



Minnesota Legislative Commission on Pensions and Retirement

Combined Service Annuity and Coverage by
More Than One Retirement System
Provisions Study as of July 1, 2015

Contents

Actuarial Opinion	3
Executive Summary	4
Summary of Key Findings	7
Results.....	7
Impact on Actuarial Accrued Liability	8
Process Description.....	10
CSA – Retirement Benefit under Rule of 90	10
CSA – Vested Benefit.....	11
CBM – Vested Benefit	15
Cumulative Impact.....	16
Appendix – Key Plan Provisions and Assumptions.....	17
Retirement Eligibility Provisions.....	17
Vesting Provisions	18
Augmentation Provisions	19
Salary Increase Assumptions	20

Actuarial Opinion

This report presents the results of the Combined Service Annuity (“CSA”) and Coverage By More Than One Retirement System (“CBM”) Provision Study performed by Deloitte Consulting, LLP as of July 1, 2015. This study includes analysis based on Minnesota Statutes, Section 356.30 and the CBM statutes of selected statewide and major local Minnesota public retirement plans, as directed by the Minnesota Legislative Commission on Pensions and Retirement (“LCPR” or “the Commission”).

Our review was based on July 1, 2015 member data provided by each System’s retained actuary. We assumed the data to be complete and accurate. Any subsequent changes to the data could change the results of our review. We analyzed the provided member data for reasonableness, but did not independently audit the data and other information provided. Our review was based on assumptions and plan provisions disclosed in the July 1, 2015 actuarial valuation for each retirement plan, unless otherwise noted in this report.

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; and changes in plan provisions or applicable law.


Our scope for this study 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. 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 Services LLP, and Deloitte Tax LLP) is an officer or director of the Systems (Minnesota State Retirement System, the Minnesota Public Employees Retirement Association, the St. Paul Teachers’ Retirement Fund Association, and the Minnesota Teachers Retirement Association). In addition, we are not aware of any relationship between the Deloitte U.S. Firms and the Systems that may impair or appear to impair the objectivity of the work detailed in this report.

DELOITTE CONSULTING LLP



Judy Stromback, FSA, EA, FCA, MAAA
Managing Director



Michael de Leon, ASA, EA, FCA, MAAA
Specialist Leader

Executive Summary

Scope

The scope of this report is to provide the results, methodologies and assumptions used to develop load factors to be applied to actuarial liabilities to reflect the Combined Service Annuity (“CSA”) provisions in Minnesota Statutes, Section 356.30 and Coverage By More Than One Retirement System (“CBM”) provisions in seven Minnesota Statutes (3A.12, 352.72, 352B.30, 352D.085, 353.71, 354.60 and 354A.39), for purposes of measuring plan obligations.

Background

The CSA provisions generally allow eligible members who have service credit in two or more Minnesota public employee retirement plans to combine service credit in the applicable plans to meet vesting and early retirement requirements, and for benefits to be determined based on the highest five consecutive years of salary during the combined years of service. If retirement benefits are deferred, the combined annuity is augmented from the last date of employment termination to benefit commencement date. To be eligible for the CSA provision, members must have at least six months of service credit in each plan, either a) have not commenced benefit payments from any plan or b) if a member has begun to receive a pension from a plan, will begin to receive one or more additional pensions from other plans within one year of the date of starting the first pension, and have combined service credits that satisfy the vesting requirement of the plan with the longest vesting requirement.

The CBM provisions generally allow members who were covered by two or more Minnesota public employee retirement plans to receive a pension from each plan if total service credit in the applicable plans is at least three years for those hired before July 1, 2010 (and all TRA and SPTRFA members) and at least five years for those hired after June 30, 2010. If retirement benefits are deferred, each annuity is augmented from the date of employment termination with that plan to benefit commencement date. To be eligible for the CBM provision, members must not have taken a refund of employee contributions from the applicable plans and have commenced benefit payments from one or more plans. Benefits will be determined based on the provisions of each plan.

Process

We reviewed the census data provided by each System’s retained actuary and the applicable Minnesota Statutes. We analyzed the impact of components of the provisions separately on the liabilities valued by systems’ actuaries and determined a combined load factor by plan and member status. The load factors are the percentage adjustment to be applied to the liability determined by the Systems’ actuaries for each member status to reflect the cumulative impact of the CSA and CBM provisions. A description of our process is detailed in the Process Description section of the report.

Results

The table below compares the current load factors to revised load factors developed from our analysis, which vary by plan and member status. These load factors reflect the cumulative impact of the CSA and CBM provisions. The development of each component included in the overall load factors is described in the Process Description section.

Retirement Plan	Current Load Factors			Revised Load Factors		
	Active Members	Vested Terminated Members	Non-Vested Terminated Members	Active Members	Vested Terminated Members	Non-Vested Terminated Members
MSRS General	1.2%	40.0%	40.0%	-	4.0%	5.0%
MSRS Correctional	-	30.0%	30.0%	-	17.0%	6.0%
MSRS State Patrol	-	30.0%	30.0%	-	13.0%	-
MSRS Judges	-	-	-	-	-	-
MSRS Legislators	-	30.0%	30.0%	-	-	-
PERA General	0.8%	60.0%	60.0%	-	15.0%	3.0%
PERA Correctional	-	30.0%	30.0%	-	35.0%	1.0%
PERA Police & Fire	-	30.0%	30.0%	-	33.0%	2.0%
SPTRFA*	7.0% Pre-89/2.0% Post-89	30.0%	30.0%	-	20.0%	9.0%
TRA	1.4%	4.0%	4.0%	-	7.0%	9.0%

*Different retirement provisions and assumptions for Pre-1989 and Post-1989 SPTRFA actives resulted in different CSA Load Factors.

