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Milliman

July 1, 2013 Actuarial Review
of the Retirement Systems under the

Minnesota Legislative Commission on Pensions and Retirement

January 31, 2014

Prepared by:

Milliman, Inc.

William V. Hogan, FSA, MAAA
Principal and Consulting Actuary

Timothy J. Herman, FSA, MAAA
Principal and Consulting Actuary

February 18, 2014

15800 Bluemound Road, Suite 100
Brookfield, WI 53005-6043
TEL +1 262 784 2250
FAX +1 262 923 3687
milliman.com

Milliman

15800 Bluemound Road
Suite 100
Brookfield, WI 53005-6043
USA

Tel +1 262 784 2250
Fax +1 262 923 3687

www.milliman.com

February 18, 2014

Minnesota Legislative Commission
on Pensions and Retirement
State Office Building, Room 55
100 Rev. Dr. Martin Luther King Jr. Blvd.
St. Paul, Minnesota 55155

ATTN: Mr. Lawrence A. Martin, Executive Director

RE: Actuarial Review of the July 1, 2013 Actuarial Valuation Reports

Ladies and Gentlemen:

The enclosed report presents the findings and comments resulting from a review of the July 1, 2013 actuarial valuations for selected funds of the retirement systems administered by the Duluth Teachers Retirement Fund Association (DTRFA), the Minnesota Public Employees Retirement Association (PERA), the Minnesota State Retirement System (MSRS), the Minnesota Teachers Retirement Association (TRA), and the St. Paul Teachers Retirement Association (StPTRFA). The funds included in the Actuarial Review are detailed below. An overview of our major findings is included in the Executive Summary section of the report. More detailed commentary is provided in the sections devoted to each fund individually.

We pursued this review with a constructive mindset. We looked to identify any possible suggestions that might improve understanding of or confidence in the actuarial services being provided. Naturally, some of the comments may be viewed as personal preference or nit-picky in nature. While we are not trying to impose our own preferences or biases on the Fund or the Fund Actuary, neither did we hesitate to make such comments if we believed that some change, however minor, would improve the actuarial functions.

This report is prepared for use by the Minnesota Legislative Commission on Pensions and Retirement (LCPR) in their oversight role with regard to the above mentioned retirement systems. It has been prepared using multi-faceted review techniques. These techniques include specific validation of a sampling of calculations.

Actuarial Review of July 1, 2013 Actuarial Valuation Reports

Funds Included in Review *	
MSRS General	PERA Police and Fire
MSRS State Patrol	PERA Local Correctional
MSRS Correctional	PERA MERF
MSRS Judges	TRA
MSRS Elective State Officers/Legislators	DTRFA
PERA General	St. PTRFA

* *A complete replication of the July 1, 2013 Actuarial Valuation has been performed for MSRS State Patrol, MSRS Correctional, PERA Police and Fire, and PERA Local Correctional. Please see the Milliman client report dated January 31, 2014 for the MSRS State Patrol report, January 31, 2014 for the MSRS Correctional report, January 31, 2014 for the Police and Fire report, and January 31, 2014 for the PERA Local Correctional report for the details of the replication valuations. For all of the other funds included in the Actuarial Review, a complete replication of the July 1, 2013 actuarial valuation has not been performed.*

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by both the relevant actuarial firms who prepare the formal valuations and the relevant staff at each of the administrative systems. This information includes, but is not limited to, statutory provisions, employee data and financial information. It should be noted that if any data or other information provided to us is inaccurate or incomplete, our calculations and recommendations may need to be revised.

Actuarial assumptions, including discount rates, mortality tables, and others identified in this report, and actuarial cost methods are those used by the Fund Actuary and as prescribed by statute or adopted by the applicable Board and approved by the LCPR. These parties are responsible for selecting the plan's funding policy, actuarial valuation methods, asset valuation methods, and assumptions. The policies, methods, and assumptions used in this valuation are those that have been so prescribed and are described in the Actuarial Basis of this report.

A valuation report is only an estimate of the System's financial condition as of a single date. It can neither predict the System's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of System benefits, only the timing of System contributions. While the valuation is based on an array of individually reasonable assumptions, other assumption sets may also be reasonable and valuation results based on those assumptions would be different. No one set of assumptions is uniquely correct. Determining results using alternative assumptions is outside the scope of our engagement.

Future actuarial measurements may differ significantly from any current measurements presented by Milliman in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of future measurements.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board (ASB) and the Code of Professional Conduct and Qualification Standards for Public Statements of Actuarial Opinion of the American Academy of Actuaries.

Milliman's work is prepared solely for the use and benefit of the LCPR. To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent unless allowed under the Legislative Commission on Pensions and Retirement Contract for Actuarial Review and Auditing Consulting Services dated July 18, 2013. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

Any distribution of the enclosed report must be in its entirety including this cover letter, unless prior written consent is obtained from Milliman, Inc. This report has been prepared in accordance with the terms and provisions of the Legislative Commission on Pensions and Retirement Contract for Actuarial Review and Auditing Consulting Services effective July 18, 2013.

We, William V. Hogan, FSA, and Timothy J. Herman, FSA, are actuaries for Milliman, Inc. We are members of the American Academy of Actuaries and a Fellow of the Society of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

We look forward to making a personal presentation of our findings in briefings to the Minnesota Legislative Commission on Pensions and Retirement and to relevant staff members.

Respectfully submitted,

Milliman, Inc.

William V. Hogan, FSA, MAAA
Principal and Consulting Actuary

Timothy J. Herman, FSA, MAAA
Principal and Consulting Actuary

WVH/TJH/kf

July 1, 2013 Actuarial Review
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Purpose and Scope of the Actuarial Audit Review

In accordance with Minnesota Statutes, Section 356.214, Subdivision 4, the Minnesota Legislative Commission on Pensions and Retirement (LCPR) has engaged Milliman, Inc. to perform an actuarial review of the July 1, 2013 actuarial valuations prepared for selected statewide and major local Minnesota public employee pension funds. Except as indicated below, our reviews have been limited in scope and do not reflect a full replication of any individual retirement system. The table below details the selected funds included in our review.

Funds Included in Review *	
MSRS General	PERA Police and Fire
MSRS State Patrol	PERA Local Correctional
MSRS Correctional	PERA MERF
MSRS Judges	TRA
MSRS Elective State Officers/Legislators	DTRFA
PERA General	St. PTRFA

* *A complete replication of the July 1, 2013 Actuarial Valuation has been performed for MSRS State Patrol, MSRS Correctional, PERA Police and Fire, and PERA Local Correctional. Please see the Milliman client report dated January 31, 2014 for the MSRS State Patrol report, January 31, 2014 for the MSRS Correctional report, January 31, 2014 for the Police and Fire report, and January 31, 2014 for the PERA Local Correctional report for the details of the replication valuations. For all of the other funds included in the Actuarial Review, a complete replication of the July 1, 2013 actuarial valuation has not been performed.*

The actuarial review of each of the remaining valuations was performed using a methodology known as a **"limited scope"** or **"peer review"** audit. Such a review is intended to provide assurance that the liabilities and costs of the system are reasonable. The review is not a full replication of the actuarial valuation results, but is a review of the key components in the valuation process that encompass the derivation of the liabilities and costs for the system. These key components are the data, the benefits valued, application of the actuarial assumptions, application of the asset valuation method and the actuarial cost method employed. The receipt of detailed valuation output for a select group of test lives provides the detail necessary to validate each of these key components. The test lives reviewed are not randomly selected, but rather are specifically chosen to include members that will cover the various benefit provisions and actuarial assumptions used in the valuation process. For example, test lives generally will include:

- Members in various status categories such as active, terminated vested, retired, and survivors.
- Retiree test lives are selected with different forms of payment to ensure all payment forms are accurately valued.
- Active members who are covered by different benefit structures are included to make sure the benefits valued for all benefit structures are appropriate.
- Members of different gender and age/service combinations to test the application of different actuarial assumptions.
- Active members are selected that will test differences within one set of actuarial assumptions, e.g. Rule of 90, early retirement and normal retirement.

We reviewed all of the information provided to us from the fund administrators and the fund actuaries. We also requested and reviewed additional information provided by the fund actuaries. With respect to the actuarial assumptions, we generally focused our review on the application of the assumptions in the valuation process. In some limited instances, we have commented about the appropriateness of some assumptions.

A limited scope audit may identify areas of concern, but it generally cannot quantify the impact of any issues identified, other than in general terms. In our report, we comment on several findings where we feel the issue identified is immaterial or within a reasonable degree of tolerance. For the most part, these comments are couched in terms of an expected percentage impact on the actuarial liability and normal cost rate. Given that the actuarial accrued liability of some of the plans is a very large number, a small percent change may result in a dollar amount judged to be "large" depending upon your point of view (0.50% of $23 billion is $115 million). However, as a percentage, the difference may be considered small and within acceptable levels of variance.

It is important to recognize that the actuarial valuation process, while very sophisticated in its calculation methodology, is still an estimate of the financial value of benefits payable on contingent events, most of which occur many years into the future. As such, a considerable amount of uncertainty and variability surrounds those estimates. As actuaries we recognize this fact and are comfortable that small differences (in percentages) in the results do not change the overall financial results portrayed in the valuation. Furthermore, the actuarial software used by different firms has implicit differences that create differences in the valuation numbers. A good example of differences in actuarial software is the decrement timing (mid-year vs. beginning of year). In this case both approaches fall within acceptable actuarial practices and both approaches produce reasonable results even though they may vary by several percentage points. For this reason, we believe the comparison of valuation results should be evaluated in terms of percentage differences. To provide some context for our comments, in a replication audit, where the differences that are identified can also be quantified, we generally expect to be within 1-2% on the calculation of the present value of future benefits and within 4-5% on the calculation of the actuarial accrued liability and normal cost. The wider range on the latter items is because there tends to be more variability in how different actuarial software programs allocate the total liability (present value of future benefits) to past and future years of service.

