 2				$19,947,097	$19,947,097
3 Expected Return: 8.0% x (2d)				$1,595,768	$1,595,768
4 Net investment income for fiscal year				($23,672)	($23,672)
5 Current year asset Gain / (Loss): (4) – (3)				($1,619,440)	($1,619,440)
6 Asset Gain/(Loss) not recognized in Actuarial Value of Assets					
	Period Ending	Gain / (Loss)	Portion Not Recognized	Amount Not Recognized	Amount Not Recognized
	6/30/2016	($1,619,440)	80%	($1,295,552)	($1,295,552)
	6/30/2015	($706,091)	60%	($423,655)	($423,655)
	6/30/2014	$1,855,481	40%	$742,192	$742,192
	6/30/2013	$1,014,336	20%	$202,867	$202,867
	Total	$544,286		($774,148)	($774,148)
7 Actuarial Value of Assets as of June 30, 2016: (1) – (6)				$20,194,279	$20,194,279
8 Ratio of actuarial value of assets to market value of assets				1.04	1.04

Determination of Unfunded Actuarial Accrued Liability and Supplemental Contribution Rate

Table 4 (Dollars in Thousands)

	Actuarial Present Value of Projected Benefits		Actuarial Present Value of Future Normal Costs		Actuarial Accrued Liability	
	TRA Valuation	Deloitte Replication Valuation	TRA Valuation	Deloitte Replication Valuation	TRA Valuation	Deloitte Replication Valuation
1. Determination of Actuarial Accrued Liability (AAL)						
a. Active Members						
i. Retirement annuities	$ 12,304,339	$ 12,576,870	$ 3,470,774	$ 3,516,579	$ 8,833,565	$ 9,060,291
ii. Disability benefits	265,720	275,784	108,812	109,596	156,908	166,188
iii. Survivor's benefits	99,342	99,070	36,704	35,399	62,638	63,671
iv. Deferred retirements	406,959	412,382	466,699	527,873	(59,740)	(115,491)
v. Refunds	15,179	32,209	150,867	171,913	(135,688)	(139,703)
vi. Total	$ 13,091,539	$ 13,396,315	$ 4,233,856	$ 4,361,359	$ 8,857,683	$ 9,034,956
b. Deferred retirements with future augmentation	594,186	594,186	-	-	594,186	594,186
c. Former members without vested rights	77,015	77,015	-	-	77,015	77,015
d. Benefit Recipients	17,187,332	17,177,347	-	-	17,187,332	17,177,347
f. Total	$ 30,950,072	$ 31,244,863	$ 4,233,856	$ 4,361,359	$ 26,716,216	$ 26,883,504
2. Determination of Unfunded Actuarial Accrued Liability (UAAL)						
a. Actuarial accrued liability					$ 26,716,216	$ 26,883,504
b. Current assets (AVA)					20,194,279	20,194,279
c. Unfunded actuarial accrued liability					$ 6,521,937	$ 6,689,225
3. Determination of Supplemental Contribution Rate						
a. Present value of future payrolls through the amortization date of June 30, 2039					$ 67,235,963	$ 68,489,434
b. Supplemental contribution rate					9.70%	9.77%

Note: The retained actuary used a different method to calculate and allocate refund of employee contributions resulting in differences in allocations of liability among active member benefit categories.

Determination of Contribution Sufficiency/ (Deficiency)

Table 5 (Dollars in Thousands)

	Percent of Payroll		Dollar Amount	
	TRA Valuation	Deloitte Replication Valuation	TRA Valuation	Deloitte Replication Valuation
1. Statutory contributions – Chapter 354				
a. Employee contributions	7.50%	7.50%	$364,408	$364,394
b. Employer contributions	7.70%	7.70%	374,140	374,112
c. Employer supplemental contributions				
(1) 1993 Legislation	0.10%	0.10%	5,000	5,000
(2) 1996 Legislation	0.07%	0.07%	3,256	3,256
(3) 1997 Legislation	0.27%	0.27%	12,954	12,954
(4) 2014 Legislation	0.30%	0.30%	14,377	14,377
d. Total	15.94%	15.94%	$774,135	$774,093
2. Required contributions – Chapter 356				
a. Normal Cost				
i. Retirement benefits	7.27%	7.39%	$353,245	$358,945
ii. Disability benefits	0.21%	0.21%	10,204	10,081
iii. Survivors	0.08%	0.07%	3,888	3,457
iv. Deferred retirement benefits	0.91%	1.06%	44,216	51,641
v. Refunds	0.32%	0.36%	15,548	17,532
vi. Total	8.79%	9.09%	$427,101	$441,657
b. Supplemental contribution amortization of Unfunded Actuarial Accrued Liability by June 30, 2039	9.70%	9.77%	$471,284	$474,529
c. Allowance for expenses	0.23%	0.23%	11,175	11,175
d. Total	18.72%	19.09%	$909,560	$927,361
3. Contribution Sufficiency/(Deficiency): (1d) – (2d)	(2.78%)	(3.15%)	($135,425)	($153,268)

Basis for the Valuation

Membership Data – Active Members

The following table displays the distribution of active participants valued by Deloitte by age and service* and includes average compensation (in dollars) as of June 30, 2016.

