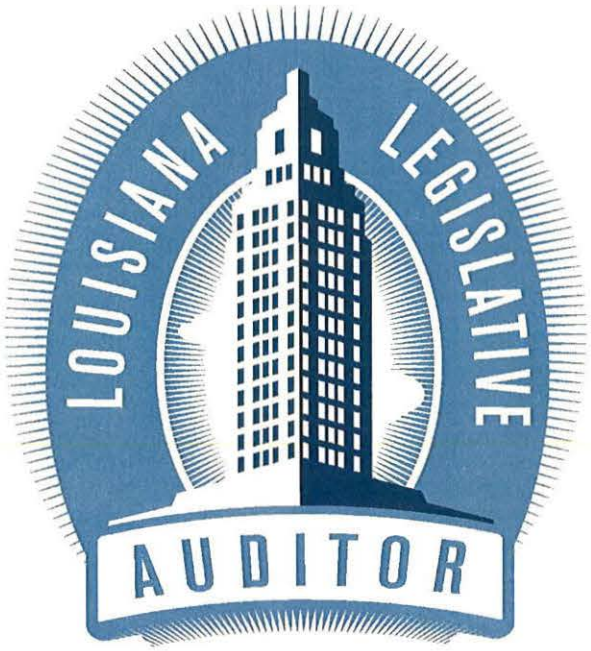
COMPREHENSIVE ACTUARIAL REVIEW OF THE 2016 ACTUARIAL VALUATION OF THE MUNICIPAL POLICE EMPLOYEES' RETIREMENT SYSTEM



ACTUARIAL SERVICES

PRESENTED TO THE PUBLIC RETIREMENT SYSTEMS' ACTUARIAL COMMITTEE

FEBRUARY 13, 2017

LOUISIANA LEGISLATIVE AUDITOR
DARYL G. PURPERA, CPA, CFE

February 3, 2017

Ms. Kathy Bourque
Municipal Police Employees' Retirement System
7722 Office Park Boulevard
Suite 200
Baton Rouge, LA 70809-7601

Re: Comprehensive Actuarial Review of the 2016 Actuarial Valuation

Dear Ms. Bourque:

To fulfill the requirements of R.S. 11:127(C), the Louisiana Legislative Auditor will prepare a comprehensive actuarial review every other year for each of the statewide retirement systems. Your system, the Municipal Police Employees' Retirement System (System), is scheduled to receive a comprehensive review for funding valuations associated with even numbered years.

The remainder of this letter contains the results of our comprehensive review of your June 30, 2016, Actuarial Valuation. More specifically, we have evaluated for reasonableness the actuarial assumptions and methods employed by the System and its actuary. Based on this review, we expect to recommend at the February 13, 2017, meeting of PRSAC (the Public Retirement Systems' Actuarial Committee) that the Actuarial Valuation prepared by G.S. Curran & Company (GSC) for June 30, 2016, and dated November 23, 2016, be approved.

I would like to thank you and your staff for your cooperation and assistance with this review.

Sincerely,

Daryl G. Purpera, CPA, CFE
Legislative Auditor

cc: G.S. Curran & Company

Comprehensive Actuarial Review of the 2016 Actuarial Valuation of the Municipal Police Employees' Retirement System

1. Net Expected Rate of Return (eROR) Assumption

According to the 2016 Actuarial Valuation, the net eROR used in the determination of the discount rate for the System's actuarial valuation as of June 30, 2016, was 7.50%. It is stated to be net of investment-related expenses.

The three most significant factors in setting or evaluating an assumed eROR are:

- Expected future inflation (forward-looking) and
- Current and future asset allocation percentages by asset class and
- Professional forecasts of future performance (forward-looking) over the selected horizon and other capital market assumptions for the different asset classes comprising the asset allocation.

We would prefer to see a net eROR assumption closer to the 6.49% consensus expectation for the 15-year *compound* return. Refer to the section below titled *Professional Investment Forecasts* for more details on the development of the 6.49%.

There are two types of expected returns or forecasts. The expected geometric or *compound* average annual return over time is much more suitable than the higher expected *arithmetic* (one-year) return for actuarial valuation purposes because pension funding calculations are all about compounding returns (forward and backward for present values) over time. The top end of our range of reasonableness is usually the expected *arithmetic* (one-year) return, 7.17% in this case. Refer to the section below titled *Professional Investment Forecasts* for more details on the development of the 7.17%.