Statement of Key Findings

Our conclusions concerning the primary issues of the audit are as follows:

In general, we have found the actuarial calculations to be accurate, appropriate, and consistent with the standards of work issued by the LCPR. While there are some exceptions noted throughout this report, we do not believe that any of these would substantively alter the results presented by the various fund actuaries. However, in our conclusions, we present some longer term considerations where we have some concerns.

There are several issues identified for one or more systems in the report. We have summarized some of them as follows:

1. The 2013 Omnibus Retirement Bill included changes to benefit provisions and financing sources including member and employer contribution increases as well as State Aid. Specific changes by fund are noted elsewhere in this report. In general, significant improvements in the long-term health of the affected funds are expected as a result of these changes. Nevertheless, there are some funds with significant financial challenges.

2. The table below compares the July 1, 2012 and July 1, 2013 Contribution Sufficiency/(Deficiency) measures as calculated by the Fund Actuaries.

Contribution Sufficiency/(Deficiency) Measure Reported by Fund Actuary

Fund*	July 1, 2012	July 1, 2013
MSRS General	-2.32%	-2.45%
MSRS Correctional	-4.58%	-5.41%
MSRS State Patrol	-11.52%	-8.68%
MSRS Judges	-13.50%	-11.46%
PERA General	-0.96%	-1.65%
PERA Correctional	0.13%	0.26%
PERA P&F	-7.94%	-2.64%
TRA	-5.04%	-4.74%
DTRFA	-8.49%	-2.88%
SPTRFA	-6.40%	-2.80%

* *The table above shows the results for Funds that use a level percentage of pay methodology to determine the Contribution Sufficiency/(Deficiency) measure. Consequently, the results for MSRS Elective State Officials/Legislators, and the MERF Division of PERA are not included.*

3. Market value returns for the last fiscal year were generally favorable. However, due to mixed investment experience for the last four fiscal years, most (but not all) of the funds using an asset smoothing mechanism reported an investment loss on an actuarial value basis as prior unrecognized losses became recognized. Many of these funds now have actuarial value of assets that are less than the market value of assets. These funds are now well positioned to report investment gains on an actuarial basis next year even if market returns are only average.

4. Each Fund Actuary has reported the Contribution Sufficiency/(Deficiency) measure on both an actuarial value and a market value basis. Reviewing this measure on a market value basis illustrates the impact the asset smoothing has on deferred asset gains. In addition to reviewing the Contribution Sufficiency/(Deficiency) measure on a market value basis, it is also instructive to consider the effects after the increases in member and employer contribution rates are fully phased in and after the temporary State Aid to the St. Paul and Duluth Teachers Funds expire. The table below illustrates the Contribution Sufficiency/(Deficiency) measure on a market value basis and on a market value basis with long-term funding sources.

July 1, 2013 Contribution Sufficiency/(Deficiency) Measure			
Fund***	Actuarial Value Basis Reported by Fund Actuary	Market Value Basis Reported by Fund Actuary	Market Value Basis with Long-Term Funding Sources Calculated by Milliman*
MSRS General	-2.45%	-0.80%	-0.80%
MSRS Correctional	-5.41%	-3.97%	-3.97%
MSRS State Patrol	-8.68%	-4.33%	0.67%
MSRS Judges	-11.46%	-9.64%	-9.64%
PERA General	-1.65%	-0.15%	-0.15%
PERA Correctional	0.26%	1.19%	1.19%
PERA P&F	-2.64%	0.65%	2.90%
TRA	-4.74%	-2.73%	-1.73%
DTRFA	-2.88%	-0.85%	-10.77%
SPTRFA	-2.80%	-1.67%	-1.42%

* *Milliman calculations use the values reported by the Fund Actuary.*

*** *The table above shows the results for Funds that use a level percentage of pay methodology to determine the Contribution Sufficiency/(Deficiency) measure. Consequently, the results for MSRS Elective State Officials, MSRS Legislators, and the MERF Division of PERA are not included.*

5. As noted in the detailed commentary, the Actuarial Required Contribution rate results in "negative amortization" for a period of time. This means that amortization payments on the unfunded actuarial liability are not large enough to cover interest on the unfunded actuarial liability in the short term. Consequently, the unfunded actuarial liability is expected to increase in the next year for most funds. Because the amortization payments are expected to increase over time under this method, eventually the payments will be enough to cover both interest and principal until the unfunded liability is fully amortized at the statutory amortization date.

   However, we note that for the St. Paul Teachers Retirement Fund Association, a "rolling" 25 year amortization period is used. This means that the amortization schedule never diminishes and the method will never get out of the negative territory. We believe that this funding methodology should be reviewed and modified if deemed appropriate.

6. For the Duluth Teachers Retirement Fund Association, there is an inherent upward bias in the calculation of the Actuarial Required Contribution rate due to the combined impact of the Fund Actuary's application of the Entry Age normal actuarial cost method and the amortization of the Unfunded Actuarial Accrued Liability as a level percentage of payroll for this fund. This issue is further discussed in Section 3 of this report. The Entry Age Normal methodology which is applied for Duluth Teachers lowers the Normal Cost and moves a portion of it to the unfunded actuarial liability. This increases the pressure on funding a mature fund such as Duluth Teachers during periods of declining payroll because the funding of the Unfunded Actuarial Accrued Liability is predicated on payments from future payrolls that will be higher than the current payroll. The increased amortization period as a

result of plan and assumption changes has further aggravated this issue. Further, it is not clear to us that this method follows the Actuarial Standards of Practice as adopted by the LCPR. Under Minnesota Statutes, the Actuarial Required Contribution rate is not required to be contributed to the Fund. Instead, this measure is compared to the Statutorily Required Contributions to assess the adequacy of the current contributions. Using Milliman's July 1, 2012 replication results, the table below illustrates the differences in the calculation of the Contribution Sufficiency/Deficiency measure in dollar terms:

Duluth Teachers' Retirement Fund Association
Illustrative Contribution Sufficiency/(Deficiency) Measure Using Milliman July 1, 2012 Results

(dollars in thousands)

Entry Age Normal Method	Newly Hired Member's Benefit Structure	Each Member's Benefit Structure	Each Member's Benefit Structure
Amortization Method	**Level Percent of Payroll**	**Level Percent of Payroll**	**Level Dollar**
1. Statutory Contributions	$7,348	$7,348	$7,348
2. Required Contributions			
a. Normal Cost	3,591	3,844	3,844
b. Amortization of the Unfunded Actuarial Accrued Liability	7,652	7,607	10,034
c. Expense	587	587	587
d. Total [2.a.+ 2.b.+ 2.c.]	11,830	12,038	14,465
Sufficiency/(Deficiency) [1.- 2.d.]	$(4,482)	$(4,690)	$(7,117)

7. Legislation passed in both 2010 and 2011 modified the cost of living adjustments (COLA) applied to annual pension payments. These modifications lowered the COLA until a specified funding level is achieved. For the 2013 valuations, we have reviewed the methodology used by the Fund Actuary for determining the level of COLA to value in these situations. We believe the methodology used is reasonable for the 2013 valuations.

   The 2013 Omnibus Pension Legislation changed the COLA mechanism for PERA General, Police & Fire, Local Correctional, and MERF Division of PERA as described below:

   > The funding ratio threshold that must be attained to pay a 2.5% postretirement benefit increase to benefit recipients was changed from 90% for one year to 90% for two consecutive years. The funding ratio threshold that determines when a 2.5% postretirement benefit increase must decrease to 1.0% was changed from less than 90% for one year to less than 80% for one year or less than 85% for two consecutive years.

   The PERA Local Correctional Plan's accrued liability funded ratio on a market value basis was 88.99% on July 1, 2012 and 96.21% on July 1, 2013. Under the new COLA mechanism, the COLA was 1.0% on January 1, 2014. The January 1, 2015 COLA will depend on the July 1, 2014 accrued liability funded ratio on a market value basis. If the July 1, 2014 funded ratio reaches 90% or more, the COLA will increase to 2.5%. Otherwise, the COLA will remain at 1.0%. The 2013 Omnibus Pension Legislation will reduce changes to the COLA but not eliminate them.

8. An important aspect of the actuarial reports is to provide a consistent "picture" of the funded status and funding requirements for each of the funds year after year. The current funded status as of the valuation date is extremely important but it is also important to understand the direction of the change in funded status. This understanding is enhanced when prior years can be compared in a consistent fashion. The following comments concerning report content are aimed in this direction.
   - We note that some of the reports do not show all of the decrement costs related to active member benefits even though the numbers accurately reflect those amounts in the totals. Specifically, in some cases, the expected refund payments have been aggregated with deferred retirement benefits for benefits expected to be paid to active members upon withdrawal.
   - Also, we note that the projected benefit ratio anticipates future increases in contributions which are already in statute for some funds, but not others. We recommend that all fund actuaries adopt a consistent methodology on this calculation.

9. An actuarial valuation is a snapshot of the current funded status as of the valuation date. It is important to understand the changes in funded status over time - both historical changes and expected future changes. We believe the valuation projections which are required by the actuarial standards will provide useful information to the LCPR to more fully understand the funding challenges the retirement systems face.

There are other relatively minor items that we note in the individual report sections later on.

Conclusions and Recommendations

While the actuarial results presented in the reports are generally correct, we believe that there are some key issues facing most of these systems.