Table 6

Years of Service	< 3		3-4		5-9		10-14		15-19		20-24		25-29		30-34		35-39		40+		Total	
Age Group	No.	Avg. Comp.	No.	Avg. Comp.	No.	Avg. Comp.	No.	Avg. Comp.	No.	Avg. Comp.	No.	Avg. Comp.	No.	Avg. Comp.	No.	Avg. Comp.	No.	Avg. Comp.	No.	Avg. Comp.	No.	Avg. Comp.
0 – 24	2,457	28,604	57	43,335	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,514	28,938
25 – 29	4,540	32,510	3,044	43,992	1,494	48,781	1	69,102	-	-	-	-	-	-	-	-	-	-	-	-	9,079	39,041
30 – 34	2,370	32,367	1,798	44,907	5,038	52,375	1,393	62,442	-	-	-	-	-	-	-	-	-	-	-	-	10,599	47,958
35 – 39	1,857	29,485	994	47,432	2,640	53,199	4,750	64,984	1,368	73,666	-	-	-	-	-	-	-	-	-	-	11,609	56,146
40 – 44	1,460	25,916	680	46,910	1,436	53,400	2,095	63,725	4,397	73,806	818	79,065	-	-	-	-	-	-	-	-	10,886	61,466
45 – 49	1,255	23,930	616	43,295	1,291	51,681	1,522	62,133	2,593	72,132	3,643	77,721	647	80,436	-	-	-	-	-	-	11,567	63,993
50 – 54	940	21,407	434	43,328	960	48,340	1,111	61,740	1,509	69,987	1,962	75,752	2,401	79,445	627	80,982	1	59,409	-	-	9,945	65,334
55 – 59	791	20,456	287	35,699	711	45,257	876	59,558	1,177	67,996	1,224	74,045	1,543	77,617	1,450	80,111	268	80,946	-	-	8,327	64,736
60 – 64	620	12,161	156	32,790	381	39,662	407	56,795	714	66,540	708	72,706	685	77,462	326	82,319	388	82,501	82	76,890	4,467	60,014
65 – 69	378	6,449	74	16,939	106	25,789	125	57,964	127	59,054	114	76,652	96	81,372	50	80,627	43	98,437	75	89,093	1,188	44,332
70+	188	5,929	23	12,448	34	14,462	15	49,457	16	60,059	13	91,572	17	71,023	13	99,153	7	71,428	23	90,597	349	28,269
Total	16,856	27,563	8,163	43,924	14,091	50,920	12,295	63,088	11,901	71,754	8,482	76,453	5,389	78,796	2,466	80,735	707	82,738	180	83,726	80,530	56,079

Membership Data – Service Retirements

The following table displays the distribution of service retirees valued by Deloitte by age and years since retirement and includes average benefits (in dollars) as of June 30, 2016.

Table 7

Years Retired	< 1		1-4		5-9		10-14		15-19		20-24		25+		Total	
Age Group	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.
<55	6	27,772	1	23,936	-	-	-	-	-	-	-	-	-	-	7	27,224
55 – 59	488	34,748	1,134	31,606	6	34,544	-	-	-	-	-	-	-	-	1,628	32,558
60 – 64	878	29,378	4,464	31,487	2,483	28,342	30	32,404	-	-	-	-	1	1,625	7,856	30,257
65 – 69	619	21,469	4,376	22,533	6,248	25,984	4,422	23,956	356	34,002	2	23,411	4	3,008	16,027	24,480
70 – 74	47	18,170	612	18,605	2,719	22,046	4,160	23,801	4,859	25,158	100	33,267	4	6,039	12,501	23,741
75 – 79	3	10,052	76	18,563	367	18,454	1,480	20,334	4,644	28,471	2,135	30,928	65	20,465	8,770	27,125
80 – 84	-	-	13	13,707	50	15,608	165	16,860	1,454	29,195	3,021	37,362	1,084	31,605	5,787	33,406
85 – 89	-	-	7	17,001	9	23,587	37	19,626	116	29,570	1,060	35,341	2,274	34,530	3,503	34,390
90+	-	-	-	-	2	60,528	9	14,563	11	19,165	76	36,264	1,714	32,811	1,812	32,813
Total	2,041	27,972	10,683	26,970	11,884	25,307	10,303	23,260	11,440	27,330	6,394	34,797	5,146	33,110	57,891	27,485

Membership Data – Survivors

The following table displays the distribution of survivors valued by Deloitte by age and years since member death and includes average benefits (in dollars) as of June 30, 2016.