Accepting this type of expected return (*arithmetic*) is a stretch because it does not reflect "volatility drag" inherent in compounding returns over time. Volatility of returns and the resultant volatility drag in the expected *compound* return over time is part of the reality of pension fund management. This is why the expected *compound* return (geometric mean) is a more appropriate choice for actuarial valuation purposes.

Another aspect of expected returns is the horizon over which the average return (whether *compound* geometric returns or *arithmetic* one-year returns) is expected. In the highly political and budget-sensitive environment of public sector pensions, return forecasts for the mid-term horizon (10-20 years) are more suitable than long-term horizons (30+ years).

Mid-term Horizon

Projecting pension costs is indeed a long-term proposition. Forecasts of future inflation and future investment returns from experts come in short-term horizons (1-5 years), mid-term horizons (5-20 years) and longest-term horizons (30-50 years). Long-term forecasts are appealing and tempting, being usually higher than mid-term horizon forecasts. While it may be argued that reliance should be placed on the longest-term horizons, there are at least six compelling reasons not to do so:

1. *Underperformance in the mid-term is not sustainable.* If the forecasting experts are right, there may be a decade or two of lower pension plan returns, with a need for very large returns thereafter. Aiming and hoping for higher returns in the long-term, while regularly suffering

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underperformance in the mid-term, is not sustainable. Consider what happens "in the meantime."

In correspondence dated May 6, 2016, the U.S. Treasury Department denied the application of the Board of Trustees of the Central States, Southeast, and Southwest Areas Pension Plan for rolling back benefits under the Multiemployer Pension Reform Plan Act of 2014 in order to avoid insolvency. One of the reasons given in the ruling[1] was that the 7.5% and other embedded return assumptions were "significantly optimistic" and were "not reasonable." More specifically, the ruling stated that the return assumptions used to the support the application were not reasonable or appropriate for the purpose of the measurement, did not take into account relevant current economic and investment forecast data, and had significant bias by being significantly optimistic. This three-fold denouncement was made primarily on the basis of the assumption's failure to recognize the lower expected returns in the first 10 to 20 years of the longer-term horizon.

2. *Reversion to historical means is flawed.* Forecasting over the longest-term horizons relies heavily on a reversion to historical means. The theory of reversion-to-the-historical-mean says that over long periods of time, average returns will remain approximately the same; so that average future returns will be approximately the same as the average of historical returns. The fatal flaw in applying that theory is that it rests on the premise that the environment in which the returns are realized will always remain the same.

   Of course, the macroeconomics of the U.S. and the world are substantially different today than over the past 50-100 years (or even over the past 20-30 years). And the future is likely to be even more different. It is flawed reasoning to point to the historical returns as the basis for making actuarial assumptions about future investment returns for the purpose of pension valuations. This backward-looking approach is also fraught with abuse because prior periods can be selected to make average outcomes to be any desired result. Long-term forecasts depend too much on reversion to historical means. Recent months' increases in the stock market values have little relevance to and influence on mid-term or long-term forecasts.

3. *Few reputable long-term forecasts.* There are relatively few sources for the longest-term forecasts of inflation and investment returns. There are many more investment consultants and forecasters who publish mid-term horizon forecasts of inflation and returns than the longest-term. More inputs from more experts gives decision-makers and their advisors more confidence that the consensus range is mainstream.

4. *The longest return horizon forecasts are the least reliable.* There is much less certainty in the longest-term forecasts. Conventional wisdom says that in the face of uncertainty, investors become more conservative. Thus, decision-makers should consider being more conservative than the longest-term forecasts because the longest-term forecasts are more uncertain. This is a principle in any forecasting profession, including hurricane forecasting. Long-term forecasts are less reliable than mid-term forecasts.

[1] https://www.treasury.gov/services/Responses2/Central%20States%20Notification%20Letter.pdf

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5. *We are not judged in the long run.* Even though pensions are long-term propositions, we live in a short-term and mid-term world. Decision-makers, actuaries and investment consultants are judged more in the short-term and mid-term. We should not need to wait 30 or more years to be vindicated for an assumption that we have so little confidence in anyway. In *The Tract on Monetary Reform (*1923), John Maynard Keynes said, "But this long run is a misleading guide to current affairs. In the long run we are all dead. Economists set themselves too easy, too useless a task if in tempestuous seasons they can only tell us that when the storm is past the ocean is flat again." Many financial economists, many in the press and many academics are calling for much lower investment return assumptions. The optics are not good for continuing with a long-term 30+ year horizon, when so many mid-term years are underperforming.