Actuarial Value of Assets

From the 7/1/2009 to the 7/1/2013 actuarial valuations, there have been significant changes to the benefit structure, updates to the actuarial assumptions, and modifications to the actuarial standards of practice adopted by the LCPR. In addition, when measured on a market value basis, the funds have experienced unfavorable asset return for the fiscal year ending June 30, 2012 and favorable asset returns for the fiscal years ending June 30, 2010, June 30, 2011, and June 30, 2013 when compared to the 8.5% (8.0% for the fiscal year ending June 30, 2013) actuarial rate of asset return assumption specified by Minnesota statutes:

- The rates of return on a market value of assets basis were typically between 15-16% for the year ending June 30, 2010 with the MSRS Legislator's fund posting the lowest return at 12.2% and the Duluth Teachers Retirement Fund Association netting a return of 17.6%.
- The rates of return on a market value of assets basis were between 21-24% for the year ending June 30, 2011 with the Duluth Teachers Retirement Fund Association posting the lowest return at 21.6% and the St. Paul Teachers Retirement Fund Association netting a return of 24.8%.
- The rates of return on a market value of assets basis ranged from a loss of 0.5% to positive return of 2.7% for the year ending June 30, 2012 with the St. Paul Teachers Retirement Fund Association posting the lowest return at (0.4%) and the PERA Police and Fire Fund Association netting a return of 2.9%.
- The rates of return on a market value of assets basis were typically between 13-16% for the year ending June 30, 2013 with Duluth Teachers Retirement Fund Association earning 16.6% and St. Paul Teachers Retirement Fund Association netting 13.5%.

The favorable market value returns for the year ending June 30, 2013 were offset by the recognition of prior investment losses under the asset smoothing method. Consequently, the July 1, 2013 actuarial valuation results indicate investment losses when measured on an actuarial value of assets.

COLA

One of the significant changes in the benefit structure made by the 2010 Omnibus Pension Legislation is the temporary reduction in the post-retirement Cost of Living Adjustment (COLA). This change requires a fund to pay a lower annual COLA until "financial stability" is restored for the fund. For most funds (but not all), the COLA is reduced from 2.5% to 2.0% per year. Minnesota statutes define "financial stability" to occur when the ratio of the market value of the fund's assets to the fund's actuarial accrued liabilities is 90% or more. If and when "financial stability" is reached as of an actuarial valuation date, the fund may pay a COLA of 2.5% as of the following January 1.

In setting the actuarial assumption with respect to "financial stability", some of the fund actuaries have prepared projections to determine if, and when, the fund is projected to reach the 90% funding level on a market value basis. For these funds, most of the projections indicate the fund will not reach the 90% funding level within the next 15 years in order to pay a higher COLA. Consequently, the actuarial valuations for these funds assume that the lower COLA required under the 2010 Omnibus Pension Legislation will continue to be paid for the actuarial valuation period (typically over the next 75-100 years for most actuarial valuation systems). This implies that additional actions may be necessary if the goal is to achieve a 90% funding level. One issue that needs to be addressed relates to when a fund is projected to achieve 90% funding level only in later years. How should an actuarial valuation model the plan fund liabilities and costs of the COLA in such a situation? For example, a small deficiency in a fund does not necessarily mean that full funding will not be achieved. It only means full funding will not be achieved by the scheduled amortization date. Consequently, these funds are expected to reach 90% funded status at some future date.

Additionally, the current statutes provide for the full 2.5% COLA to be paid when a fund reaches the 90% funding level (on a market value of assets basis). There is the possibility that a fund may be in the position to satisfy the 90% funding criteria before a higher COLA is paid and be less than 90% funded after paying the higher COLA. This suggests administrative issues that may need to be addressed by the Funds or via law changes.

The 2013 Omnibus Pension Legislation changed the COLA mechanism for some funds. These changes that are described above will reduce but not eliminate these issues. We stand ready to assist the Commission with this issue.

Finally, we would prefer that all of the actuary reports document the analysis for assuming the COLA assumption being used.

Amortization of Unfunded Actuarial Liability

Earlier, we noted a concern about the funding for Duluth Teachers Retirement Fund Association. However, we note that most of the Funds that we have reviewed share a similar issue to a lesser degree. Most of the Funds amortize their unfunded actuarial liability as a level percentage of future payroll. Since future payroll is projected to increase each year, a significant portion of the amortization is pushed back to the later years. In fact, the early years of amortization payments do not even cover the interest on the unfunded actuarial liability. This is sometimes referred to as "negative amortization". The problem arises when payrolls do not increase as projected. When this happens, the unfunded actuarial liability goes up (not down) since the payments do not cover the interest. A corollary to that problem occurs when using a rolling 25 year amortization such as St. Paul Teachers Retirement Fund. Even if the payroll projection is

met, you never cover the interest on the unfunded actuarial liability because you are always in the first year of the amortization.

We have provided the following table in an effort to demonstrate our concern. The question is whether the data is an aberration or a trend for the future. The data in this table was taken from the 2013 actuarial valuation reports.

Geometric Mean Over Select Time Periods

	Payroll Growth Assumption	1-Year	5-Year	10-Year	20-Year
PERA General	3.75%	2.0%	2.1%	1.8%	4.0%
PERA P&F	3.75%	0.2%	2.5%	3.6%	5.9%
MSRS General	3.75%	4.9%	1.9%	2.1%	2.6%
MSRS State Patrol	3.75%	-0.6%	0.7%	1.4%	2.8%
TRA	3.75%	1.2%	1.5%	2.9%	3.3%
DTRFA	3.50%	-3.0%	-3.0%	-1.3%	0.1%
StPTRFA	4.00%	3.5%	1.0%	1.9%	3.6%

American Academy of Actuaries Actuarial Standards of Practice

The Actuarial Standards Board of the Academy of Actuaries establishes and improves standards of actuarial practice. These Actuarial Standards of Practice (ASOPs) identify what the actuary should consider, document, and disclose when performing an actuarial assignment. Standards of practice are in place to assure the public that actuaries are professionally accountable. At the same time, the standards provide practicing actuaries with a basis for assuring that their work will conform to appropriate practices. Written standards of practice, coupled with written provisions for disciplining members, show that the profession governs itself and takes an active interest in protecting the public.

There are ASOPs for each area of specialty (Casualty, Health, Life, Pension) and also general standards that apply to all practice areas. The specific pension ASOPs that apply to the actuarial work reviewed by Milliman include:

- ASOP 4: Measuring Pension Obligations
- ASOP 27: Selection of Economic Assumptions for Measuring Pension Obligations
- ASOP 35: Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations
- ASOP 44: Selection and Use of Asset Valuation Methods for Pension Valuations

ASOP 4

ASOP 4 governs the calculation of pension obligations and the communication of those results. In general, the report should contain sufficient information such that:

- It would be properly interpreted and applied by the person to whom the communication is directed, and
- Another actuary in the pension practice could form an opinion about the reasonableness of the conclusion.

Standard of Practice No. 4 also indicates specific requirements for content of actuarial reports including:

- The name of the person or firm retaining the actuary and the purpose of the report,
- An outline of the benefits being valued,
- The effective date of the calculation,
- A summary of the participant data,
- A summary of asset information,
- A description of the actuarial methods and assumptions, and
- A statement of the findings, conclusions or recommendations necessary to satisfy the purpose of the communication.

ASOP 27

ASOP 27 governs the selection of economic assumptions for measuring pension obligations. The guidance with respect to the investment return assumption included in the current version of this standard of practice calls for the actuary to construct a "best estimate range" and recommend a specific point within this range. The standard defines the best estimate range as "...the narrowest range within which the actuary reasonably anticipates that the actual results, compounded over the measurement period, are more likely than not to fall". (ASOP 27, § 2.1)

We believe that the current 8.0% for 4 years, 8.5% thereafter select and ultimate interest rate assumption generally can fit within the guidance provided by the current standard. As we reported in our review of the experience studies during 2010, we believe it falls on the upper end of the "best estimate range" when

looking at standard Milliman economic models.* This means the 8.0/8.5% assumption is somewhat more likely to generate investment losses in the future as opposed to investment gains relative to the 8.0/8.5% long-term return assumption according to the output from Milliman's standard model.

Changes to ASOP 27

The Actuarial Standards Board has adopted a revised edition of ASOP 27. This revised edition will be first effective for the July 1, 2015 actuarial valuation of the funds. The revised edition of ASOP 27 no longer includes the concept of a "best estimate range." Instead, the revised edition of the standard calls for the actuary to select a "reasonable" assumption. An assumption is "reasonable" if it has no significant bias (i.e. it is neither significantly optimistic or pessimistic). The revised edition goes on to describe a "Range of Reasonable Assumptions." In part, this definition states, "The actuary should also recognize that different actuaries will apply different professional judgment and may choose different reasonable assumptions. As a result, a range of reasonable assumption may develop both for an individual actuary and across actuarial practice." (Revised edition of ASOP 27, Section 3.6.2).

The general trend that we have seen over the last decade is a reduction in the capital market assumptions by both actuarial firms and investment consultants. In addition, we have also seen the trend of lower interest rate assumption used by public pension funds. As a reference point, the 50th percentile return based on Milliman's capital market model is significantly less than 8.5%. In our view, we might feel that the current 8.5% assumption does have a bias toward optimism.

ASOP 35

ASOP 35 governs the selection of demographic and other noneconomic assumptions for measuring pension obligations. A revised edition of this standard was adopted by the Actuarial Standards Board of the American Academy of Actuaries in September 2010. This standard is applicable to Members of the American Academy of Actuaries and is effective for any actuarial valuation with a measurement date on or after June 30, 2011. Consequently, the July 1, 2011 actuarial valuation was the first time the revised ASOP 35 standard applies to Members of the American Academy of Actuaries who prepare work for the Minnesota retirement funds. We believe the current mortality assumption used for the July 1, 2013 actuarial valuations satisfy the requirements in the revised ASOP 35 standard.