Table 8

Years Since Death	< 1		1-4		5-9		10-14		15-19		20-24		25+		Total	
Age Group	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.
< 45	15	14,926	40	20,110	43	15,296	18	13,564	6	12,367	1	31,354	-	-	123	16,551
45 – 49	7	17,547	40	11,468	20	15,462	8	15,240	8	15,095	2	35,822	-	-	85	14,178
50 – 54	8	16,774	34	14,035	20	16,288	9	12,497	5	28,077	1	41,026	3	28,184	80	16,445
55 – 59	15	22,428	51	20,915	43	15,163	18	11,981	7	16,147	3	3,126	2	17,315	139	17,466
60 – 64	35	19,704	96	23,311	66	19,215	36	17,524	12	17,603	5	20,749	1	7,639	251	20,515
65 – 69	44	22,313	207	22,755	148	20,751	91	20,394	35	18,116	17	17,273	3	9,009	545	21,236
70 – 74	75	25,055	271	23,656	190	22,144	129	22,800	63	19,003	23	22,378	13	17,091	764	22,739
75 – 79	74	25,354	250	26,963	220	28,269	151	28,664	90	27,201	69	29,231	33	18,724	887	27,336
80 – 84	71	35,864	302	32,560	221	35,552	144	32,420	111	36,404	73	31,664	67	29,898	989	33,630
85 – 89	47	32,721	208	39,718	190	35,898	135	35,350	89	33,379	59	35,131	92	31,731	820	35,799
90+	21	34,760	79	35,673	104	34,180	74	34,226	51	31,760	31	39,799	48	37,177	408	34,984
Total	412	26,840	1,578	27,769	1,265	27,623	813	27,581	477	28,449	284	30,635	262	29,392	5,091	27,935

Membership Data – Disability Retirements

The following table displays the distribution of service disability retirements valued by Deloitte by age and years disabled and includes average benefits as of June 30, 2016.

Table 9

Years Disabled	< 1		1-4		5-9		10-14		15-19		20-24		25+		Total	
Age Group	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.	No.	Avg. Ben.
< 45	1	5,430	13	11,408	5	8,025	-	-	-	-	-	-	-	-	19	10,203
45 – 49	3	21,072	18	17,040	10	9,051	10	6,062	-	-	1	4,863	-	-	42	12,522
50 – 54	4	12,802	38	21,606	15	16,610	10	11,280	4	7,796	1	2,846	-	-	72	17,614
55 – 59	4	30,384	67	23,353	35	20,593	13	15,687	6	11,695	3	14,337	-	-	128	21,281
60 – 64	7	28,482	75	29,450	70	22,831	44	20,114	21	15,837	11	18,426	2	8,126	230	23,665
65+	1	21,061	25	23,123	4	15,601	-	-	-	-	-	-	-	-	30	22,052
Total	20	23,091	236	23,846	139	19,864	77	16,395	31	13,997	16	15,838	2	8,126	521	20,761

Membership Data – Terminated Members

The following table displays statistics for terminated members as of June 30, 2016.

Table 10

	Deferred Vested		Other Non-Vested		Total	
	TRA Valuation	Deloitte Replication Valuation	TRA Valuation	Deloitte Replication Valuation	TRA Valuation	Deloitte Replication Valuation
1. Number	13,680	13,680	31,850	31,850	45,530	45,530
2. Average age	48.0	48.0	45.7	45.7	46.4	46.4
3. Average service	7.5	7.5	0.9	0.9	2.9	2.9
4. Average annual benefit, with augmentation to Normal Retirement Date and 60% CSA load**	$10,536	$10,536	N/A	N/A	N/A	N/A
5. Average refund value, with 4% CSA load	$31,526	$31,500	$2,424	$2,418	$11,168	$11,156

Statement of Actuarial Methods

The actuarial methods below were documented by the retained actuary, and we agree with their application without any changes. They are documented here for illustrative purposes only, and reflect exactly what was provided in the retained actuary's report.

Actuarial Cost Method

Liabilities and contributions in this report are computed using the Individual Entry Age Normal Cost Method. This method is prescribed by Minnesota Statutes.

The objective of this method is to fund each member's benefits under the Plan as payments that are level, as a percentage of salary, starting at original participation date (or employment date) and continuing until the assumed date of retirement, termination, disability or death.

At any given date, a liability is calculated equal to the contributions which would have been accumulated if this method of funding had always been used, the current plan provisions had always been in place, and all assumptions had been met. The difference between this liability and the assets (if any) which are held in the fund is the unfunded actuarial accrued liability. The unfunded actuarial accrued liability is typically funded over a chosen period in accordance with the amortization schedule.

A detailed description of the calculation follows: The normal cost for each active member, under the latest assumed retirement age, is determined by applying the level percentage of salary that, if contributed each year from date of entry into the Plan until the assumed retirement, termination, disability, or death date, is sufficient to provide the full value of the benefits expected to be payable.

- The present value of future normal costs is the total of the discounted value of all active members' normal cost, assuming these to be paid in each case from the valuation date until retirement (termination, disability, or death) date.
- The present value of projected benefits is calculated as the value of all benefit payments expected to be paid to the Plan's current members, including active and retired members, beneficiaries, and terminated members with vested rights.
- The actuarial accrued liability is the excess of the present value of projected benefits over the present value of future normal costs.
- The unfunded actuarial accrued liability is the excess of the actuarial accrued liability over the assets of the fund, and represents that part of the actuarial accrued liability which has not been funded by accumulated past contributions.

Amortization Method

The unfunded actuarial accrued liability is amortized as a level percentage of payroll each year to the statutory amortization date of June 30, 2039, assuming payroll increases of 3.50% per year (effective with the 2016 valuation). If the unfunded actuarial accrued liability is negative, the surplus amount is amortized over 30 years as a level percentage of payroll. If there is an increase in the unfunded actuarial accrued liability due to a change in the actuarial assumptions, plan provisions, or actuarial cost method, a new amortization period is determined. This new amortization period is determined by blending the period needed to amortize the prior unfunded actuarial accrued liability over the prior amortization period and the increase in unfunded actuarial accrued liability amortized over 30 years. If there is a decrease in the unfunded actuarial accrued liability, no change is made to the amortization period.