6. *The duration of the liabilities is approximately 11 years.* The "duration" of the liabilities is the average length of time until each year's benefit payments, where each future year is weighted with the present value of that year's benefits. It can be thought of a weighted average length of time until benefits are paid. As of June 30, 2016, the duration of the System's accrued liability is approximately 11 years. This speaks to the preferable use of a mid-term horizon for the future expected net return on plan assets used to pay benefits, rather than a 30-year horizon.

For these six reasons, we believe a mid-term horizon (e.g., 10-20 years) is much more appropriate than a long-term horizon (e.g., 30+ years).

If one were to concede the use of an expected arithmetic (one year) return in lieu of an expected compound (geometric) return for actuarial valuation purposes, as we do for the upper end of our range of reasonableness, that makes 7.17% reasonable but not recommended.

However, if one were to *also* insist on the use of a 30-year horizon, the expected arithmetic (one year) return at an upper end could be 7.55% (refer to table below). That would make the current 7.50% reasonable, but even less recommendable.

Compare to Current 7.50% Return Assumption		
	Expected Geometric (Compound) Annual Return	**Expected Arithmetic (One Year) Annual Return**
Mid-term Horizon (Ave of Lowest 3 firms)	6.10%	6.77%
Mid-term Horizon (Ave of All 8 firms)	**6.49%**	**7.17%**
Mid-term Horizon (Ave of Highest 3 firms)	6.90%	7.61%
Long-term Horizon (Ave of 2 firms)	6.84%	7.55%

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Inflation

The 2016 Actuarial Valuation (page 4) states "An inflation rate of 2.875% was implicit in both the assumed rate of return and rate of salary increases." We would prefer to see an inflation assumption closer to the 2.25% suggested by the expected inflation rates in the exhibit below. An inflation assumption of 2.875% appears to be an outlier compared to authoritative forecasts.

Because arithmetic or geometric rates are relatively easy to calculate, and are therefore readily available, it is tempting to rely on historical rates based on the consumer price index. However, there are many professional sources available to actuaries and investment consultants that forecast inflation on a forward-looking basis. In our opinion, forward-looking forecasts are much more appropriate than historical rates. Actuarial Standards of Practice (ASOP) No. 27 section 3.4 states:

> "Relevant Data—To evaluate relevant data, the actuary should review appropriate recent and long-term historical economic data. The actuary should not give undue weight to recent experience. The actuary should consider the possibility that some historical economic data may not be appropriate for use in developing assumptions for future periods due to changes in the underlying environment."

There are many reasons to rely far more on forward-looking forecasts than historical. The past history of inflation rates in the U.S. (whether the past 10, 25, 50, or 100 years) may be interesting and useful in understanding inflation forces, but they should not supplant forward-looking expectations from inflation-forecasting experts and should not be used to defend or support a current valuation assumption concerning future inflation rates.

Expert professional sources for forward-looking inflation forecasts are generally much lower than 2.875%. Consider the forward-looking forecasts from expert professionals presented on the following page.

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Forward-looking Annual Inflation Forecasts (From Professional Experts in the Field of Forecasting Inflation)	
Federal Reserve Board's Federal Open Market Committee	
Long-run Price Inflation Objective (Since Jan 2012)	2.00%
Congressional Budget Office: *The Budget and Economic Outlook*	
Overall Consumer Price Index (Aug 2016; Ultimate)	2.40%
Overall Consumer Price Index (Aug 2016; 11 Years)	2.33%
Personal Consumer Expenditures (Aug 2016; Ultimate)	2.00%
Personal Consumer Expenditures (Aug 2016; 11 Years)	1.95%
2016 Social Security Trustees Report	
CPI-W 15-Year Intermediate Assumption	2.50%
CPI-W 30-Year Intermediate Assumption	2.55%
GDP Deflator 15-Year Intermediate Assumption	2.13%
GDP Deflator 30-Year Intermediate Assumption	2.17%
Quarterly Survey of Professional Forecasters	
2Q2016 Federal Reserve Bank of Philadelphia 10-Year Forecast	2.20%
Federal Reserve Bank of Cleveland	
30-Year Expectation on June 1, 2016	2.04%
20-Year Expectation on June 1, 2016	1.87%
10-Year Expectation on June 1, 2016	1.63%
Bond Investors (Excess Yield of Non-indexed Treasuries Over Indexed Treasuries)	
30-Year Expectation on June 30, 2016	1.60%
Median 30-year Expectation over 1/1/11 - 6/30/16	2.28%
20-Year Expectation on June 30, 2015	1.33%
Median 20-year Expectation over 1/1/11 - 6/30/16	2.27%
10-Year Expectation on June 30, 2015	1.40%
Median 10-year Expectation over 1/1/11 - 6/30/16	2.14%
Investment Consultants and Forecasters	
2016 GRS Survey major national investment forecasters and consultants	
Median expectation among 8 firms (6 to 20 Years)	2.23%
Median expectation among 2 firms (30 Years)	2.38%
2016 HAS Survey of 12 investment advisors: Median (10 years)	2.22%
2016 HAS Survey of 12 investment advisors: Median (20 years)	2.31%