ASOP 44

ASOP 44, Selection and Use of Asset Valuation Methods for Pension Valuations, governs the asset valuation method. This ASOP provides that the asset valuation method, which is used to develop the actuarial value of assets, should bear a reasonable relationship to the market value. It further provides that the asset valuation method should be likely to satisfy both of the following:

- Produce values within a reasonable range around market value AND
- Recognize differences from market value in a reasonable amount of time.

In lieu of both of the above, the standard will be met if either of the following requirements is satisfied:

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* Milliman's investment consultants develop long-term capital market expected returns based on current yields and valuation levels, published surveys of expert forecasts of real GDP growth and inflation, and historical risk measures of asset class return volatility and covariance. These capital market assumptions underlie the "building block" method used in our expected return model based on the guidance in Actuarial Standard of Practice No. 27 (ASOP27), *Selection of Economic Assumptions for Measuring Pension Obligations.* The building block method in our model considers asset allocation, expected return and variance of each class, and correlation and covariance between asset classes. We then analyze the output ranges and adjust for expected investment expenses in order to arrive at our recommended investment return assumption.

- There is a sufficiently narrow range around the market value OR
- The method recognizes differences from market value in a sufficiently short period.

We believe the methodology in statute meets the requirements of ASOP 44 because it recognizes the difference between market value and actuarial value in a sufficiently short period.

The purpose of an asset valuation method is to reduce volatility in the value of assets that is used in the valuation process thereby creating more stable contribution rates. However, it is important to recognize the difference between the actuarial and market value of assets and the impact the deferred investment experience will have on future valuations. As required by the LCPR actuarial standards of practice, the valuation reports include the difference between actuarial and market value of assets, and provide the funded ratio and actuarial contribution rate on a market value basis.

We believe that all of the reports meet these requirements.

Standards for Actuarial Work (Legislative Commission on Pensions and Retirement)

The Legislative Commission on Pensions and Retirement (LCPR) has adopted standards for actuarial work. The purposes of the standards are:

1. To ensure that sound actuarial procedures are utilized in developing actuarial assumptions, actuarial valuations, and cost estimates for proposed legislation for each retirement plan.
2. To establish sufficient uniformity of actuarial procedures that financial comparability of the retirement plans of the State of Minnesota is maximized.
3. To facilitate the development of sound public policy decision making in the pension area by the Legislature and the Legislative Commission on Pension and Retirement.

These standards are updated periodically, most recently as of August 11, 2010. All actuarial work for retirement plans subject to Minnesota Statutes, Section 356.215 and not subject to Minnesota Statutes, Section 356.216 must be prepared in accordance with the appropriate standards in effect as of the date of the valuation. Specific comments regarding the Commission's Standards are included in our discussion of each Plan.

Audit Conclusion

The Duluth Teachers Retirement Fund Association (DTRFA) is made up of one fund. The fund covers the public school teachers employed by Duluth public schools (except charter school teachers).

In general, the fund experienced a decrease in the accrued liability funded ratio and a decrease in the contribution rate deficiency. The decrease in the deficiency measure is primarily due to the temporary addition of $6,000,000 in State Aid. In addition, the DTRFA is a mature fund with about 43% of its membership in pay status representing more than 70% of the Actuarial Accrued Liability.

The following changes affected the July 1, 2013 actuarial valuation of the Fund:

- Benefit provisions and contribution sources were changed as a result of the 2013 Omnibus Retirement Bill
  - Scheduled increases in member and employer contribution rates of 1.71% of pay fully phased in at July 1, 2014.
  - State Contributions of $6,000,000 on October 1, 2013 and October 1, 2014 were added.
  - Increase in the formula multiplier of 0.2% for New Plan members that applies to service after June 30, 2013.
  - Change in actuarial early retirement reduction factors for New Plan Tier II members to a table of stated reductions.
  - A 1% annual post-retirement COLA was reinstated on January 1, 2014. The post-retirement COLA will change to a CPI-based COLA up to 5% if the funded ratio is 90% or higher on an actuarial value basis.

Following Minnesota Statute 356.215 Subdivision 11, the statutory amortization date was extended from June 30, 2039 to June 30, 2040 due to the increase in the accrued liability from the changes in actuarial assumptions and plan benefits.

As noted in our July 1, 2012 replication review, there appears to be a difference in the application of the entry age normal actuarial cost method between the Milliman results and the results prepared by the fund actuary. The Milliman results employ a method which bases the normal cost rate on the benefits to be earned by current members based on each member's benefit structure. In determining the normal cost rate, we assumed the current plan design has been in effect since date of hire. This approach will result in a normal cost rate that is level over a member's career. Subject to changes in the demographic composition of the active member group, the normal cost rate for the fund as a whole will decrease over time under the current benefit structure as new members with lower benefits replace current members with higher benefits.

We believe the fund actuary's results are based on the normal cost rate using the same benefit structure for new hires on all current members. Under this application of the entry age normal actuarial cost method, the part of the current members' future accruals that will no longer be funded via normal cost rate are essentially capitalized as the actuarial accrued liability and therefore funded via amortization of the unfunded actuarial accrued liability. This approach will result in a normal cost rate that is level over time, subject to changes in the demographic composition of the active member group.

In practice, we have seen both applications of the entry age normal actuarial cost method used for governmental employer pension plans. However, there is a concern about consistency between the results produced by different Fund Actuaries. Based on other replication valuations we have prepared, we

believe that all of the other Fund Actuaries use the method we have employed. It is also questionable whether the method used for DTRFA satisfies the requirements of Section III of the Standards For Actuarial Work as updated by the Legislative Commission on August 11, 2010. Furthermore, with the extension of the amortization period and the declining covered payroll discussed in the Executive Summary, we believe the use of this variation of the EAN method used for the DTRFA valuation to be increasingly inappropriate. We have provided more discussion on this below.

As required by Minnesota Statutes, the Unfunded Actuarial Accrued Liability (UAAL) is amortized as a level percent of payroll from the valuation date to the statutory amortization date to determine the Actuarial Required Contribution Rate. Currently, the actuary applies an assumed payroll growth assumption of 3.50% as set in statute to determine the amortization rate to pay off the UAAL. A review of the data set forth in Section 4, Exhibit III of the fund actuary's report provides a clear downward trend in payroll from June 30, 2008 to June 30, 2011 with a slight increase in the June 30, 2012 fiscal year, and another decrease on the June 30, 2013 fiscal year. Looking further back, the annual payroll growth from June 30, 1993 through June 30, 2013 is slightly over 0.1%. The implication of future payroll lower than what was projected by the actuarial assumptions is that the calculated amortization payment is not sufficient to pay off the Unfunded Actuarial Accrued Liability by the statutory amortization date. For example, the fund actuary's report calls for a supplemental contribution amortization of $10.7 million; whereas, interest alone on the unfunded liability is almost $13.0 million. This situation is sometimes referred to as "negative amortization". For a growing payroll situation, this lower contribution is offset by higher contributions in the future. However, if payroll is not growing, the lower contributions are not offset and the deficit grows instead of shrinks. Given the mature state of this Fund, we believe this assumption should be addressed with consideration given to a level dollar amortization method.

There is an inherent upward bias in the calculation of the Actuarial Required Contribution rate due to the combined impact of the fund actuary's application of the Entry Age normal actuarial cost method and the amortization of the Unfunded Actuarial Accrued Liability as a level percentage of payroll for this fund. Under Minnesota Statutes, the Actuarial Contribution rate is not required to be contributed to the Fund. Instead, this measure is compared to the Statutorily Required Contributions to assess the adequacy of the current contributions. Using Milliman's July 1, 2012 replication results, the table below illustrates the differences in the calculation of the Contribution Sufficiency/Deficiency measure in dollar terms:

Duluth Teachers' Retirement Fund Association
Illustrative Contribution Sufficiency/(Deficiency) Measure Using Milliman July 1, 2012 Results

(dollars in thousands)

	Entry Age Normal Method	Newly Hired Member's Benefit Structure	Each Member's Benefit Structure	Each Member's Benefit Structure
	Amortization Method	**Level Percent of Payroll**	**Level Percent of Payroll**	**Level Dollar**
1.	Statutory Contributions	$7,348	$7,348	$7,348
2.	Required Contributions			
a.	Normal Cost	3,591	3,844	3,844
b.	Amortization of the Unfunded Actuarial Accrued Liability	7,652	7,607	10,034
c.	Expense	587	587	587
d.	Total [2.a.+ 2.b.+ 2.c.]	11,830	12,038	14,465
Sufficiency/(Deficiency) [1.- 2.d.]		$(4,482)	$(4,690)	$(7,117)

The combined effect of (1) negative amortization by using level percent of pay amortization, (2) declining covered payroll, (3) the Fund Actuary's continued application of the Entry Age Normal Cost Method, and (4) the extension of the amortization date as required by Minnesota Statutes is likely to result in higher funding deficiencies in future years.

For the July 1, 2013 Actuarial Valuation of the DTRFA, we have prepared a limited scope sample life review of the Fund Actuary's results as provided in our contract. A full replication review was last prepared for the July 1, 2012 Actuarial Valuation. Our comments below reflect the results of our sample life review.