Asset Valuation Method

As prescribed in the Minnesota Statutes Section 356.215, Subdivision 1, Paragraph (f), the assets are valued based on a five-year moving average of expected and market values (five-year average actuarial value) determined as follows:

- At the end of each plan year, an average asset value is calculated as the average of the market asset value at the beginning and end of the fiscal year net of investment income for the fiscal year;
- The investment gain or (loss) is taken as the excess of actual investment income over the expected investment income based on the average asset value as calculated above;
- The investment gain or (loss) so determined is recognized over five years at 20% per year;
- The asset value is the sum of the market value plus the scheduled recognition of investment gains or (losses) during the current and the preceding four fiscal years.

Supplemental Contributions

The City of Minneapolis, the Minneapolis School District, and the State of Minnesota are scheduled to make the following supplemental contributions to the Fund in FY15:

1993 Legislation:	Supplemental contributions of $5,000,000 annually are assumed to be made until full actuarial funding is achieved. Amount is fixed in statute.
1996 Legislation:	Supplemental contributions of $3,256,410 annually are assumed to be made until the amortization date of June 30, 2039 or full actuarial funding is achieved, whichever is earlier. Amount is variable as described in Minnesota Statutes, Chapter 423A.02. Assumed amount is based on actual amount received in most recent fiscal year, and information provided by the Teachers Retirement Association.
1997 Legislation:	Supplemental contributions of $12,954,000 annually are assumed to be made until full actuarial funding is achieved or the stabilizer may be used to decrease contribution rates. Amount is fixed in statute.
2014 Legislation:	Supplemental contributions of $14,377,000 annually are assumed to be made until full actuarial funding is achieved or the stabilizer may be used to decrease contribution rates. Amount is fixed in statute.

Entry Age Calculation

As required by the LCPR Standards for Actuarial Work, a member's Entry Age is calculated as the age at the valuation date less years of service. Age on the valuation date is calculated as age nearest birthday. The years of service for each member are provided by TRA.

Decrement Timing

All decrements are assumed to occur in the middle of the plan year. This is the preferred decrement timing in the LCPR Standards for Actuarial Work.

Funding Objective

The fundamental financing objective of the fund is to establish contribution rates which, when expressed as a percentage of active member payroll, will remain approximately level from generation to generation and meet the required deadline for full funding.

Benefits included or excluded

To the best of our knowledge, all material benefits have been included in the liability.

IRC Section 415(b): The limitations of Internal Revenue Code Section 415(b) have been incorporated into our calculations. Annual benefits may not exceed the limits in IRC Section 415. This limit is indexed annually. For 2016, the limit is $210,000.

IRC Section 401(a)(17): The limitations of Internal Revenue Code Section 401(a)(l7) have been incorporated into our calculations. Compensation for any 12-month period used to determine accrued benefits may not exceed the limits in IRC Section 401(a)(17) for the calendar year in which the 12-month period begins. This limit is indexed annually. For 2016, the limit is $265,000. Certain members first hired before July 1, 1995 may have a higher limit.

Actuarial Assumptions

The following assumptions were used in valuing the liabilities and benefits under the plan. All assumptions are prescribed by Statutes, the LCPR, or the Board of Trustees. The assumptions prescribed are based on the experience study dated June 10, 2015.

The Allowance for Combined Service Annuity was based on the recommendation of a prior actuary. We are unable to judge the reasonableness of this assumption without performing a substantial amount of additional work beyond the scope of this assignment.[1]

1. Investment Return	8.47% compounded annually to reflect an 8.00% assumption for one (1) year and 8.50% thereafter.
2. Future post-retirement adjustments	2.00% per year. Once the funded ratio reaches 90% on a market value basis for two consecutive years, the COLA is scheduled by statute to revert back from 2.00% to 2.50%. Future assets and liabilities were projected using the 2016 valuation results as a starting point and assuming all actuarial assumptions are met in future years. These assumptions include a rate of return on the market value of assets of 8.0% for the next year and 8.5% thereafter. Further, there is an assumption that the stabilizer provisions will not be utilized by the Board. Based on this methodology, as of July 1, 2016, the increased COLA is not expected to be implemented during the next 40 years, and so we assume it will not occur. For the July 1, 2015 valuation, the COLA was expected to increase with the July 1, 2037 valuation.
3. Salary increases	Reported salary for prior fiscal year with new hires annualized, is increased according to the salary scale increase table shown in the rate table for current fiscal year and annually for each future year. See table of sample rates.
4. Payroll Growth	3.50% per year.
5. Future Service	Members are assumed to earn future service at a full-time rate.
6. Mortality Rates	
a. Pre-Retirement	RP 2014 white collar employee table, male rates set back 6 years and female rates set back 5 years. Generational projection uses the MP-2015 scale.
b. Post-retirement	RP 2014 white collar employee table, male rates set back 3 years and female rates set back 3 years. Generational projection uses the MP-2015 scale.
c. Post disability	RP 2014 disabled retiree mortality, without adjustment
7. Disability	Age-related rates based on experience; see table of sample rates.
8. Withdrawal	Rates vary by service based on actual plan experience, as shown in the rate table.