It has become much harder to defend inflation assumptions greater than or equal to 2.5% in the face of so many opinions to the contrary from experts in the field of inflation forecasting. Our preferred inflation

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assumption currently would be 2.25% because it lies more comfortably within a consensus of the expectations above. Outliers may not be reasonable.

Asset Allocation

It has been generally accepted for many years that a fund's asset allocation to specified asset classes is responsible for over 90% of a fund's investment performance. Therefore, the asset allocation of the System is a core element in setting and evaluating the assumed future eROR.

In our evaluation of the actuary's net eROR assumption, we relied on the nine target asset allocation percentages set forth in the investment consultant's asset allocation and market assumptions report, which are consistent with the target asset allocation percentages disclosed in the System's 2016 CAFR.

Professional Investment Forecasts

We applied those target asset allocations to the expectations in the Gabriel, Roeder, Smith & Company survey of eight major national investment consultants and forecasters. Given the brevity of the descriptions of the asset classes identified, our mapping of these nine asset classes to the investment consultant's asset classes may not be exact.

We applied the investment consultants' expected returns. We replaced the investment consultants' respective inflation assumptions with 2.25%, our preferred assumption based on the inflation forecasters' expectations presented above. We reduced the respective forecasts by the expected investment-related expenses and added alpha for active management (above expected passive management expenses) back in as permitted and limited by ASOP No. 27. This process results in normalized expected returns for any one given year in the forecast horizon (called the expected arithmetic return).

Finally, we reduced the resultant one-year arithmetic returns for volatility drag in the compound return expected over time. Following are the results of this process.

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Investment Consultant	Distribution of 15-Year Average Geometric Compound Net Nominal Return			Probability of exceeding
	40th	50th	60th	7.50%
(1)	(2)	(3)	(4)	(5)
1	5.05%	5.88%	6.71%	31.18%
2	5.38%	6.09%	6.80%	30.84%
3	5.54%	6.32%	7.12%	35.40%
4	5.73%	6.45%	7.18%	35.75%
5	5.64%	6.44%	7.25%	36.98%
6	6.11%	6.83%	7.56%	40.86%
7	5.68%	6.56%	7.45%	39.51%
8	6.53%	7.31%	8.10%	47.60%
Average	**5.71%**	**6.49%**	**7.27%**	**37.27%**

Notice in the table above, the 50th percentile expectation of the consensus average is 6.49%. That can be considered the bottom of a range of reasonableness (unless additional conservatism is desired). Actuarially speaking, it is the preferred assumption because it is the 50th percentile expectation of compound returns over time.

Following is the backup showing the development of the one-year arithmetic returns.

Investment Consultant	Investment Consultant Expected Nominal One-Year Return	Investment Consultant Inflation Assumption	Expected One-Year Real Return (2)-(3)	Consensus Inflation Assumption	Expected Nominal One-Year Return (4)+(5)	Investment and Active Management Expenses	Recognized Value for Active Management	Expected Nominal One Year Return Net of Expenses (6)-(7)+(8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	7.07%	2.50%	4.57%	2.25%	6.82%	0.32%	0.14%	6.64%
2	6.78%	2.20%	4.58%	2.25%	6.83%	0.32%	0.14%	6.65%
3	7.19%	2.25%	4.94%	2.25%	7.19%	0.32%	0.14%	7.01%
4	6.52%	1.56%	4.96%	2.25%	7.21%	0.32%	0.14%	7.03%
5	7.09%	2.00%	5.08%	2.25%	7.33%	0.32%	0.14%	7.15%
6	7.60%	2.26%	5.34%	2.25%	7.59%	0.32%	0.14%	7.41%
7	7.61%	2.25%	5.36%	2.25%	7.61%	0.32%	0.14%	7.43%
8	8.12%	2.20%	5.92%	2.25%	8.17%	0.32%	0.14%	7.99%
Average	**7.25%**	**2.15%**	**5.10%**	**2.25%**	**7.35%**	**0.32%**	**0.14%**	**7.17%**