The load factors developed based on the July 1, 2015 member information and methodologies and assumptions disclosed in this report are generally lower than the current CSA load factors developed by Milliman in the study performed in 2001. While we do not have sufficient information to determine the specific cause of the differences from the loads developed in 2001, we believe the following factors likely contributed to the reductions:

- Rule of 90 permits members to retire with an unreduced pension when the member's age and allowable service equals 90, but is available only to members first hired before July 1, 1989. The plans' CSA and CBM liability is, in part, attributable to members, who would not otherwise have been eligible for Rule of 90, becoming eligible for Rule of 90 because CSA and CBM allows for combining service credit under more than one plan to satisfy the Rule of 90 service requirement. This liability has decreased since 2001 as the number of active and vested terminated members first hired before July 1, 1989, has declined.
- Overall, assumed and actual retirement rates for members eligible for Rule of 90 Retirement have decreased since the prior study, and the liability associated with this type of retirement decreases each year an eligible member defers retirement.
- The cost to the plans of CSA benefits for vested and non-vested terminated members is greater when the rate of salary increase exceeds the rate of deferred augmentation. This is because under CSA, instead of the member receiving augmentation on his or her benefit in the first plan from employment termination date to benefit commencement date, the member will have his or her highest average salary applied to all years of service, including years of service with the first plan.
 - In the 20 years preceding the 2001 study, under MSRS, PERA, and TRA, the augmentation rate was 3% until age 55, and 5% thereafter. Since 2012, under MSRS and TRA, the deferred augmentation rate is 2%; under PERA, the deferred augmentation rate is 1% (no augmentation for those terminating in 2012 or later).
 - The experience preceding the 2001 study (1996-2000), under MSRS, PERA, and TRA, led to an ultimate salary scale rate of 5%. Recent experience (2008-2014), under MSRS and PERA, led to an ultimate salary scale rate of 3.25% and under TRA, an ultimate salary scale rate of 3.50%.
 - In summary, the level of salary increases preceding the 2001 study were generally 1.50%-1.75% higher than recent experience while augmentation rates for terminated members have remained unchanged for all but the last few years..
- Employee contribution rates have increased while deferred augmentation rates have decreased, since the prior study. This results in employee contributions with interest being more valuable than the CSA annuity for a larger portion of the population.

- The merger into TRA of the Minneapolis TRA in 2006 and the Duluth TRA in 2015 reduced CSA liability for vested and non-vested terminated members as former Minneapolis and Duluth members became TRA “Active Members” and would no longer need to use CSA or CBM to determine the benefits from two plans instead of just TRA. Also, TRA worked on a major “data integrity” cleanup project beginning in about 2000, so the data on terminated members used in 2001 was not as clean as the data TRA now maintains on these members, allowing for a more accurate calculation of CSA and CBM liability.

We have also considered non-vested terminated members who are eligible for the CBM provisions in the development of the revised load factors for each plan. This group was not included in the 2001 Milliman CSA Study. We believe the inclusion of these members is appropriate to estimate the liabilities of each plan.

These results are discussed further in the Summary of Key Findings section as well as the sections that follow.

Other Considerations

Recurrence of CSA and CBM Load Study – We recommend performing this study every four years, coincident with future experience studies. Due to the implementation of the changes in vesting service requirements for members hired after certain dates, the number of members who could become vested or attain a higher vesting percentage after considering the total service in all plans will continue to increase.

Comparison to Prior Study – In our results summary, we noted some causes for our load factors differing significantly from those estimated in the 2001 Milliman Study. Throughout this report we document both our recommended load factors and those recommended in the prior study; however, we do not have sufficient information to determine each component driving the change in load factors or to quantify the impact of the causes noted above. Performing a detailed reconciliation would require significant resources from Milliman, the Systems, and Deloitte Consulting, and would be dependent on the retention of files dating back to 2001. To further validate our results, we have provided the Systems an opportunity to review our process, methodology, and head counts to support the overall reasonableness of our analysis.

Summary of Key Findings

Deloitte Consulting performed the Combined Service Annuity (“CSA”) and Coverage By More Than One Retirement System (“CBM”) study as of July 1, 2015. This study includes member information from the Minnesota State Retirement System (“MSRS”), the Minnesota Public Employees Retirement Association (“PERA”), the St. Paul Teachers’ Retirement Fund Association (“SPTRFA”), and the Minnesota Teachers Retirement Association (“TRA”).

The plans within each System that were included in this study are summarized below. Please note that the General Plan within PERA includes the recently merged Minneapolis Employees Retirement Fund (“MERF”), and TRA includes the recently merged Duluth Teachers’ Retirement Fund Association (“DTRFA”).

MSRS	PERA	SPTRFA	TRA
General	General	SPTRFA	TRA
Correctional	Correctional		
State Patrol	Police & Fire		
Judges			
Legislators			

Results

The table below compares the current load factors to revised load factors developed from our analysis, which vary by plan and member status. These load factors reflect the cumulative impact of the CSA and CBM provisions. The development of each component included in the overall load factors is described in the Process Description section.

Retirement Plan	Current Load Factors			Revised Load Factors		
	Active Members	Vested Terminated Members	Non-Vested Terminated Members	Active Members	Vested Terminated Members	Non-Vested Terminated Members
MSRS General	1.2%	40.0%	40.0%	-	4.0%	5.0%
MSRS Correctional	-	30.0%	30.0%	-	17.0%	6.0%
MSRS State Patrol	-	30.0%	30.0%	-	13.0%	-
MSRS Judges	-	-	-	-	-	-
MSRS Legislators	-	30.0%	30.0%	-	-	-
PERA General	0.8%	60.0%	60.0%	-	15.0%	3.0%
PERA Correctional	-	30.0%	30.0%	-	35.0%	1.0%
PERA Police & Fire	-	30.0%	30.0%	-	33.0%	2.0%
SPTRFA*	7.0% Pre-89/2.0% Post-89	30.0%	30.0%	-	20.0%	9.0%
TRA	1.4%	4.0%	4.0%	-	7.0%	9.0%

*Different retirement provisions and assumptions for Pre-1989 and Post-1989 SPTRFA actives resulted in difference CSA Load Factors.