Comments

Membership Data	We received the original data file prepared by the Fund and supplied to the actuary. We found that the data elements were being used in a consistent manner by the fund actuary. We also noted that the number of records and other summary values listed in the report were reasonable. Based upon this, we believe the data used by the actuary to prepare the actuarial valuation is appropriate and reasonably accurate.
Actuarial Value of Assets	We have reviewed the application of the asset smoothing method. It is the method defined in statute and we believe that this method has been applied correctly.
Actuarial Valuation	We reviewed 12 sample life calculations (6 active, 4 in-pay, 2 deferred vested). We reviewed calculated values and matched the present value of future benefits provided by the actuary to within a reasonable degree of tolerance in the sample lives.
Funding Method	As noted above, we believe that the actuary should consider revising their application of the Entry Age Normal funding method to be consistent with the other funds and as provided in the statutes.
Actuarial Assumptions	We have reviewed the actuarial assumptions as summarized in the actuarial valuation. We have confirmed that the fund actuary has applied these assumptions as summarized in the report, and we have also confirmed the appropriate use of assumptions required by Chapter 356.215, except as noted below. We have determined that the Fund Actuary has applied a salary increase assumption for the initial years of employment (select period) that is not consistent with the increase assumption contained in Chapter 356.215 of the Minnesota statutes. We have confirmed in the sample lives that the Fund Actuary is applying the rates as stated in their report. Since the rates only apply in the early years of employment and the liabilities in DTRFA are heavily skewed to retirees and longer service employees, we believe the impact of these rates is not likely to be significant in total present value of benefits. It is possible that this could affect the calculation of Entry Age Normal Cost by a larger percentage than the present value of benefits. We note there appears to be a substantial difference between the fund actuary's results and our results for active Member benefits for deferred retirement and refund of contributions. This apparent difference is due to the approaches used in the valuation system when an active Member is assumed to leave the System by withdrawal. In the actuarial assumptions, Members who withdraw from the System after becoming eligible for a deferred benefit are assumed to take the larger of their return of

contributions, or their deferred annuity benefit. In the fund actuary's results, the benefits are included in the deferred retirement component if the member is projected to be vested at the time of withdrawal. Otherwise, the benefits are included in the refund of contributions component. In the Milliman results, the deferred retirement component includes the value of annuity benefits for vested Members who withdraw from the System. The refund of contributions component includes both the refund of contributions for members who are not vested at the date of assumed withdrawal plus the value of the return of contributions for Members who are assumed to elect a refund of contributions in lieu of future annuity benefits.

We further note there is a substantial difference between the Fund Actuary's results and our results for terminated members. For deferred retirements with future augmentation, we believe this difference is due to different application of the actuarial standards for terminations that are expected following the member's vesting date. According to the actuarial standards, the proper technique is to assume that the member selects the benefit with the greater value. Thus, for each year after the member's vesting date, the actuarial present value of Projected Benefits is based on the larger of the member's contributions accumulated with interest or the present value of the member's vested deferred benefit (augmented, if appropriate). In our valuation, we determine the greater value as of the former member's assumed retirement date, and then discounting the greater value from the member's assumed retirement date to the valuation date. In the Fund Actuary's valuation, it is our understanding that the greater value is determined by comparing the present value of the deferred benefit as of the valuation date to the member's contributions accumulated with interest at the valuation date. Because the interest on accumulated contributions is 4% and the interest discount factor is 8% for the first 4 years and 8.5% thereafter, the Fund Actuary's method produces a higher present value.

As part of legislation enacted in 2013, the annual Cost of Living Adjustment (COLA) applied to the pensions of retired Members was changed to 1.0%. However, if the Fund achieves at least 90% funded ratio on the actuarial value of assets to actuarial liability, the COLA will provide benefit increases based on the change in CPI-U up to a maximum of 5%. The valuation by the Fund Actuary assumes that the 1.0% COLA will remain in place for all years. As stated in the Fund Actuary's report, this assumption is based on the projections that indicate a steadily declining funding level in the future given the current statutory contribution schedule. We believe this assumption is reasonable.

In addition, the actuarial assumptions description regarding the treatment of unknown data is somewhat vague. We recommend a more detailed description of this assumption.

Plan Provisions

We have reviewed the sample life calculations for compliance with Chapter 354A of the Minnesota statutes. We believe that these calculations reasonably reflect the benefits provided under the statute. In addition, the Actuarial Valuation Report contains a summary of the plan provisions. We believe this summary reasonably reflects the benefits provided under the statute.

Actuarial Report

The information provided in the Actuarial Valuation Report appears to

meet all of the requirements of the Standards for Actuarial Work established by the State of Minnesota Legislative Commission on Pensions and Retirement with one exception. The Actuarial Standards require the disclosure of certain funding measurements based upon the market value of assets.

There are some other items worthy of note with respect to the report. First, we are pleased that the report contains a ten year projection of cash flows. Second, the report does not separately provide costs related to expected refunds by active members who terminate employment. Third, we believe it would be a good enhancement to the report if the assumptions section reflected the date of the last experience analysis on which the assumptions are based (although we note that the body of the report does discuss this information).

Audit Conclusion

The Minnesota Public Employees Retirement Association (PERA) is made up of four funds. The funds cover the general membership (General), police and fire members (P&F), local correctional members (Correctional), and the Minneapolis Employees' Retirement Fund (MERF Division of PERA), reflecting the distinct benefit provisions and contribution rate requirements of each group.

For the July 1, 2013 Actuarial Valuations of the PERA Funds, Milliman prepared a replication audit of the Police and Fire Fund and the Local Correctional Fund and sample life audits of the other two funds. Detailed information regarding the replication audit of the Police and Fire Fund and the PERA Correctional Fund is provided in separate reports; however, we have provided some general comments regarding the result of the replication audit in this report. Commentary and results on the sample life audits for the other two funds are provided below.

The following changes from the 2013 Omnibus Pension Legislation were reflected in the July 1, 2013 actuarial valuations:

- COLA mechanism for PERA General, Police & Fire, Local Correctional, and MERF Division of PERA:
  - The funding ratio threshold that must be attained to pay a 2.5% postretirement benefit increase to benefit recipients was changed from 90% for one year to 90% for two consecutive years. The funding ratio threshold that determines when a 2.5% postretirement benefit increase must decrease to 1.0% was changed from less than 90% for one year to less than 80% for one year or less than 85% for two consecutive years.
- Police & Fire Fund changes in addition to the COLA mechanism changes:
  - Post-retirement increases were reduced from 1.5% to 1.0% per year.
  - Member and employer contribution rates increased 3.0% of pay fully phased in by January 1, 2015.
  - State contributions of $9,000,000 paid annually on October 1. These contributions continue until both PERA Police & Fire and MSRS State Patrol reach 90% funded ratio on a market value basis.
  - For retirements after May 31, 2014, the first post-retirement increase will be delayed two years. In addition, the reduction for early retirement is 5% per year that the member is under age 55 at the time of retirement. This change in the early retirement reduction is phased in over a 5-year period ending June 30, 2019.
  - For members hired after June 30, 2014, the vesting requirement was changed to 50% vested after 10 years grading to 100% vested after 20 years. In addition, allowable service to determine benefits is limited to 33 years (the pro-rata share of employee contributions for service in excess of 33 years is refunded).

The reader should note that the Fund Actuary determined the Supplemental Contribution Amortization of the Unfunded Actuarial Accrued Liability using the Statutory Amortization Date as described in Minnesota Statutes Section 356.215 Subd. 11(j). Thus, the actuarially required contribution rate includes a component for the amortization of the unfunded actuarial liability (UAL). For a given level of UAL, annual amortization payments are calculated as increasing by 3.75% per year ("level percent amortization"). If future experience follows the actuarial assumptions, this should result in amortization payments that keep pace with the assumed growth in overall compensation. Please note that with the current amortization period, amortization payments in the short term will not be large enough to cover interest on the UAL, which means that as a dollar amount the UAL is expected to grow. This situation is sometimes referred to

as "negative amortization". The negative amortization will continue until the amortization period becomes short enough, and the amortization payments become large enough, such that the amortization payments will be enough to cover both interest and principal, and from that point forward the UAL as a dollar amount is expected to decline progressively until ultimately reaching zero by the end of the amortization period.

PERA General showed modest declines while the other three funds showed modest gains in all of the funded ratios and in the contribution rate sufficiency/deficiency measure as reported by the Fund Actuary. With the exception of PERA General, the primary reason for the improvement in the contribution rate sufficiency/deficiency measure is the recognition of deferred investment gains in the actuarial value of assets for PERA P&F and PERA Correctional while MERF improved due to sizeable market returns during the past year. In addition, PERA P&F showed a larger improvement due to changes in plan provisions.

General

The contribution rate deficiency increased from (0.96%) to (1.65%) of pay on an actuarial value basis. On a market value basis, the deficiency decreased to (0.15%). The funding ratios have also decreased on an actuarial basis and the Fund Actuary has determined that a 90% ratio will not be reached within a 15 year period so that the 2.5% COLA has not been applied in this valuation.

Police & Fire

There is a 2.64% of pay deficiency using the actuarial value of assets. This is a significant improvement from the previous year. The primary reason is the significant changes in the plan provisions. With scheduled increases in the contribution rate, the plan's funded status is expected to improve. More detailed information is available in our replication report.

MERF Division of PERA

Both the funded ratios and contribution rate deficiency measure increased for the MERF Division of PERA. This increase is primarily due to investment gains from the prior fiscal year and the actual contributions in excess of the required contributions. As of July 1, 2013, the Accrued Liability Funded Ratio is 74.44%. When this ratio reaches 80%, the MERF Division will be merged with the PERA General Fund (based upon the Fund Actuary's report, potentially three to five years at current contribution levels and ignoring gains or losses). Upon the merger, the remaining liability will be amortized as a level dollar amount through June 30, 2031. The payment will be based on the assumptions of the PERA General Fund.