Notice the one-year arithmetic average consensus is 7.17%. This can be considered the top end of a range of reasonableness (or rounded to 7.25%) based on a mid-term horizon.

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For use in an actuarial valuation for pensions, where the entire measurement and funding model is built on compounding (forward or backward), the 50th percentile compound geometric expectation is the most appropriate choice of a net eROR assumption. Nevertheless, while we would prefer to see 6.49%, an expected arithmetic (one year) return of 7.50% is a reasonable assumption, given that three of the eight investment consultants expected an arithmetic (one year) return to be near of over 7.50% as their mid-term horizon.

However, only one of the eight major national investment consultants expects the 50th percentile of the compound return over time to be near 7.50%. Some might consider this an outlier. According to the consensus capital market assumptions of these investment consultants, there is only a 37.27% chance of achieving at least the 7.50% compound annual return over the next 15 years.

2. Treatment of Administrative Expenses

According to page 41 of the 2016 Actuarial Valuation, the Investment Rate of Return is "7.5% (Net of Investment Expenses)."

The report (page 9) also states "Each year a determination is made of two cost components, and the actuarially required contributions are based on the sum of these two components plus administrative expenses." The report (page 17) includes estimated administrative expenses of $1,365,125 in the calculation of the Employer Actuarially Required Contribution for Fiscal 2017.

It is therefore our understanding, confirmed by direct conversations and correspondence with the System's actuary, that the administrative expenses are recognized in advance for funding purposes by way of a load of expected administrative expenses on the normal cost. That process is consistent with a Actuarial Standards of Practice (ASOPs), including:

Actuarial Standards of Practice (ASOP) No. 4 section 3.13(c) states:

> "Expenses should be considered when assigning periodic costs or actuarially determined contributions to time periods. For example, the expenses for a period may be added to the normal cost for benefits or expenses may be reflected as an adjustment to the investment return assumption or the discount rate. As another example, expenses may be reflected as a percentage of pension obligation or normal cost."

Actuarial Standards of Practice (ASOP) No. 27 section 3.8.3(e) states:

> "Investment and Other Administrative Expenses—Investment and other administrative expenses may be paid from the plan assets. To the extent such expenses are not otherwise recognized, the actuary should reduce the investment return assumption to reflect these expenses."

Actuarial Standards of Practice (ASOP) No. 35 section 3.6.1 states:

> "Administrative Expenses Charged to the Plan—The actuary should take into account expenses such as investment advisory, investment management, or insurance advisory services, to the extent that the costs of these services are not reflected in the investment return assumption; premiums paid to

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the Pension Benefit Guaranty Corporation (PBGC); accounting and auditing services; actuarial services; plan administration services; legal services; and trustee services. Formats for this assumption may include a dollar amount, a specific percentage of assets, a specific (and explicitly disclosed) reduction in the investment return assumption, or a percentage of benefit obligation or normal cost."

In conclusion, we concur with the actuary that the June 30, 2016, discount rate should be based on the net eROR without any reductions for administrative expenses since they are included explicitly in the calculation of the actuarially required contributions.

This approach used in the 2016 Actuarial Valuation is reasonable and appropriate.

3. Mortality

The 2016 Actuarial Valuation (page 41) states that the mortality assumption for annuitant and beneficiary mortality is the "RP 2000 Combined Healthy with Blue Collar Adjustment Sex Distinct Mortality Tables projected to 2029 using Scale AA for males and set back 1 year and projected to 2029 using scale AA for females."

Base table

To evaluate the reasonableness of the mortality assumption, we reviewed the base mortality (RP2000 with Blue Collar Adjustments) separately from the projection scale (Scale AA).