Impact on Actuarial Accrued Liability

The tables below show a comparison of the 7/1/2015 Actuarial Accrued Liability (“AAL”) produced by each System’s retained actuary using the current CSA load factors, and the estimated AAL using the revised load factors developed from our analysis, which includes the cumulative impact of the CSA and CBM provisions.

Total

Plan	Total (Dollars In Thousands)		
	Actual AAL with Current Factor	Estimated AAL with Revised Factor	Change
MSRS General	13,092,702	12,693,559	(399,143)
MSRS Correctional	1,239,258	1,227,558	(11,700)
MSRS State Patrol	833,033	831,806	(1,227)
MSRS Judges	315,633	315,633	0
MSRS Legislators	230,219	216,687	(13,532)
PERA General	23,560,951	22,761,921	(799,030)
PERA Correctional	498,052	501,028	2,976
PERA Police & Fire	8,460,477	8,467,260	6,783
SPTRFA*	1,596,770	1,578,303	(18,467)
TRA	25,562,155	25,465,179	(96,976)

*Estimated Actuarial Accrued Liability using load factor weighted by Pre-1989 and Post-1989 SPTRFA active counts

The liability impacts above are the result of changes in revised component load factors noted below. The change in liability for each member group is estimated below.

Active Members

Plan	Active Members (Dollars In Thousands)				Change
	Actual with Current Factor		Estimated with Revised Factor		
	AAL	CSA Load Factor	AAL	Load Factor	
MSRS General	4,813,204	1.2%	4,756,130	-	(57,074)
MSRS Correctional	489,003	-	489,003	-	-
MSRS State Patrol	253,151	-	253,151	-	-
MSRS Judges	106,352	-	106,352	-	-
MSRS Legislators	16,581	-	16,581	-	-
PERA General	8,894,325	0.8%	8,823,735	-	(70,590)
PERA Correctional	303,358	-	303,358	-	-
PERA Police & Fire	3,149,756	-	3,149,756	-	-
SPTRFA*	459,730	7.0%/2.0%	448,080	-	(11,650)
TRA	8,435,468	1.4%	8,319,002	-	(116,466)

*Estimated Actuarial Accrued Liability using load factor weighted by Pre-1989 and Post-1989 SPTRFA active counts

Vested Terminated Members

Plan	Vested Terminated Members (Dollars In Thousands)				
	Actual with Current Factor		Estimated with Revised Factor		Change
	AAL	CSA Load Factor	AAL	Load Factor	
MSRS General	1,322,239	40.0%	982,235	4.0%	(340,004)
MSRS Correctional	114,082	30.0%	102,674	17.0%	(11,408)
MSRS State Patrol	9,289	30.0%	8,074	13.0%	(1,215)
MSRS Judges	4,166	-	4,166	-	-
MSRS Legislators	58,639	30.0%	45,107	-	(13,532)
PERA General	2,513,778	60.0%	1,806,778	15.0%	(707,000)
PERA Correctional	86,264	30.0%	89,582	35.0%	3,318
PERA Police & Fire	308,309	30.0%	315,424	33.0%	7,115
SPTRFA	78,303	30.0%	72,280	20.0%	(6,023)
TRA	552,566	4.0%	568,505	7.0%	15,939

Non-Vested Terminated Members

Plan	Non-Vested Terminated Members (Dollars In Thousands)				
	Actual with Current Factor		Estimated with Revised Factor		Change
	AAL	CSA Load Factor	AAL	Load Factor	
MSRS General	8,259	40.0%	6,194	5.0%	(2,065)
MSRS Correctional	1,581	30.0%	1,289	6.0%	(292)
MSRS State Patrol	52	30.0%	40	-	(12)
MSRS Judges	-	-	-	-	-
MSRS Legislators	-	30.0%	-	-	-
PERA General	60,183	60.0%	38,743	3.0%	(21,440)
PERA Correctional	1,532	30.0%	1,190	1.0%	(342)
PERA Police & Fire	1,541	30.0%	1,209	2.0%	(332)
SPTRFA	4,913	30.0%	4,119	9.0%	(794)
TRA	73,846	4.0%	77,396	9.0%	3,550

In Pay Status Members (Retirees, Disabled Members, and Survivors)

Plan	In Pay Status Members (Dollars In Thousands)	
	AAL	CSA Load Factor
MSRS General	6,949,000	N/A
MSRS Correctional	634,592	N/A
MSRS State Patrol	570,541	N/A
MSRS Judges	205,115	N/A
MSRS Legislators	154,999	N/A
PERA General	12,092,665	N/A
PERA Correctional	106,898	N/A
PERA Police & Fire	5,000,871	N/A
SPTRFA	1,053,824	N/A
TRA	16,500,275	N/A

Process Description

Deloitte Consulting received census data files as of July 1, 2015 from each System's retained actuary.

We excluded the following members from each census file and created a combined census database that is used as the basis for this study:

- Members with less than one half year of service
- Beneficiaries in pay status
- Members with an invalid or missing unique identifier

For members with missing or invalid date of birth, date of hire, date of termination, and/or salary, assumptions were made based on those disclosed in the unknown data section of each plan's July 1, 2015 actuarial valuation report.

Within the combined database, members were identified as being eligible for the CSA or CBM provisions if service in at least two plans was reported. The results of this study could change if the unique identifiers provided in the census files were not accurate for members. The table below shows the number of members who were identified as being eligible for CSA or CBM provisions. This table includes members who were later excluded from our analysis by component because their benefits were not increased under the CSA or CBM provisions.