Local Correctional

Based on the actuarial value of assets, the Plan is 91% funded and the statutory contribution exceeds the required contribution by 0.26%. As noted by the Fund Actuary, the COLA has changed as shown in the table below:

Effective Date of Change	COLA Change
January 1, 2011	2.5% to 1.0%
January 1, 2012	1.0% to 2.5%
January 1, 2013	2.5% to 1.0%

The Plan's accrued liability funded ratio on a market value basis was 88.99% on July 1, 2012 and 96.21% on July 1, 2013. Under the new COLA mechanism, the COLA was 1.0% on January 1, 2014. The January 1, 2015 COLA will depend on the July 1, 2014 accrued liability funded ratio on a market value basis. If the

July 1, 2014 funded ratio reaches 90% or more, the COLA will increase to 2.5%. Otherwise, the COLA will remain at 1.0%. For the July 1, 2013 actuarial valuation, the Fund Actuary assumed a 2.5% COLA for all future years.

Unless otherwise noted, the following comments apply to all four funds.

Comments

Membership Data

We received the original data file prepared by the Fund and supplied to the actuary. We found that the data elements were being used in a consistent manner by the Fund Actuary. We also noted that the number of records and other summary values listed in the report were within a reasonable tolerance to our own totals. Based upon this, we believe the data used by the actuary to prepare the actuarial valuation is appropriate and reasonably accurate.

Actuarial Value of Assets

We have reviewed the application of the asset smoothing method for PERA General, PERA P&F, and PERA Correctional. It is the method defined in statute and we believe that this method has been applied correctly. For the MERF Division of PERA, the Market Value of Assets is used. It is the method defined in Statute.

Actuarial Valuation

We reviewed 47 sample life calculations (16 active, 20 in-pay and 11 deferred vested). We reviewed calculated values by decrement and matched the values provided by the actuary to within a reasonable degree of tolerance. Based upon this limited review, we believe the actuarial calculations summarized in the actuary's report are reasonably accurate.

Funding Method

We believe that the actuary has correctly applied the Entry Age Normal funding method as provided in the statutes. This has been verified on a limited basis by the sample life calculations reviewed in the Actuarial Valuation section. In addition, the total required contribution follows the methodology provided in Minnesota Statutes 356.215.

Actuarial Assumptions

We have reviewed the actuarial assumptions as summarized in the actuarial valuation. We have confirmed that the sample life calculations from the Actuarial Valuation section have applied these assumptions as summarized in the report. We have also confirmed the appropriate use of assumptions required by Chapter 356.215. All other assumptions were selected by the Fund and the actuary.

In general, we believe that the assumptions employed by the Fund Actuary for the MERF Division of PERA are reasonable and consistent with statutes and the Standards for Actuarial Work with one possible exception. The retirement rate assumption for this fund is that 100% of active members retire at age 61. The valuation results prepared by the Fund Actuary are consistent with the assumptions approved by the LCPR. We note Section II.D(4) of the Standards for Actuarial Work states:

> "*Members Remaining Active Beyond the Age at Which the Retirement Rate becomes 100% - Each remaining active member must be assumed to retire one year following the valuation date unless a different timing assumption is approved by the Commission. Remaining active members must be included in the valuation for all purposes.*"

Because the assumptions were approved by the LCPR, we concluded that the valuation results were consistent with the Standards for Actuarial Work.

Because the Fund is closed and there is a relatively small number of active members who are close to retirement age, there is not a significant impact on the valuation results.

Plan Provisions

We have reviewed the sample life calculations for compliance with Chapter 353 of the Minnesota statutes. We believe that these calculations reasonably reflect the benefits provided under the statute. In addition, the Actuarial Valuation Report contains a summary of the plan provisions. We believe this summary reasonably reflects the benefits provided under the statute.

Actuarial Report

The information provided in the Actuarial Valuation Report appears to meet the requirements of the Standards for Actuarial Work established by the State of Minnesota Legislative Commission on Pensions and Retirement. The information contained in the report appears to be accurate and provides the information in a logical progression.

In all reports, the Fund Actuary has provided the expected impact on the valuation results if the COLA provision reverted back to a 2.5% level upon reaching a 90% funding level. We find this to be useful information in understanding this issue. We agree with the Fund Actuary's assessment that the 2.5% COLA is not expected to apply for PERA General, Police & Fire, and MERF Division of PERA. However, the Local Correctional fund is at 96.21% as of July 1, 2013 and we find the Fund Actuary's assumption of the 2.5% COLA to be reasonable.

Audit Conclusion

The Minnesota State Retirement System (MSRS) is made up of five funds. The funds cover the state employees (General), state patrol, correctional members (Correctional), judges, and certain grandfathered elected State officers. Each fund reflects the distinct benefit provisions and contribution rate requirements of each group.

For the July 1, 2013 Actuarial Valuations of the MSRS Funds, Milliman prepared a replication audit of the MSRS State Patrol Fund and the MSRS Correctional Fund and sample life audits of the other three funds. Detailed information regarding the replication audit of the MSRS State Patrol Fund and the MSRS Correctional Fund is provided in separate reports; however, we have provided some general comments regarding the result of the replication audit in this report. Commentary and results on the sample life audits for the other two funds are provided below.

The following changes from the 2013 Omnibus Pension Legislation were reflected in the July 1, 2013 actuarial valuations:

- State Patrol
  - Post-retirement increases were reduced from 1.5% to 1.0% per year until an 85% funded ratio is reached on a market value basis. The post-retirement increases revert to 2.5% when a 90% funded ratio is reached.
  - Member and employer contribution rates increased 5.0% of pay fully phased in by July 1, 2016.
  - State contributions of $1,000,000 paid annually on October 1. These contributions continue until both PERA Police & Fire and MSRS State Patrol reach 90% funded ratio on a market value basis.
  - For retirements after June 30, 2015, the reduction for early retirement is 4% per year that the member is under age 55 at the time of retirement.
  - For members hired after June 30, 2013, the vesting requirement for retirement and survivor benefits was changed from 5 to 10 years.
  - Allowable service to determine benefits is limited to 33 years (the pro-rata share of employee contributions for service in excess of 33 years is refunded). Members with at least 28 years of service as of July 1, 2013 are not subject to this service limit.
- Judges
  - Post-retirement increases were reduced from 2.0% per year to 1.75% per year. Increases revert to 2.0% when a 70% funding ratio is reached (on a market value of assets basis). Increases revert to 2.5% when a 90% funding ratio is reached (on a market value of assets basis).
  - A new benefit program (Tier 2) was created for judges first appointed or elected after June 30, 2013. Judges first appointed or elected before July 1, 2013 with less than five years of service as of December 31, 2013 may make a one-time irrevocable election for Tier 2 benefits.
    - Tier 2 member contributions are 7.00% of pay.
    - The Normal Retirement Age for Tier 2 members is 66.

  - The retirement benefit formula for Tier 2 members is 2.5% of Average Salary multiplied by the number of years of service. There is no maximum benefit percentage for Tier 2 members.
- Tier 1 member contributions were increased from 8.00% of payroll to 9.00% of payroll effective July 1, 2013. Employer contributions for both Tier 1 and Tier 2 members were increased from 20.50% of payroll to 22.50% of payroll as of July 1, 2013.

The reader should note that the Fund Actuary determined the Supplemental Contribution Amortization of the Unfunded Actuarial Accrued Liability using the Statutory Amortization Date as described in Minnesota Statutes Section 356.215 Subd. 11(j). Thus, the actuarially required contribution rate includes a component for the amortization of the unfunded actuarial liability (UAL). For a given level of UAL, annual amortization payments are calculated as increasing by 3.75% per year ("level percent amortization"). If future experience follows the actuarial assumptions, this should result in amortization payments that keep pace with the assumed growth in overall compensation. Please note that with the current amortization period, amortization payments in the short term will not be large enough to cover interest on the UAL, which means that as a dollar amount the UAL is expected to grow. This situation is sometimes referred to as "negative amortization". The negative amortization will continue until the amortization period becomes short enough, and the amortization payments become large enough, such that the amortization payments will be enough to cover both interest and principal, and from that point forward the UAL as a dollar amount is expected to decline progressively until ultimately reaching zero by the end of the amortization period.

In general, the four on-going funds showed modest gains in most of the funded ratios and a decrease in the contribution rate deficiency as reported by the Fund actuary. The primary reason for the decrease in the contribution rate deficiency measure is the changes in plan provisions. We note the 5% contribution rate increase scheduled to be fully phased in at July 1, 2016 for the State Patrol fund is expected to significantly improve the deficiency measure in this fund. Nevertheless, a significant contribution rate deficiency exists for all of these funds.

Additional discussion of the four on-going funds follows:

General

A contribution rate deficiency remains. This measure is likely to show a larger deficiency for the next year as statutory contributions are less than actuarially required. Without increases in the contribution rate or favorable actuarial experience, the plan's funded status is expected to deteriorate. The Fund Actuary has noted that the UAL will never get paid down based upon the current actuarial measurement. This conclusion seems reasonable to us.

Correctional

The contribution rate deficiency increased. The primary reason is the recognition of investment losses from prior years. The percent of pay deficiency is 5.41% using the actuarial value of assets. This is a significant deficiency in the contribution rates. Without increases in the contribution rate or favorable actuarial experience, the plan's funded status is expected to deteriorate.

State Patrol

The contribution rate deficiency improved slightly. The primary reason is the significant changes in the plan provisions. We note that the normal cost rate plus expenses is 21.07%. Almost two-thirds of the contributions are needed to cover the ongoing cost of benefits in the current year (normal cost plus expenses). The excess of the statutory contributions over the normal cost rate plus expenses is a payment to amortize the unfunded accrued liability. With scheduled increases in the contribution rates,

addition of State Aid, reduction in post-retirement benefit increases, and using a market value basis, it appears this fund may be heading towards a modest contribution sufficiency.

Judges

The Judges plan has a statutory contribution rate that is almost 13 percentage points higher than the normal cost rate. However, its funded status is very weak (51% on an actuarial value basis) so the UAAL contribution is higher than the normal cost rate. Because the Fund has a contribution deficiency of more than 11% of pay, the funded status is expected to decrease.