We believe the use of the RP2000 with Blue Collar Adjustments as the base mortality table to be reasonable. The process we used to determine the reasonableness of the base mortality table is as follows:

1. Experience Study: An experience study (dated February 17, 2016) was prepared in 2016 covering the period from July 1, 2009, through June 30, 2014. We reviewed the experience study report and found the section on mortality to be described with reasonable detail and careful recognition of relevant mortality experience. The report describes reasonable applications of actuarial credibility principles.

2. Size of the plan: Due to the small size of the experience group and low number of deaths during the study period, the results of the experience study are not fully credible (unlike LASERS, which was fully credible). Only partial credibility can therefore be given to the results of the experience study. A weighted average of the group's experience and that of a standard reference table is needed to obtain a final mortality assumption for valuation purposes.

3. Standard mortality table: Since the experience study is not fully credible, it is necessary to select a standard mortality table as a reference table to be used in the determination of the mortality assumption. Possible candidates for a standard reference table include:

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a. The mortality tables developed for LASERS or TRSL. However, an actuarial assessment would need to be made of the appropriateness of the actuarial methodology and the comparability of the groups covered before considering them for use as the standard reference table for this purpose.

b. The RP2000 mortality table was published in or around the year 2000. It was developed by the Society of Actuaries based on national private sector pension data.

c. RP2014 mortality table was published in October 2014. As for RP2000, this table was also developed by the Society of Actuaries based on national private sector pension data. It is the most recent reliable base mortality table available, for purposes of national estimates of mortality for pension plans.

4. Louisiana mortality rates: The Centers for Disease Control and Prevention (CDC) has published data[2] demonstrating that mortality rates in Louisiana are generally higher than national averages. Therefore, it would be more prudent not to use a current national mortality table (such as RP2014) as the standard reference table in the weighted average calculations described above without adjustment.

5. RP2000 with blue collar adjustment as the standard mortality table: The experience study states that RP2000 mortality table was selected as the standard base mortality table. The RP2014 mortality table, being the newest table available, was considered by the system's actuary. However, the RP2000 mortality table was ultimately selected to account for the higher mortality rates in Louisiana. We find this approach reasonable. We analyzed the data from CDC[1] and found that mortality rates in Louisiana are approximately 20% higher than national mortality rates. We found the mortality rates in RP2000 to be approximately 26% higher than those of RP2014 (representative of national rates). In our opinion, this is close enough for RP2000 to qualify as a reasonable standard reference table for reflecting general Louisiana mortality. The blue collar adjustments are also reasonable.

6. Credibility weights: Credibility weights were calculated separately by GSC for males and females based on the number of deaths observed in the experience study. Due to the low number of deaths, the weights assigned to the combined group's experience were low (44% for males and 32% for females). The associated weights assigned to the standard reference table were the compliments of those (56% for males and 68% for females). These weighting factors calculated by GSC used standard actuarial treatment required for developing weighted average mortality that recognizes the credibility level of data in an experience study with insufficient data of its own.

7. Credibility weighted mortality: The credibility weights were applied to (a) the experience study mortality rates and (b) standard reference table's mortality rate (RP2000 as projected to 2012) to obtain the weighted mortality rates. The average rate was 98% of the standard reference table for males and 92% of the standard reference table for females.

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[2] Refer to Table 3 in the *National Vital Statistics Reports* (Volume 60, Number 4) dated January 22, 2012, published by the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System.

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8. Set-forwards and set-backs: The credibility weighted mortality rates were compared to the standard reference table to set the appropriate set-forwards and set-backs to determine the best fitting table to use for the final mortality assumption. No adjustment to the standard reference table was determined to be the best fit for males and a set-back one year (in the RP2000 table with blue collar adjustments projected by Scale AA to 2029) was determined to be the best fit for females.

Therefore, we find the base table (before projection for future mortality) to be fully appropriate for the 2016 Actuarial Valuation.

Projection scales

Once the base table was found to be reasonable, we then reviewed the projection scale used in the mortality assumption (projection Scale AA). We believe the actuary's use of Scale AA projected to 2029 is not unreasonable.

However, there is an intermediate projection scale, Scale BB, which was developed to be used in connection with RP2000, pending creation and release of RP2014 and MP2014. Scale BB was released in September 2012 and available at the time of the experience study. Scale BB was developed after the results of the Society of Actuaries' analyses showed that the rates of mortality improvement in the U.S. over the then-recent past had differed significantly from those predicted by Scale AA. Scale BB would be a better choice for the projection of mortality improvements when coupled with RP2000.