Plan	CSA / CBM Eligible Counts by Plan & Status			
	Active Members	Vested Terminated Members	Non-Vested Terminated Members	Total Members
MSRS General	5,969	5,355	1,092	12,416
MSRS Correctional	927	916	208	2,051
MSRS State Patrol	381	36	5	422
MSRS Judges	167	4	-	171
MSRS Legislators	10	27	-	37
PERA General	7,461	16,138	11,064	34,663
PERA Correctional	1,233	1,958	344	3,535
PERA Police & Fire	3,640	989	102	4,731
SPTRFA	1,551	1,448	503	3,502
TRA	14,309	3,233	4,400	21,942

We isolated the impact on Present Value of Future Benefit ("PVFB") of meeting the Rule of 90 from the impact on PVFB of a greater vested benefit due to other retirement eligibility provisions and higher final average salary requirements. We then determined a combined load factor by plan and member status. The process for each of the components are discussed further below.

CSA – Retirement Benefit under Rule of 90

In certain plans, members first hired before July 1, 1989 are eligible for an unreduced early retirement benefit once they meet the Rule of 90 (age plus allowable service totals 90). Impacted members are those who would be eligible for Rule of 90, or meet the Rule of 90 at an earlier date, after taking into account their earliest hire date and total years of service in all plans.

For active members, we used the total years of service to determine the member's early retirement benefit amount and probabilities of withdrawal and retirement. The change in PVFB for impacted members of a plan was divided by the total PVFB for active members of the plan to determine the load factor.

For vested and non-vested terminated members, we compared annuity factors assuming benefits were payable at normal retirement to annuity factors assuming benefits were payable upon eligibility for Rule of 90. The percent increase in annuity factors was assumed to be the percent increase in PVFB. The change in PVFB was adjusted by the ratio of impacted members to total counts, separately for vested and non-vested terminated members, to determine the load factor for each plan.

The tables below summarize the results of our analysis for the applicable plans.

Active Members

Plan	7/1/2015 Active Valuation Counts	Number of Impacted Members	Change in PVFB for Impacted Members	Load on Valuation Counts
MSRS General	49,037	493	3.9%	0.0%
PERA General	145,650	453	11.9%	0.0%
SPTRFA	3,597	22	4.6%	0.0%
TRA	79,406	482	9.6%	0.1%

Vested Terminated Members

Plan	7/1/2015 VT Valuation Counts	Number of Impacted Members	Change in PVFB for Impacted Members	Load on Valuation Counts
MSRS General	16,787	307	14.0%	0.3%
PERA General	51,605	554	18.6%	0.2%
SPTRFA	1,892	41	14.4%	0.3%
TRA	13,314	285	13.5%	0.3%

Non-Vested Terminated Members

Plan	7/1/2015 NVT Valuation Counts	Number of Impacted Members	Change in PVFB for Impacted Members	Load on Valuation Counts
MSRS General	6,941	35	15.5%	0.1%
PERA General	125,366	164	19.6%	0.0%
SPTRFA	1,981	23	12.9%	0.1%
TRA	31,026	355	12.1%	0.1%

CSA – Vested Benefit

Members who are not vested upon termination receive a refund of accumulated employee contributions with interest. Members who are vested upon termination may elect to receive a deferred annuity or a refund of accumulated employee contributions with interest.

To determine the impact on the deferred annuity, we considered 2 components:

- the increase in vesting percentage considering total service in all plans
- the increase in deferred annuity considering the final average salary during service in all plans

Active Members

We identified the active members potentially impacted by an increase in vesting percentage based on the vesting service requirements for each plan. We assumed that active members' final average salary would not be impacted by service with another plan earlier in their career. We determined that active members' employee contributions with interest are generally greater than the PVFB of a deferred annuity at ages prior to age 50. CSA eligibility results in a member becoming vested in and thereby entitled to a deferred annuity earlier than would have been the case in the absence of CSA eligibility.

This would create additional liability to the plan if the deferred annuity at earlier ages was more valuable than the refund. However, the plan's liability for the refund is greater than the liability for the deferred vested annuity until the member reaches age 50. By this age, most members are vested regardless of CSA and the additional benefit of CSA eligibility has only a negligible impact on liability

After analyzing the number of impacted active members (i.e., those who would terminate at age 50 or later and before full eligibility) and the probabilities of termination, we concluded that a load for active members is not required as we estimate the load would impact liability by less than 0.1%.

The table below summarizes the number of impacted active members for the applicable plans.

Plan	7/1/2015 Active Valuation Counts	Number of Impacted Members	Percentage of Population Impacted
MSRS General	49,037	690	1.4%
MSRS Correctional	4,449	64	1.4%
MSRS State Patrol	843	5	0.6%
PERA General	145,650	778	0.5%
PERA Correctional	3,692	32	0.9%
PERA Police & Fire	11,157	34	0.3%

Vested Terminated Members

Based on our review of the vesting service requirements in each plan, we determined that all vested terminated members in the 7/1/2015 valuation are 100% vested. Although certain plans have introduced graded vesting over periods up to 20 years, no terminated members with partial vesting were found in our study. Current vested terminated members can therefore only be impacted by the change in their final average salary.

To determine the increase in a deferred annuity for a vested terminated member due to higher final average salary for participation in a subsequent plan, we compared the cumulative salary increase from termination date in the applicable plan to termination date in the subsequent plan (or projected termination/retirement if active in the subsequent plan) to cumulative augmentation over the same period. Since augmentation in the determination of a CSA only applies from the date of last termination (in the case where the member doesn't immediately retire), it is only the difference between final average salary and augmentation that creates a load for vested terminated members. The augmentation rate for 2012 and later was 2% for all plans except for the MSRS Judges Plan and the PERA plans. Augmentation rates are not applicable for the MSRS Judges Plan or for the PERA Plans for terminations after 2011. The augmentation rate for PERA plans was 1% for those who terminated before January 1, 2012. The lower augmentation rate in the PERA plans was the main cause of the larger change in PVFB for impacted members in the PERA plans compared to other plans.

Impacted members are those whose cumulative salary increase is higher than the cumulative augmentation factor. The change in cumulative factors for impacted members was weighted with total counts to determine the load factor for each plan.

The table below summarizes the results of our analysis for each plan.