[1] This statement is from the TRA valuation report, and refers to the Allowance for Combined Service Annuity assumption based on an experience study published in 2001. In October 2016, an updated Combined Service Annuity and Coverage by More Than One Retirement System Provisions Study as of July 1, 2015 performed by Deloitte Consulting was completed based on participant information as of July 1, 2015. The LCPR has approved the use of updated factors from the 2015 study for the next actuarial valuation as of July 1, 2017.

9. Expenses	Prior year administrative expenses expressed as percentage of prior year payroll.
10. Retirement Age	Graded rates beginning at age 55 as shown in rate table. Members who have attained the highest assumed retirement age will retire in one year.
11. Percent Married	85% of male members and 65% of female members are assumed to be married. Members are assumed to have no children.
12. Age Difference	Females two years younger than males.
13. Allowance for Combined Service Annuity	Liabilities for active members are increased by 1.40% and liabilities for former members are increased by 4.00% to account for the effect of some Participants being eligible for a Combined Service Annuity.
14. Refund of Contributions	All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of their contributions accumulated with interest or the value of their deferred benefit.
15. Interest on Member Contributions	Members and former members who are eligible for the money purchase annuity are assumed to receive interest credits equal to the Pre-Retirement interest rate. All other members and former members receive the interest crediting rate as specified in statutes.
16. Commencement of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at unreduced retirement age.
17. Form of Payment	Members are assumed to elect subsidized joint and survivor form of annuity as follows: Males: • 10.0% elect 50% Joint & Survivor option • 10.0% elect 75% Joint & Survivor option • 60.0% elect 100% Joint & Survivor option • 20.0% elect Straight Life option Females: • 13.5% elect 50% Joint & Survivor option • 6.5% elect 75% Joint & Survivor option • 35.0% elect 100% Joint & Survivor option • 45.0% elect Straight Life option Members eligible for deferred annuities (including current terminated deferred members) and future disability benefits are assumed to elect a life annuity.
18. Missing Data for Members	Membership data was supplied by TRA as of the valuation date. This information has not been audited by CMC. We have reviewed the information for internal consistency and we have no reason to doubt its substantial accuracy. In the small number of cases where submitted data was missing or incomplete and could not be recovered from prior years, the following assumptions were applied, if needed: Data for active members: Salary, Service, and Date of Birth: Based on current active demographics. Gender: Female Data for terminated members:

Date of Birth: July 1, 1970

Average salary: $38,000

Date of Termination: Derived from date of birth, original entry age, and service

Data for in-pay members:

Beneficiary date of birth: Wife two years younger than husband

Gender: Based on first name

Form of payment: Life annuity for retirees and beneficiaries, 100% J&S option for disabled retirees.

19. Sample Rate Tables

Termination Rates		
Service	**Males**	**Females**
Less than 1	32.00%	29.00%
1	15.00%	13.00%
2	11.00%	11.00%
3	8.50%	9.00%
4	6.25%	7.00%
5	5.25%	5.50%
6	4.60%	4.00%
7	4.10%	3.50%
8	2.80%	3.00%
9	2.30%	2.50%
10	2.00%	2.10%
15	1.10%	1.10%
20	0.60%	0.60%
25 or more	0.50%	0.50%

	Rate (%)			
	Pre-retirement Mortality*		**Disability**	
Age	**Male**	**Female**	**Male**	**Female**
20	0.023	0013	0.00	0.00
25	0.026	0.014	0.00	0.00
30	0.036	0.014	0.00	0.00
35	0.031	0.018	0.01	0.01
40	0.035	0.024	0.03	0.03
45	0.041	0.033	0.05	0.05
50	0.061	0.055	0.10	0.10
55	0.105	0.092	0.16	0.16

[redacted]

60	0.175	0.140	0.25	0.25
65	0.292	0.204	0.00	0.00

*rates shown for 2014, the base year of the tables.

	Annuitant Mortality Rates (%)			
	Retirement*		**Disability**	
Age	**Male**	**Female**	**Male**	**Female**
55	0.267	0.196	2.337	1.448
60	0.353	0.267	2.660	1.700
65	0.486	0.430	3.169	2.086
70	0.945	0.706	4.035	2.820
75	2.015	1.352	5.429	4.105
80	4.126	2.682	7.662	6.104
90	13.560	9.947	17.301	13.265
95	24.351	18.062	24.717	19.588
100	38.292	29.731	32.672	27.819

*Rates are shown for 2014, the base year of the tables.