Unless otherwise noted, the following comments apply to all five funds.

Legislators/Constitutional Officers Consolidated Fund

Beginning for the July 1, 2013 to June 30, 2014 fiscal period, the Legislators Retirement Fund and the Elective State Officers Retirement Fund will be administratively consolidated. For reporting purposes, the Fund Actuary has prepared separate valuations of these two groups for this fiscal year but will provide a combined report in future years. Both funds are effectively administered on a "pay as you go" basis. The Fund Actuary has reported the required funding information in accordance with Minnesota statutes however funding ratios have very little meaning for these two groups. Nevertheless, (gain)/loss analysis can provide useful information with respect to directional changes in the costs for these two groups.

Comments

Membership Data	We received the original data file prepared by the Fund and supplied to the actuary. Generally, we found that the data elements were being used in a consistent manner by the Fund Actuary. There are some instances when the Fund Actuary has made assumptions about missing data. We also noted that the number of records and other summary values listed in the report were within a reasonable tolerance to our own totals. Based upon this, we believe the data used by the actuary to prepare the actuarial valuation is appropriate and reasonably accurate.
Actuarial Value of Assets	We have reviewed the application of the asset smoothing method. It is the method defined in statute and we believe that this method has been applied correctly.
Actuarial Valuation	We reviewed 53 sample life calculations (22 active, 20 in-pay and 11 deferred vested). We reviewed calculated values by decrement and matched the values provided by the actuary to within a reasonable degree of tolerance. Based upon this limited review, we believe the actuarial calculations summarized in the actuary's report are reasonably accurate.
Funding Method	We believe that the actuary has correctly applied the Entry Age Normal funding method as provided in the statutes. This has been verified on a limited basis by the sample life calculations reviewed in the Actuarial Valuation section. In addition, the total required contribution follows the methodology provided in Minnesota Statutes 356.215.
Actuarial Assumptions	We have reviewed the actuarial assumptions as summarized in the actuarial valuation. We have confirmed that the sample life calculations from the Actuarial Valuation section have applied these assumptions as summarized in the report. We have also confirmed the appropriate use of assumptions required by Chapter 356.215. All other assumptions were

selected by the Fund and the actuary.

We note that the Fund Actuary has assumed that former Members with deferred vested benefits will elect a single life annuity. Our valuation assumes that percentages of these Members will elect optional forms the same as for regular retirements. We believe that either assumption is reasonable; however, our preference is to use the "blended" assumption.

Plan Provisions

We have reviewed the sample life calculations for compliance with Chapter 352 of the Minnesota statutes. We believe that these calculations reasonably reflect the benefits provided under the statute. In addition, the Actuarial Valuation Report contains a summary of the plan provisions. We believe this summary reasonably reflects the benefits provided under the statute.

Actuarial Report

The information provided in the Actuarial Valuation Report appears to meet the requirements of the Standards for Actuarial Work established by the State of Minnesota Legislative Commission on Pensions and Retirement. The information contained in the report appears to be accurate and provides the information in a logical progression.

We do note that the "Other Gain" for the Legislators exceeds the normal 1% of Actuarial Accrued Liability threshold. The Fund Actuary does provide some footnoted information on causes. However, we feel that quantification of some of the larger reasons could be useful to the reader.

In all reports, the Fund Actuary has provided the expected impact on the valuation results if the COLA provision reverted back to a 2.5% level upon reaching a 90% funding level. We find this to be useful information in understanding this issue. We agree with the Fund Actuary's assessment that the 2.5% COLA is not expected to apply.

Audit Conclusion

The St. Paul Teachers Retirement Fund Association (StPTRFA) is made up of one fund. The fund covers the public school teachers employed by St. Paul public schools (except charter school teachers).

In general, the fund showed a decrease in the accrued liability funded ratio and an increase in the projected benefit funded ratio. The fund also showed a decrease in the contribution rate deficiency. As noted below, the Fund Actuary has included the scheduled contribution rate increases of 2.5% phased in over the next four years in the projected benefit funded ratio. While including these known contribution rate increases seems logical, this methodology has not been consistently applied in this manner by the other Funds. More consistency between the funds concerning this measure would be desirable.

The following changes affected the July 1, 2013 actuarial valuation of the Fund:

- Benefit provisions and contribution sources were changed as a result of the 2013 Omnibus Retirement Bill
  - Scheduled increases in member and employer contribution rates of 2.50% of pay over the next four years.
  - State Contributions of $7,000,000 on October 1, 2013 and October 1, 2014 were added.
  - Increase in the formula multiplier of 0.2% for Coordinated members that applies to service after June 30, 2015.
  - Change in actuarial early retirement reduction factors to a table of stated reductions.
  - The salary scale assumption was decreased by 1%.

The reader should note that the Fund Actuary determined the Supplemental Contribution Amortization of the Unfunded Actuarial Accrued Liability using a 25-year rolling amortization period as prescribed in Minnesota Statutes Section 356.215 Subd. 11(j). Thus, the actuarially required contribution rate includes a component for the amortization of the unfunded actuarial liability (UAL). For a given level of UAL, annual amortization payments are calculated as increasing by 3.75% per year ("level percent amortization"). Please note that with the current amortization period of 25 years, amortization payments in the short term will not be large enough to cover interest on the UAL, which means that as a dollar amount the UAL is expected to increase during the next year. This situation is sometimes referred to as "negative amortization". Because the amortization period used to calculate the contribution rate is reset at 25 each year for the entire UAL, the negative amortization will continue each year into the future unless the amortization period is set to a shorter period so that the amortization payments will be large enough to cover both interest and principal. This means that the actuarially required contribution rate would not lead to a 100% funded ratio in any future year unless the System has experience more favorable than assumed.

For the July 1, 2013 Actuarial Valuation of the StPTRFA, we have prepared a limited scope sample life review of the Fund Actuary's results as provided in our contract. A full replication review was last prepared for the July 1, 2012 Actuarial Valuation. Our comments below reflect the results of our sample life review.

Comments

Membership Data	We received the original data file prepared by the Fund and supplied to the actuary. We found that most of the data elements were being used in a

consistent manner by the Fund Actuary. We also noted that the number of records and other summary values listed in the report were reasonable.

We note that the Fund Actuary changed the processing of valuation payroll for active members with less than 1 year of service as a result of last year's replication review. It is our understanding that the Fund Actuary used the reported payroll for active members with less than 1 year of service in the prior year's valuation. As stated in the Fund Actuary's report, the processing methodology was changed this year to annualize reported pay for these individuals.

For terminated members, it is our understanding that the Fund Actuary supplements the data reported by the fund with salary history information that the Fund Actuary maintains. As noted in the July 1, 2012 replication report, when we used this supplemental information, our aggregate valuation results are more than 5% different from the Fund Actuary's results. Our valuation systems appear to produce a similar difference for the sample life we reviewed.

Our conclusion is that overall the Fund Actuary is reasonably reflecting the data received from SPTRFA to within a reasonable degree of tolerance with our own determinations.

Actuarial Value of Assets

We have reviewed the application of the asset smoothing method. It is the method defined in statute, and we believe that this method has been applied correctly.

Actuarial Valuation

We reviewed 12 sample life calculations (6 active, 4 in-pay, 2 deferred vested). We reviewed calculated values by decrement and matched the values provided by the actuary to within a reasonable degree of tolerance.

Based upon our review, we believe the actuarial calculations summarized in the actuary's report are reasonably accurate.

Funding Method

We believe that the actuary has correctly applied the Entry Age Normal funding method as provided in the statutes. This has been verified on a limited basis by the sample life calculations reviewed in the Actuarial Valuation section. In addition, the total required contribution follows the methodology provided in Minnesota Statutes 356.215.

Actuarial Assumptions

We have reviewed the actuarial assumptions as summarized in the actuarial valuation. We have confirmed that the sample life calculations from the Actuarial Valuation have applied these assumptions as summarized in the report. We have also confirmed the appropriate use of assumptions required by Chapter 356.215. All other assumptions were selected by the Fund and the Fund Actuary.

Similar to our July 1, 2012 replication review, our 2013 sample life review continues to show a substantial difference between the Fund Actuary's results and our results for active Member benefits for deferred retirement and refund of contributions. This apparent difference is due to the approaches used in the valuation system when an active Member is assumed to leave the System by withdrawal. In the actuarial assumptions, Members who withdraw from the System after becoming eligible for a

deferred benefit are assumed to take the larger of their return of contributions, or their deferred annuity benefit. In the Fund Actuary's results, the benefits are included in the deferred retirement component if the member is projected to be vested at the time of withdrawal. Otherwise, the benefits are included in the refund of contributions component. In the Milliman results, the deferred retirement component includes the value of annuity benefits for vested Members who withdraw from the System. The refund of contributions component includes both the refund of contributions for members who are not vested at the date of assumed withdrawal plus the value of the return of contributions for Members who are assumed to elect a refund of contributions in lieu of future annuity benefits. We believe that both methodologies are reasonable and that the present value of benefits in total for the two categories reasonably reflect the expected costs.

We further note there is a substantial difference between the Fund Actuary's results and our results for terminated members. For deferred retirements with future augmentation, we believe this difference is due to different interpretation and application of the actuarial standards for terminations that are expected following the member's vesting date. According to the actuarial standards, the proper technique is to assume that the member selects the benefit with the greater value. Thus, for each year after the member's vesting date, the actuarial present value of Projected Benefits is based on the larger of the member's contributions accumulated with interest or the present value of the member's vested deferred benefit (augmented, if appropriate). In our valuation, we determine the greater value as of the former member's assumed retirement date, and then discounting the greater value from the member's assumed retirement date to the valuation date. In the Fund Actuary's valuation, it is our understanding that the greater value is determined by comparing the present value of the deferred benefit as of the valuation date to the member's contributions accumulated with interest at the valuation date. Because the interest on accumulated contributions is 4% and the interest discount factor is 8% for the first 4 years and 8.5% thereafter, the Fund Actuary's method produces a higher present value.