Plan	7/1/2015 VT Valuation Counts	Number of Impacted Members	Change in PVFB for Impacted Members	Load on Valuation Counts
MSRS General	16,787	3,186	21.2%	4.0%
MSRS Correctional	1,276	808	26.6%	16.8%
MSRS State Patrol	52	26	26.6%	13.3%
MSRS Judges	16	-	0.0%	0.0%
MSRS Legislators	56	-	0.0%	0.0%
PERA General	51,605	13,701	54.4%	14.4%
PERA Correctional	2,620	1,661	54.9%	34.8%
PERA Police & Fire	1,560	616	83.4%	32.9%
SPTRFA	1,892	1,135	32.9%	19.7%
TRA	13,314	2,457	36.8%	6.8%

The tables below provide additional detail on how the CSA benefit impacts vested terminated members in the two largest groups, MSRS General and PERA General. Each table illustrates the number of impacted Vested Terminated members by age and service cohort and their average calculated CSA Factor ("Avg. CSA Fx"), which is the change in PVFB for that cohort.

MSRS General

	MSRS Service								Total
	<5	5-10	10-15	15-20	20-25	25-30	30-35	>35	
<25	1								1
Avg. CSA Fx	44%								44%
25-30	30	10							40
Avg. CSA Fx	41%	24%							36%
30-35	129	68	3						200
Avg. CSA Fx	47%	37%	36%						43%
35-40	184	115	18						317
Avg. CSA Fx	41%	37%	30%						39%
40-45	240	127	31	8	1				407
Avg. CSA Fx	34%	27%	26%	22%	1%				31%
45-50	281	150	54	18	11				514
Avg. CSA Fx	28%	18%	19%	19%	22%				24%
50-55	295	211	90	44	19	11	2		672
Avg. CSA Fx	21%	12%	10%	9%	12%	13%	12%		15%
55-60	300	166	79	44	35	9	3	1	637
Avg. CSA Fx	15%	7%	6%	6%	7%	6%	4%	12%	11%
60-65	181	81	26	18	15	3	1		325
Avg. CSA Fx	12%	5%	4%	3%	3%	3%	7%		8%
65-70	43	13	6	1		1			64
Avg. CSA Fx	13%	5%	4%	2%		2%			10%
>70	7		1	1					9
Avg. CSA Fx	17%		2%	1%					14%
Total	1,691	941	308	134	81	24	6	1	3,186
Avg. CSA Fx	26%	18%	13%	9%	9%	9%	7%	12%	21%

PERA General

	PERA Service								Total
	<5	5-10	10-15	15-20	20-25	25-30	30-35	>35	
<25	2								2
Avg. CSA Fx	112%								112%
25-30	313	36							349
Avg. CSA Fx	99%	99%							99%
30-35	1,044	242	13						1,299
Avg. CSA Fx	107%	113%	108%						108%
35-40	1,252	319	69	3					1,643
Avg. CSA Fx	91%	91%	96%	96%					91%
40-45	1,426	405	114	20	1				1,966
Avg. CSA Fx	74%	63%	68%	67%	90%				71%
45-50	1,407	598	199	63	16	1			2,284
Avg. CSA Fx	58%	46%	47%	49%	53%	62%			53%
50-55	1,213	657	284	119	37	22	1		2,333
Avg. CSA Fx	42%	30%	27%	26%	32%	34%	47%		36%
55-60	1,054	586	315	156	71	24	5		2,211
Avg. CSA Fx	30%	18%	15%	15%	17%	19%	20%		23%
60-65	673	344	177	91	47	19	3	3	1,357
Avg. CSA Fx	21%	10%	7%	7%	8%	10%	11%	12%	15%
65-70	141	62	17	4	3	4			231
Avg. CSA Fx	19%	9%	7%	7%	4%	8%			15%
>70	23	2	1						26
Avg. CSA Fx	28%	6%	1%						26%
Total	8,548	3,251	1,189	456	175	70	9	3	13,701
Avg. CSA Fx	64%	45%	33%	24%	21%	21%	20%	12%	54%

Non-Vested Terminated Members

To determine the impact of vesting a non-vested terminated member, we compared the present value of a deferred annuity to accumulated employee contributions with interest at each integer age for a strawman member. We used the average service and employee contributions of all non-vested terminated members across all plans for this calculation.

To determine the increase in a deferred annuity for a non-vested terminated member due to higher final average salary for participation in a subsequent plan, we compared the cumulative salary increase from termination date in the applicable plan to termination date in the subsequent plan (or projected termination/retirement if active in the subsequent plan) to cumulative augmentation over the same period. Since augmentation in the determination of a CSA only applies from the date of last termination (in the case where the member doesn't immediately retire), it is only the difference between final average salary and augmentation that creates a load for non-vested terminated members.

After considering these two components, impacted members are those whose revised deferred annuity would be greater than their accumulated employee contributions with interest. The change in cumulative factors for impacted members was weighted with total counts to determine the load factor for each plan.

The table below summarizes the results of our analysis for each plan.

Plan	7/1/2015 NVT Valuation Counts	Number of Impacted Members	Change in PVFB for Impacted Members	Load on Valuation Counts
MSRS General	6,941	285	84.4%	3.5%
MSRS Correctional	531	49	59.6%	5.5%
MSRS State Patrol	17	-	0.0%	0.0%
MSRS Judges	-	-	-	-
MSRS Legislators	-	-	-	-
PERA General	125,366	4,615	80.9%	3.0%
PERA Correctional	2,139	47	50.0%	1.1%
PERA Police & Fire	995	25	83.9%	2.1%
SPTRFA	1,981	166	88.7%	7.4%
TRA	31,026	2,219	119.1%	8.5%

CBM – Vested Benefit

Under the CBM provisions in the Minnesota Statutes set forth on page four, eligible members are entitled to receive a deferred annuity in all plans even though they do not meet the vesting requirements of each plan individually. Impacted non-vested terminated members are those who are not vested in a plan and have commenced or received a benefit from another plan. An eligible member will receive CBM benefits rather than CSA benefits if (a) the CBM produces a higher total benefit or (b) the member has begun to receive or has already received a benefit from any plan.