Salary Scale	
Service	**Salary Increase**
1	9.50%
2	7.75%
3	7.25%
4	7.00%
5	7.00%
6	6.85%
7	6.70%
8	6.55%
9	6.40%
10	6.25%
11	6.00%
12	5.75%
13	5.50%
14	5.25%
15	5.00%

[redacted]

16	4.75%
17	4.50%
18	4.30%
19	4.20%
20	4.10%
21	4.00%
22	3.90%
23	3.80%
24	3.70%
25	3.60%
26 or more	3.50%

Retirement Rate (%)

	Coordinated Members				Basic Members	
Age	**Tier 1 Early**	**Tier 1 Unreduced**	**Tier 2 Early**	**Tier 2 Unreduced**	**Eligible for 30 & Out Provision**	**Not Eligible for 30 & Out Provision**
55	5	35	5		40	5
56	10	35	5		40	5
57	10	35	5		40	5
58	10	35	5		40	5
59	14	35	5		40	5
60	17	35	6		25	25
61	20	35	15		25	25
62	25	35	15		25	25
63	25	35	15		25	25
64	25	35	20		25	25
65		40	30		40	40
66		35		35	40	40
67		30		30	40	40
68		30		25	40	40
69		30		25	40	40
70		35		35	60	60
71-74		100		100	60	60

75-79		100		100	60	100
80 & Over		100		100	100	100

Coordinated Tier 2 Members age 62 or older with 30 or more years of service have 5% added to their early retirement rates.

20. Changes in Actuarial Assumptions

Mortality, retirement, termination and optional forms of payment assumptions were updated. In addition, price inflation was lowered to 2.75%, general wage growth and payroll growth were lowered to 3.50% and total salary increases were changed.

Plan Provisions Summary – Basic Members

This summary of provisions reflects our interpretation of applicable Statutes for purposes of preparing this valuation. This interpretation is not intended to provide a basis for administering the Plan.

1. Plan year	July 1 through June 30.
2. Eligibility	Teachers first hired prior to July 1, 1978 employed by the Board of Education of Special School District No. 1, other than a charter school, and not covered by the Social Security Act. Certain part-time licensed employees of Special School District No. 1 are also covered. These members were transferred to TRA as part of the merger of the Minneapolis Teachers Retirement Fund Association (MTRFA) effective June 30, 2006.
3. Contributions	Shown as a percent of salary: Member: 11.00%; Employer: 15.14% After June 30, 2015, the member and employer contribution rates may be adjusted if there is a sufficiency of at least 1.00% or a deficiency of at least 0.50%. The Board has discretion to adjust this rate based on discussion with the actuary and consideration of various metrics. The resulting rate may not go below the normal cost plus administrative expenses. Potential contribution increases after June 30, 2016 are not reflected in this valuation report. Employee contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).
4. Teaching service	A year is earned during a calendar year if the member is employed in a covered position and employee contributions are deducted. Certain part-time service and military service is also included.
5. Salary	Periodic compensation used for contribution purposes excluding lump sum annual or sick leave payments, severance payments, any payments made in lieu of employer paid fringe benefits or expenses, and employer contributions to a Section 457 deferred compensation plan.
6. Average salary	Average of the five highest successive years of annual salary.
7. Retirement	
a. Normal retirement	
i. Age/service requirements	Age 60, or any age with 30 years of Teaching Service.
ii. Amount	2.50% of Average Salary for each year of Teaching Service.
b. Early retirement benefit	
i. Age/service requirements	Age 55 with less than 30 years of Teaching Service.
ii. Amount	The greater of (a) or (b): (a.) 2.25% of Average Salary for each year of Teaching Service with reduction of 0.25% for each month before the Member would first be eligible for a normal retirement benefit. (b.) 2.50% of Average Salary for each year of Teaching Service assuming augmentation to the age of first eligibility for a normal retirement

	benefit at 3.00% per year and actuarial reduction for each month before the member would be first eligible for a normal retirement benefit. An alternative benefit is available to members who are at least age 50 and have seven years of Teaching Service. The benefit is based on the accumulation of the 6.50% "city deposits" to the Retirement Fund. Other benefits are also provided under this alternative depending on the member's age and Teaching Service.
c. Form of payment	Life annuity. Actuarially equivalent options are: (a.) 10 or 15 year Certain and Life (b.) 50%, 75%, or 100% Joint and Survivor with bounce back feature (option is cancelled if member is predeceased by beneficiary).
d. Benefit increases	Under current law, the annual post-retirement increase on January 1 is 2.0 percent. When the funded ratio reaches 90 percent (on a market value of assets basis) for two consecutive years, the annual increase will rise to 2.5 percent. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 preceding the increase date will receive a full increase. Members receiving benefits for at least one full month but less than 12 full months as of the June 30 preceding the increase date will receive a prorated increase.
8. Disability	
i. Age/service requirement	Total and permanent disability with three years of Teaching Service.
ii. Amount	An annuity actuarially equivalent to the continued accumulation of member and city contributions at the current rate for a period of 15 years (but not beyond age 65) plus an additional benefit equal to the smaller of 100% of the annuity provided by city contributions only or $150 per month. A member with 20 years of Teaching Service also receives an additional $7.50 per month. Payments stop earlier if disability ceases or death occurs. Benefits may be reduced on resumption of partial employment.
iii. Form of payment	Same as for retirement.
iv. Benefit increases	Same as for retirement.
9. Death	
a. Benefit A	
i. Age/service requirements	Death before retirement.
ii. Amount	The accumulation of member and city contributions plus 6.00% interest. Paid as a life annuity, 15-year Certain and Life, or lump sum. If an annuity is chosen the beneficiary also receives additional benefits.
b. Benefit B	
i. Age/service requirements	An active member with seven years of Teaching Service. A former member age 60 with seven years of Teaching Service who dies before retirement or disability benefits begin.
ii. Amount	The actuarial equivalent of any benefits the member could have received if resignation occurred on the date of death.