As part of legislation enacted in 2011, the annual Cost of Living Adjustment (COLA) applied to the pensions of retired Members was changed to 1.0% if the Accrued Liability Funded Ratio is less than 80%. However, if the Fund achieves at least 80%, but less than 90% funded ratio on the actuarial value of assets to actuarial liability, the COLA will increase to 2.0%. The valuation by the Fund Actuary assumes that the lower 1.0% COLA will remain in place for all years. As stated in the Fund Actuary's report, this assumption is based on the current market value funded ratio of 60% and projections that indicate a steadily declining funding level in the future given the current statutory contribution schedule. We believe this assumption is reasonable.

Plan Provisions

We have reviewed the sample life calculations for compliance with Chapter 354A of the Minnesota statutes. We believe that these calculations reasonably reflect the benefits provided under the statute. In addition, the Actuarial Valuation Report contains a summary of the plan provisions. We believe this summary reasonably reflects the benefits provided under the

statute.

Actuarial Report

The information provided in the Actuarial Valuation Report appears to meet most of the requirements of the Standards for Actuarial Work established by the State of Minnesota Legislative Commission on Pensions and Retirement.

The projected benefit funded ratio reported by the Fund Actuary includes the scheduled contribution rate increases of 2.5% phased in over the next four years in this measure.

The information contained in the report appears to be accurate and provides the information in a logical progression.

Audit Conclusion

The Minnesota Teachers Retirement Association (TRA) is made up of one fund. The fund covers the state public school teachers except for those teachers employed by St. Paul or Duluth public schools (except charter school teachers) or the University of Minnesota. Effective July 1, 2006, the Minneapolis Teachers Retirement Fund was merged into this fund.

The fund experienced a decrease in the accrued liability funding ratio and in the contribution rate deficiency. The decrease in the contribution rate deficiency measure is mainly due to the increase in the employee and employer contribution rates offset by the recognition of previously deferred asset losses. We note the contribution rate increases scheduled to be fully phased in by July 1, 2014 are expected to continue to improve the deficiency measure in this fund.

The following plan change was reflected in the July 1, 2013 actuarial valuation of the Fund:

- The early retirement reduction factors were changed with the 2013 Pension Omnibus Legislation. The revised factors are phased in over a 5-year period.

The reader should note that the Fund Actuary determined the Supplemental Contribution Amortization of the Unfunded Actuarial Accrued Liability using the Statutory Amortization Date as prescribed in Minnesota Statutes Section 356.215 Subd. 11(j). Thus, the actuarially required contribution rate includes a component for the amortization of the unfunded actuarial liability (UAL). For a given level of UAL, annual amortization payments are calculated as increasing by 3.75% per year ("level percent amortization"). If future experience follows the actuarial assumptions, this should result in amortization payments that keep pace with the assumed growth in overall compensation. Please note that with the current amortization period, amortization payments in the short term will not be large enough to cover interest on the UAL, which means that as a dollar amount the UAL is expected to increase during the next year. This situation is sometimes referred to as "negative amortization". The negative amortization will continue until the amortization period becomes short enough, and the amortization payments become large enough, such that the amortization payments will be enough to cover both interest and principal, and from that point forward the UAL as a dollar amount is expected to decline progressively until ultimately reaching zero by the end of the amortization period.

For the July 1, 2013 Actuarial Valuation, we have prepared a limited scope sample life review of the Fund Actuary's results as provided in our contract. A full replication review was last prepared for the July 1, 2011 Actuarial Valuation. Our comments below reflect the results of our sample life review.

Comments

Membership Data	We received the original data file prepared by the Fund and supplied to the actuary. We found that the data elements were being used in a consistent manner by the Fund Actuary. We also noted that the number of records and other summary values listed in the report were within a reasonable tolerance to our own totals. Based upon this, we believe the data used by the actuary to prepare the actuarial valuation is appropriate and reasonably accurate.
Actuarial Value of Assets	We have reviewed the application of the asset smoothing method. It is the method defined in statute and we believe that this method has been applied correctly.
Actuarial Valuation	We reviewed 14 sample life calculations (8 active, 4 in-pay and 2 deferred vested). We reviewed calculated values by decrement and matched the

values provided by the actuary to within a reasonable degree of tolerance. Based upon this review, we believe the actuarial calculations summarized in the actuary's report are reasonably accurate with two items noted below.

For one sample life of an active Coordinated member hired before July 1, 1989, we note there appears to be a difference in the valuation systems with respect to the determination of eligibility for future retirement benefits. It is our understanding that the Fund Actuary's valuation system determines the eligibility for retirement benefits based on a member's age and service at the valuation date. In this sample, the age was 55 and service was 34 under the Fund Actuary's valuation system. The Fund Actuary then correctly determined that this sample life was not eligible for Rule-of-90 (age plus service is 89) benefits, calculated the applicable Early Retirement Benefits, and correctly used the early retirement decrement rate of 7%. In the Milliman valuation system, the eligibility for retirement benefits is determined based on a member's age and service at the assumed decrement date. Because mid-year decrements are assumed, the Milliman valuation system calculates the age and service at decrement to be 55.5 and 34.5, respectively. Consequently, the Milliman valuation system determines that this sample life is eligible for Rule-of-90 (age plus service is 90), calculates the applicable Rule-of-90 benefits (which are higher than the Early Retirement Benefits) and uses the Rule-of-90 retirement decrement of 50%. Consequently, Milliman's calculated present value of future benefits for this sample life is higher than the Fund Actuary's calculated present value of future benefits. While our July 1, 2011 replication results were within 1.7% of the active members present value of future benefits calculated by the Fund Actuary, we cannot say with certainty what the magnitude of this difference is for the July 1, 2013 valuation.

For one sample life for a disabled in-pay Member. It appears the member was valued as receiving a Joint & 100% Survivor Annuity even though the retiree data file does not contain any spousal information or form of benefit payment information. This approach covers the death benefit payable to a married disabled member. However, this approach implicitly assumes 100% marriage rate for disabled members and ignores the conversion from disability to regular retirement when the member reaches Normal Retirement Age. We recommend the Fund Actuary review the implications of the conversion from disability to regular retirement at Normal Retirement Age to determine what, if any, modifications to the actuarial assumptions and/or valuation methodology may be appropriate for future valuations. We recognize that the accrued liability for disabled members is less than 0.61% of the total fund accrued liability and this issue is probably less than 10% of the accrued liability for disabled members. Consequently, this issue is not likely to significantly impact the actuarial valuation results.

Funding Method

We believe that the actuary has correctly applied the Entry Age Normal funding method as provided in the statutes. This has been verified on a limited basis by the sample life calculations reviewed in the Actuarial Valuation section. In addition, the total required contribution follows the methodology provided in Minnesota Statutes 356.215.

Actuarial Assumptions

We have reviewed the actuarial assumptions as summarized in the actuarial valuation. We have confirmed that the sample life calculations from the Actuarial Valuation section have applied these assumptions as summarized in the report. We have also confirmed the appropriate use of assumptions required by Chapter 356.215. All other assumptions were selected by the Fund and the Fund Actuary.

As noted in our July 1, 2011 replication valuation, there appears to be a substantial difference between the Fund Actuary's results and our replication valuation results for active Member benefits for deferred retirement and refund of contributions. This apparent difference is due to the approaches used in the valuation system when an active Member is assumed to leave the System by withdrawal. In the actuarial assumptions, Members who withdraw from the System after becoming eligible for a deferred benefit are assumed to take the larger of their return of contributions, or their deferred annuity benefit. In the Fund Actuary's results, the benefits are included in the deferred retirement component if the member is projected to be vested at the time of withdrawal. Otherwise, the benefits are included in the refund of contributions component. In the Milliman results, the deferred retirement component includes the value of annuity benefits for vested Members who withdraw from the System. The refund of contributions component includes both the refund of contributions for members who are not vested at the date of assumed withdrawal plus the value of the return of contributions for Members who are assumed to elect a refund of contributions in lieu of future annuity benefits. As noted in our July 1, 2011 replication valuation, we believe the Fund Actuary is reasonably reflecting the withdrawal decrement because the Fund Actuary's present value of future benefits for the withdrawal decrement (sum of deferred retirement component plus refund of contributions component) is within 1.4% of the Milliman results included in our July 1, 2011 replication valuation.

Plan Provisions

We have reviewed the sample life calculations for compliance with Chapter 354 of the Minnesota statutes. We believe that these calculations reasonably reflect the benefits provided under the statute. In addition, the Actuarial Valuation Report contains a summary of the plan provisions. We believe this summary reasonably reflects the benefits provided under the statute.

Actuarial Report

The information provided in the Actuarial Valuation Report appears to meet all of the requirements of the Standards for Actuarial Work established by the State of Minnesota Legislative Commission on Pensions and Retirement with one exception.

In the summary of plan provisions section, the report refers to new early retirement reduction factors that begin to apply July 1, 2015. However, there are no details on what the level of rates are, how they are phased in over a 5-year period, and the differences that apply to members retiring at age 62 or later with at least 30 years of service. As a technical reader of the report, we believe the inclusion of the additional detail would be beneficial.

With respect to the valuation of the post-retirement COLA, we agree that the lower 2.0% COLA is appropriate for the July 1, 2013 actuarial valuation based upon the 2013-2014 contribution rates. According to the Fund Actuary's report, this assumption is based on projections that indicate the Fund is not expected to reach a 90% funded ratio for over 30 years.

Finally, the information contained in the report appears to be accurate and provides the information in a logical progression.

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