For this analysis, we used the same approach used to determine the impact of an increase in vesting percentage for CSA eligible non-vested terminated members. We compared the present value of a deferred annuity to accumulated employee contributions with interest at each integer age for a strawman member. We used the average service and employee contributions of all non-vested terminated members across all plans for the strawman calculation.

Impacted members are those whose deferred annuity would be greater than their accumulated employee contributions with interest. The change in the present value of future benefits for impacted members was weighted with total counts to determine the load factor for each plan.

The table below summarizes the effect of our analysis for each plan.

Plan	7/1/2015 NVT Valuation Counts	Number of Impacted Members	Change in PVFB for Impacted Members	Load on Valuation Counts
MSRS General	6,941	43	159.8%	1.0%
MSRS Correctional	531	1	262.9%	0.5%
MSRS State Patrol	17	1	0.0%	0.0%
MSRS Judges	-	-	-	-
MSRS Legislators	-	-	-	-
PERA General	125,366	173	205.2%	0.3%
PERA Correctional	2,139	-	-	-
PERA Police & Fire	995	-	-	-
SPTRFA	1,981	11	212.3%	1.2%
TRA	31,026	102	211.1%	0.7%

Cumulative Impact

Cumulative load factors by plan and member status were developed by compounding the load factors that were estimated for each impact component. The result was rounded to the nearest one percent. For example, the cumulative load factor for MSRS Non-Vested Terminated Members was derived as: $1.001 \times 1.035 \times 1.01 = 1.046$, or 4.6%, rounded to the nearest one percent of 5.0%. The tables below provide this development.

Active Members

Plan	CSA Actives - Rule of 90 Load Factor	CSA Actives - Vesting Load Factor	Cumulative Load Factor
MSRS General	0.0%	0.0%	0.0%
MSRS Correctional	0.0%	0.0%	0.0%
MSRS State Patrol	0.0%	0.0%	0.0%
MSRS Judges	0.0%	0.0%	0.0%
MSRS Legislators	0.0%	0.0%	0.0%
PERA General	0.0%	0.0%	0.0%
PERA Correctional	0.0%	0.0%	0.0%
PERA Police & Fire	0.0%	0.0%	0.0%
SPTRFA	0.0%	0.0%	0.0%
TRA	0.1%	0.0%	0.0%

Vested Terminated Members

Plan	CSA Vested Terminated - Rule of 90 Load Factor	CSA Vested Terminated - Vested Benefit Load Factor	Cumulative Load Factor
MSRS General	0.3%	4.0%	4.0%
MSRS Correctional	0.0%	16.8%	17.0%
MSRS State Patrol	0.0%	13.3%	13.0%
MSRS Judges	0.0%	0.0%	0.0%
MSRS Legislators	0.0%	0.0%	0.0%
PERA General	0.2%	14.4%	15.0%
PERA Correctional	0.0%	34.8%	35.0%
PERA Police & Fire	0.0%	32.9%	33.0%
SPTRFA	0.3%	19.7%	20.0%
TRA	0.3%	6.8%	7.0%

Non-Vested Terminated Members

Plan	CSA Non-Vested Terminated - Rule of 90 Load Factor	CSA Non-Vested Terminated - Vested Benefit Load Factor	CBM Non-Vested Terminated - Vested Benefit Load Factor	Cumulative Load Factor
MSRS General	0.1%	3.5%	1.0%	5.0%
MSRS Correctional	0.0%	5.5%	0.5%	6.0%
MSRS State Patrol	0.0%	0.0%	0.0%	0.0%
MSRS Judges	0.0%	0.0%	0.0%	0.0%
MSRS Legislators	0.0%	0.0%	0.0%	0.0%
PERA General	0.0%	3.0%	0.3%	3.0%
PERA Correctional	0.0%	1.1%	0.0%	1.0%
PERA Police & Fire	0.0%	2.1%	0.0%	2.0%
SPTRFA	0.1%	7.4%	1.2%	9.0%
TRA	0.1%	8.5%	0.7%	9.0%

Appendix – Key Plan Provisions and Assumptions

Retirement Eligibility Provisions

Plan	Details
MSRS General	<p><u>First hired before July 1, 1989:</u> (a.) Age 55 and three years of Allowable Service; or (b.) Any age with 30 years of Allowable Service; or (c.) Rule of 90: Age plus Allowable Service totals 90.</p> <p><u>First hired after June 30, 1989:</u> Age 55 and three years (five years if hired after June 30, 2010) of Allowable Service.</p>
MSRS Correctional	Age 50 and vested.
MSRS State Patrol	Age 50 and three years (ten years if first hired after June 30, 2013) of Allowable Service.
PERA General - Coordinated	<p><u>First hired before July 1, 1989:</u> (a.) Age 55 and three years of Allowable Service; or (b.) Any age with 30 years of Allowable Service; or (c.) Rule of 90: Age plus Allowable Service totals 90.</p> <p><u>First hired after June 30, 1989:</u> Age 55 and three years (five years if hired after June 30, 2010) of Allowable Service.</p>
PERA Correctional	Age 50 and vested.
PERA Police & Fire	Age 50 and vested.
SPTRFA - Coordinated	<p><u>First hired before July 1, 1989:</u> (a.) Age 55 and three years of Allowable Service; or (b.) Any age with 30 years of Allowable Service; or (c.) Rule of 90: Age plus Allowable Service totals 90.</p> <p><u>First hired after June 30, 1989:</u> Age 55 with three years of Allowable Service.</p>
TRA - Coordinated	<p><u>First hired before July 1, 1989:</u> (a.) Age 55 and three years of Allowable Service; or (b.) Any age with 30 years of Allowable Service; or (c.) Rule of 90: Age plus Allowable Service totals 90.</p> <p><u>First hired after June 30, 1989:</u> Age 55 with three years of Allowable Service.</p>