c. Benefit C	
i. Age/service requirements	As an active member who dies and leaves surviving children.
ii. Amount	A monthly benefit of $248.30 to the surviving widow while caring for a child and an additional $248.30 per month for each surviving dependent child. The maximum family benefit is $579.30 per month. Benefits to the widow cease upon death or when no longer caring for an eligible child. Benefits for dependent children cease upon marriage or age 18 (age 22 if a full time student).
iii. Benefit Increases	Same as for retirement.
10. Withdrawal	
a. Refund of contributions	
i. Age/service requirements	Termination of Teaching Service.
ii. Amount	Member's contributions earn 4.00% interest compounded annually. For vested members, a deferred annuity may be elected in lieu of a refund.
b. Deferred annuity	
i. Age/service requirements	Seven years of Teaching Service.
ii. Amount	The benefit is computed under law in effect at termination and increased by the following percentage compounded annually: (a.) 3.00% therefore until the earlier of January 1 of the year following attainment of age 55 and June 30, 2012; (b.) 5.00% thereafter until the earlier of June 30, 2012 and when the annuity begins; and (c.) 2.00% beginning July 1, 2012. In addition, the interest earned on the member and city contributions between termination and age 60 can be applied to provide an additional annuity.

Plan Provisions Summary – Coordinated Members

This summary of provisions reflects our interpretation of applicable Statutes for purposes of preparing this valuation. This interpretation is not intended to provide a basis for administering the Plan.

<table>
<tr><td>1. Plan year</td><td>July 1 through June 30.</td></tr>
<tr><td>2. Eligibility</td><td>A public school or MNSCU teacher who is covered by the Social Security Act, except for teachers employed by St. Paul public schools or by the University of Minnesota. Charter school teachers employed statewide are covered by TRA.

No MNSCU teacher will become a new Member unless that person elects coverage as defined by Minnesota Statutes under Chapter 354B.</td></tr>
<tr><td>3. Contributions</td><td>Shown as a percent of salary:<table><tr><td>Member</td><td>Employer</td></tr><tr><td>7.50%</td><td>7.50%</td></tr></table>Employer also contributes Supplemental amount equal to 3.64% of Salary (members employed by Special School District #1 only).

After June 30, 2015, the member and employer contribution rates may be adjusted if there is a sufficiency of at least 1.00% or a deficiency of at least 0.50%. The Board has discretion to adjust this rate based on discussion with the actuary and consideration of various metrics. The resulting rate may not go below the normal cost plus administrative expenses.

Potential contribution increases after June 30, 2016 are not reflected in this valuation report.

Employee contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).</td></tr>
<tr><td>4. Teaching service</td><td>A year is earned during a calendar year if the member is employed in a covered position and employee contributions are deducted. Certain part-time service and military service is also included.</td></tr>
<tr><td>5. Salary</td><td>Periodic compensation used for contribution purposes excluding lump sum annual or sick leave payments, severance payments, any payments made in lieu of employer paid fringe benefits or expenses, and employer contributions to a Section 457 deferred compensation plan.</td></tr>
<tr><td>6. Average salary</td><td>Average of the five highest successive years of annual salary. Average salary is based on all Allowable Service if less than five years.</td></tr>
<tr><td>7. Retirement</td><td></td></tr>
<tr><td>a. Normal retirement</td><td></td></tr>
<tr><td>i. Age/service requirements</td><td><u>First hired before July 1, 1989:</u>
(a.) Age 65 and three years of Allowable Service; or
(b.) Age 62 and 30 years of Allowable Service.

Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service.
<u>First hired after June 30, 1989:</u>
The age when first eligible for full Social Security retirement benefits (but not to exceed age 66) and three years of Allowable Service.
Proportionate Retirement Annuity is available at normal retirement age and one year of Allowable Service.</td></tr>
</table>

b. Early retirement

i. Age/service requirements

First hired before July 1, 1989:

(a.) Age 55 and three years of Allowable Service; or
(b.) Any age and 30 years of Allowable Service; or
(c.) Rule of 90: Age plus Allowable Service totals 90.

First hired after June 30, 1989:

Age 55 with three years of Allowable Service.

ii. Amount

First hired before July 1, 1989:

The greater of (a), (b), or (c):

(a.) 1.20% of Average Salary for each of the first ten years of Allowable Service.

1.70% of Average Salary for each year of Allowable Service in excess of 10 prior to July 1, 2006, and 1.90% of Average Salary for years of Allowable Service after July 1, 2006.

No actuarial reduction if age plus years of service totals 90. Otherwise reduction of 0.25% for each month the member is under age 65 (or 62 if 30 years of Allowable Service) at time of retirement.

(b.) 1.70% of Average Salary for each year of Allowable Service prior to July 1, 2006 and 1.90% for each year of Allowable Service beginning July 1, 2006, assuming augmentation to normal retirement age at 3.00% per year (2.50% per year for members hired after June 30, 2006) and actuarial reduction for each month the member is under the full Social Security benefit retirement age (not to exceed age 66). Beginning July 1, 2015, new early retirement reduction factors will apply, including special factors for members retiring at age 62 or later with at least 30 years of service.