Vesting Provisions

Plan	Details																																																																																
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PERA Police & Fire	<u>Vesting Percent if first hired</u>																																																																																
	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>Years of Service</u></th> <th style="text-align: center;"><u>Before 7/1/2010</u></th> <th style="text-align: center;"><u>After 6/30/2010 & before 7/1/2014</u></th> <th style="text-align: center;"><u>After 6/30/2014</u></th> </tr> </thead> <tbody> <tr><td style="text-align: center;"><3</td><td style="text-align: center;">0%</td><td style="text-align: center;">0%</td><td style="text-align: center;">0%</td></tr> <tr><td style="text-align: center;">3</td><td style="text-align: center;">100%</td><td style="text-align: center;">0%</td><td style="text-align: center;">0%</td></tr> <tr><td style="text-align: center;">4</td><td style="text-align: center;">100%</td><td style="text-align: center;">0%</td><td style="text-align: center;">0%</td></tr> <tr><td style="text-align: center;">5</td><td style="text-align: center;">100%</td><td style="text-align: center;">50%</td><td style="text-align: center;">0%</td></tr> <tr><td style="text-align: center;">6</td><td style="text-align: center;">100%</td><td style="text-align: center;">60%</td><td style="text-align: center;">0%</td></tr> <tr><td style="text-align: center;">7</td><td style="text-align: center;">100%</td><td style="text-align: center;">70%</td><td style="text-align: center;">0%</td></tr> <tr><td style="text-align: center;">8</td><td style="text-align: center;">100%</td><td style="text-align: center;">80%</td><td style="text-align: center;">0%</td></tr> <tr><td style="text-align: center;">9</td><td style="text-align: center;">100%</td><td style="text-align: center;">90%</td><td style="text-align: center;">0%</td></tr> <tr><td style="text-align: center;">10</td><td style="text-align: center;">100%</td><td style="text-align: center;">100%</td><td style="text-align: center;">50%</td></tr> <tr><td style="text-align: center;">11</td><td style="text-align: center;">100%</td><td style="text-align: center;">100%</td><td style="text-align: center;">55%</td></tr> <tr><td style="text-align: center;">12</td><td style="text-align: center;">100%</td><td style="text-align: center;">100%</td><td style="text-align: center;">60%</td></tr> <tr><td style="text-align: center;">13</td><td style="text-align: center;">100%</td><td style="text-align: center;">100%</td><td style="text-align: center;">65%</td></tr> <tr><td style="text-align: center;">14</td><td style="text-align: center;">100%</td><td style="text-align: center;">100%</td><td style="text-align: center;">70%</td></tr> <tr><td style="text-align: center;">15</td><td style="text-align: center;">100%</td><td style="text-align: center;">100%</td><td style="text-align: center;">75%</td></tr> <tr><td style="text-align: center;">16</td><td style="text-align: center;">100%</td><td style="text-align: center;">100%</td><td style="text-align: center;">80%</td></tr> <tr><td style="text-align: center;">17</td><td style="text-align: center;">100%</td><td style="text-align: center;">100%</td><td style="text-align: center;">85%</td></tr> <tr><td style="text-align: center;">18</td><td style="text-align: center;">100%</td><td style="text-align: center;">100%</td><td style="text-align: center;">90%</td></tr> <tr><td style="text-align: center;">19</td><td style="text-align: center;">100%</td><td style="text-align: center;">100%</td><td style="text-align: center;">95%</td></tr> <tr><td style="text-align: center;">20+</td><td style="text-align: center;">100%</td><td style="text-align: center;">100%</td><td style="text-align: center;">100%</td></tr> </tbody> </table>	<u>Years of Service</u>	<u>Before 7/1/2010</u>	<u>After 6/30/2010 & before 7/1/2014</u>	<u>After 6/30/2014</u>	<3	0%	0%	0%	3	100%	0%	0%	4	100%	0%	0%	5	100%	50%	0%	6	100%	60%	0%	7	100%	70%	0%	8	100%	80%	0%	9	100%	90%	0%	10	100%	100%	50%	11	100%	100%	55%	12	100%	100%	60%	13	100%	100%	65%	14	100%	100%	70%	15	100%	100%	75%	16	100%	100%	80%	17	100%	100%	85%	18	100%	100%	90%	19	100%	100%	95%	20+	100%	100%	100%
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Augmentation Provisions