(c.) For eligible members: the monthly benefit that is actuarially equivalent to 2.2 times the members' accumulated deductions plus interest thereon.

First hired after June 30, 1989:

1.70% of Average Salary for each year of Allowable Service prior to July 1, 2006 and 1.90% for each year of Allowable Service beginning July 1, 2006, assuming augmentation to normal retirement age at 3.00% per year (2.50% per year for members hired after June 30, 2006) and actuarial reduction for each month the member is under the full Social Security benefit retirement age (not to exceed age 66). Beginning July 1, 2015, new early retirement reduction factors will apply, including special factors for members retiring at age 62 or later with at least 30 years of service.

c. Early Retirement Reduction Factors

Age	Hired before 7/1/89	Hired from 7/1/89 to 6/30/06	Hired after 6/30/06
55	43.56%	51.55%	54.08%
58	33.59%	40.46%	42.74%
60	24.65%	30.75%	32.74%
62	13.68%	18.96%	20.53%
65	0.00%	4.21%	4.86%
66	0.00%	0.00%	0.00%

Members who are age 62 with 30 years of service are eligible for a special set of reduction factors:

Age	Hired before 7/1/89	Hired from 7/1/89 to 6/30/06	Hired after 6/30/06
62	10.40%	14.46%	16.11%
63	6.64%	10.40%	11.70%
64	3.18%	6.64%	7.55%
65	0.00%	3.18%	2.65%
66	0.00%	0.00%	0.00%

All of the early retirement reduction factors shown are the ultimate factors. These are being phased in from the prior factors over a five-year period beginning July 1, 2015.

d. Form of payment

Life annuity. Actuarially equivalent options are:

(a.) 50%, 75%, or 100% Joint and Survivor with bounce back feature (option is cancelled if member is predeceased by beneficiary).
(b.) 15 year Certain and Life
(c.) Guaranteed Refund.

e. Benefit increases

Under current law, the annual post-retirement increase on January 1 is 2.0 percent. When the funded ratio reaches 90 percent (on a market value of assets basis) for two consecutive years, the annual increase will rise to 2.5 percent. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 preceding the increase date will receive a full increase. Members receiving benefits for at least one full month but less than 12 full months as of the June 30 preceding the increase date will receive a prorated increase.

8. Disability

i. Age/service requirements

Total and permanent disability before Normal Retirement Age with three years of Allowable Service.

ii. Amount

Normal Retirement Benefit based on Allowable Service and Average Salary at disability without reduction for commencement before Normal Retirement Age unless an optional annuity plan is selected.

Payments stop at Normal Retirement Age or the five year anniversary of the effective date of the disability benefit, whichever is later. Payments stop earlier if disability ceases or death occurs. Benefits may be reduced on resumption of partial employment.

iii. Form of payment

Same as for retirement.

iv. Benefit increases

Same as for retirement.

9. Retirement after disability

i. Age/service requirements

Normal Retirement Age or the five year anniversary of the effective date of the disability benefit, whichever is later.

ii. Amount

Any optional annuity continues. Otherwise, the larger of the disability benefit paid before Normal Retirement Age or the normal retirement benefit available at Normal Retirement Age, or an actuarially equivalent optional annuity.

iii. Benefit Increases

Same as for retirement.

10. Death	
a. Surviving spouse optional annuity	
i. Age/service requirements	Member or former member with three years of Allowable Service who dies before retirement or disability benefits commence.
ii. Amount	Survivor's payment of the 100% Joint and Survivor benefit or an actuarial equivalent term certain annuity. If commencement is prior to age 65 (age 62 if 30 years of service), the benefit is reduced for early retirement with half the applicable reduction factor used from age 55 to actual commencement age. If no surviving spouse, then an actuarial equivalent dependent child benefit is paid to age 20 or for five years if longer.
iii. Benefit increase	Same as for retirement.
11. Withdrawal	
a. Refund of contributions	
i. Age/service requirements	Thirty days following termination of teaching service.
ii. Amount	Member's contributions earn 4.00% interest compounded annually. For vested members, a deferred annuity may be elected in lieu of a refund.
b. Deferred annuity	
i. Age/service requirements	Vested at date of termination. Current requirement is three years of Allowable Service.
ii. Amount	For members first hired prior to July 1, 2006, the benefit is computed under law in effect at termination and increased by the following percentage compounded annually: (a.) 3.00% therefore until the earlier of January 1 of the year following attainment of age 55 and June 30, 2012; (b.) 5.00% thereafter until the earlier of June 30, 2012 and when the annuity begins; and (c.) 2.00% from July 1, 2012 onward. Amount is payable as a normal or early retirement. A member who terminated service before July 1, 1997 whose benefit does not commence until after June 30, 1997 shall receive an actuarially equivalent increase to reflect the change from 5.00% to 6.00% in the post-retirement interest assumption; or For eligible members; the monthly benefit that is actuarially equivalent to 2.2 times the members' accumulated deductions plus interest thereon. For members first hired July 1, 2006 and after, the benefit computed under law in effect at termination is increased by 2.50% compounded annually until June 30, 2012 and increased by 2.00% from July 1, 2012 forward until the annuity begins.