Plan	Details
MSRS General	Benefit computed under law in effect at termination and increased by the following annual augmentation percentage: (a.) 0.00% before July 1, 1971; (b.) 5.00% from July 1, 1971 to January 1, 1981; (c.) 3.00% thereafter (2.50% if hired after June 30, 2006) until January 1 of the year following attainment of age 55 or January 1, 2012, whichever is earlier; (d.) 5.00% thereafter until the annuity begins (2.50% if hired after June 30, 2006), but before January 1, 2012. Amount is payable as a normal or early retirement; (e.) 2.00% from January 1, 2012 thereafter. Amount is payable at normal or early retirement.
MSRS Correctional	Benefit computed under law in effect at termination and increased by the following annual augmentation percentage: (a.) 0.00% before July 1, 1971; (b.) 5.00% from July 1, 1971 to January 1, 1981; (c.) 3.00% thereafter (2.50% if hired after June 30, 2006) until January 1 of the year following attainment of age 55 or January 1, 2012, whichever is earlier; (d.) 5.00% thereafter until the annuity begins (2.50% if hired after June 30, 2006), but before January 1, 2012; and (e.) 2.00% from January 1, 2012 thereafter. Amount is payable at normal or early retirement.
MSRS State Patrol	Benefit is computed under law in effect at termination and increased by the following annual augmentation percentage: (a.) 0.00% before July 1, 1971; (b.) 5.00% from July 1, 1971 to January 1, 1981; (c.) 3.00% thereafter (2.50% if hired after June 30, 2006) until January 1, 2012; and (d.) 2.00% after December 31, 2011 until the annuity begins. Amount is payable at normal or early retirement.
PERA General - Coordinated	Benefit is computed under law in effect at termination and increased by the following annual augmentation percentage for terminations prior to January 1, 2012: (a.) 0.00% before July 1, 1971; (b.) 5.00% from July 1, 1971 to January 1, 1981; (c.) 3.00% (2.50% if hired after June 30, 2006) thereafter until the earlier of January 1 of the year following attainment of age 55 and January 1, 2012; (d.) 5.00% (2.50% if hired after June 30, 2006) thereafter until the earlier of the date the annuity begins and January 1, 2012; or (e.) 1.00% from January 1, 2012 to when the benefit begins. Members who terminate after 2011 will receive no future augmentation.
PERA Correctional	Benefit is computed under law in effect at termination and increased by the following annual augmentation percentage for terminations prior to January 1, 2012: (a.) 3.00% (2.50% if hired after June 30, 2006) until the earlier of January 1 of the year following attainment of age 55 and January 1, 2012; (b.) 5.00% (2.50% if hired after June 30, 2006) thereafter until the earlier of the date the annuity begins and January 1, 2012; and (c.) 1.00% from January 1, 2012 thereafter. If a member terminates employment after 2011, they are not eligible for augmentation.
PERA Police & Fire	Benefit is computed under law in effect at termination and increased by the following annual augmentation percentage for terminations prior to January 1, 2012: (a.) 0.00% before July 1, 1971; (b.) 5.00% from July 1, 1971 to January 1, 1981; (c.) 3.00% (2.50% if hired after June 30, 2006) thereafter until the earlier of January 1 of the year following attainment of age 55 and January 1, 2012; (d.) 5.00% (2.50% if hired after June 30, 2006) thereafter until the earlier of the date the annuity begins and January 1, 2012; and (e.) 1.00% from January 1, 2012 thereafter. Members who terminate after 2011 will receive no future augmentation.
SPTRFA - Coordinated	Benefit computed under law in effect at termination and payable as a normal or early retirement benefit. For members hired on or before June 30, 2006, the benefit is augmented at 3.00 % compounded annually from the 1st of the month following termination until the January 1st after turning age 55 and then augmented at 5.00 % compounded annually from that date to July 1, 2012. For members hired after June 30, 2006, the benefit is augmented at 2.50% compounded annually from the 1st of the month following termination to July 1, 2012. Augmentation for all members, regardless of hire date, changed to 2.00% as of July 1, 2012 for the portion of benefit deferral which occurs after June 30, 2012.
TRA - Coordinated	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 forward. 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. Amount is payable as a normal or early retirement.

Salary Increase Assumptions

Plan	Details			
PERA Correctional	<u>Age</u>	<u>Increase</u>	<u>Age</u>	<u>Increase</u>
	20	8.75%	50	4.75%
	25	7.50%	55	4.50%
	30	6.50%	60	4.00%
	35	6.00%	65	3.75%
	40	5.50%	70+	3.75%
	45	4.75%		
SPTRFA - Coordinated	In addition to the age-based rates shown below, during the first 15 years of employment, a service-based component of 0.20% x (15-T), where T is completed years of service, is included in the salary increase used.			
	<u>Age</u>	<u>Salary Increase</u>	<u>Age</u>	<u>Salary Increase</u>
	<22	5.90%	42	4.90%
	23	5.85%	43	4.85%
	24	5.80%	44	4.80%
	25	5.75%	45	4.75%
	26	5.70%	46	4.70%
	27	5.65%	47	4.65%
	28	5.60%	48	4.60%
	29	5.55%	49	4.55%
	30	5.50%	50	4.50%
	31	5.45%	51	4.45%
	32	5.40%	52	4.40%
	33	5.35%	53	4.35%
	34	5.30%	54	4.30%
	35	5.25%	55	4.25%
	36	5.20%	56	4.20%
	37	5.15%	57	4.15%
	38	5.10%	58	4.10%
39	5.05%	59	4.05%	
40	5.00%	60+	4.00%	
41	4.95%			

Years	Plan					
	MSRS General	MSRS Correctional	MSRS Police & Fire	PERA General	PERA Police and Fire	TRA
1	10.25%	5.75%	7.75%	11.78%	12.75%	12.00%
2	7.85%	5.60%	7.25%	8.65%	10.75%	9.00%
3	6.65%	5.45%	6.75%	7.21%	8.75%	8.00%
4	5.95%	5.30%	6.50%	6.33%	7.75%	7.50%
5	5.45%	5.15%	6.25%	5.72%	6.25%	7.25%
6	5.05%	5.00%	6.00%	5.27%	5.85%	7.00%
7	4.75%	4.85%	5.75%	4.91%	5.55%	6.85%
8	4.45%	4.70%	5.60%	4.62%	5.35%	6.70%
9	4.25%	4.55%	5.45%	4.38%	5.15%	6.55%
10	4.15%	4.40%	5.30%	4.17%	5.05%	6.40%
11	3.95%	4.30%	5.15%	3.99%	4.95%	6.25%
12	3.85%	4.20%	5.00%	3.83%	4.85%	6.00%
13	3.75%	4.10%	4.85%	3.69%	4.75%	5.75%
14	3.55%	4.00%	4.70%	3.57%	4.65%	5.50%
15	3.45%	3.90%	4.55%	3.45%	4.55%	5.25%
16	3.35%	3.80%	4.40%	3.35%	4.55%	5.00%
17	3.25%	3.70%	4.25%	3.26%	4.55%	4.75%
18	Thereafter	3.60%	4.10%	3.25%	4.55%	4.50%
19		3.50%	3.95%	Thereafter	4.55%	4.25%
20		Thereafter	3.80%		4.55%	4.00%
21			3.75%		4.45%	3.90%
22			Thereafter		4.35%	3.80%
23					4.25%	3.70%
24					Thereafter	3.60%
25+						3.50%