Furthermore, there are two ways to reflect mortality improvement: (a) Project the improvements to a target year in the future or (b) Apply the improvement scale generationally. The first way applies the mortality rate for a 65-year old (for example) regardless of whether the member turns 65 in 2020 or turns 65 in 2040. The generational projection applies the improvements for the four years between 2016 and 2020 for a member turning 65 in 2020, but applies the improvements for the 24 years between 2016 and 2040 for a member turning 65 in 2040. While the actuarial literature permits the use of a static projection to a given future year, the actuarial profession is endorsing the generational approach as being preferable.

A more current approach to estimating mortality rates for valuation purposes would be to use either: (a) RP2000 projected generationally by Scale BB or (b) RP2014 loaded with 120% and projecting generationally using MP2016. Blue collar adjustment would also be reasonable for each. While either of these two approaches would be more current and preferable methodologies, we do not find the mortality tables used in the MPERS 2016 actuarial funding valuation report to be unreasonable.

4. Cost of Living Adjustments

Page 4 of the 2016 Actuarial Valuation states:

> "Although the board of trustees has authority to grant ad hoc Cost of Living Increases (COLAs) under limited circumstances, these COLAs have not been shown to have a historical pattern, the amounts of the COLAs have not been relative to a defined cost-of-living or inflation index, and there is no evidence to conclude that COLAs will be granted on a predictable basis in the future.

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> Therefore, for purposes of determining the present value of benefits, these COLAs were deemed not to be substantively automatic and the present value of benefits excludes COLAs not previously granted by the board of trustees."

Certain Louisiana statutes are applicable to all state and statewide retirement systems and provide numerous rules, conditions, thresholds and benefit levels governing the granting and paying of cost-of-living adjustments or permanent benefit increases. For the purpose of this letter report, we refer to both as COLAs. For example, R.S. 11:241-248 provides substantive rules applicable broadly to many of Louisiana's retirement systems, including MPERS. These statutes have been around for a very long time. Certain other Louisiana statutes are applicable to specific retirement systems. For example, R.S. 11:2225(A)(7) provides substantive COLA rules specifically for MPERS. Again, this specific statute has been around a while.

The broadly applicable rules and the specific system rules have changed over time; most recently, in 2013 significant changes were adopted. Nevertheless, COLA statutes applicable to MPERS have been part of the framework for many years. And this statutory history of providing a mechanism for MPERS COLAs continues today.

Currently, the COLA statutes applicable to MPERS provide for (a) mathematical and logical rules for *when* the MPERS board is allowed to grant a COLA and (b) mathematical and logical rules for *how much* COLA the MPERS board may grant. There is not much if any discretion in the application of these rules.

When

The statutory mechanism for *when* the MPERS board is allowed to grant base COLAs and additional COLAs depends on whether the funded ratio is at or above certain percentage levels and on how long it has been since a COLA had previously been granted.

According to page 11 of the 2016 Actuarial Valuation, the funded ratio of MPERS was 70.64% as of June 30, 2016. According to the statutes, during the time while MPERS's funded ratio is at least 70% but below 80% a COLA is allowed every fourth year subject to the excess earnings rule determining the amount, as described below. The MPERS amortization policy expects the System to achieve a funded ratio of 80%, then 90%, before too long. A simple amortization schedule or an open group forecast valuation could demonstrate this. Once it reaches 90% or more, a COLA is expected to be allowed every other year subject to the excess earnings rule determining the amount, as described below.

Discretion

If these conditions are satisfied and the MPERS board is allowed to grant a base COLA and possibly an additional COLA, the board must vote to actually grant the COLA. The board is free to vote for or against a COLA when allowed, or not to vote at all. This is the discretionary aspect of the COLA-granting process. This discretionary step is what prevents the COLA from being considered "automatic." But consider the following internal and external forces at play which tend to press board members to grant COLAs when allowed:

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- While we have no personal knowledge or experience with the MPERS board, generally speaking, retirement board members often have a sense of duty to serve the plan members. The MPERS retirement board of trustees is composed of individuals who have a natural constituency in plan members. There is likely a natural inclination to grant benefits when allowed.

- Social Security gives a COLA almost every year. In any given future year, if MPERS retirees have not had a COLA in a couple years and since they are not generally covered by Social Security, there is a natural tendency to want to grant a COLA if allowed.

- Furthermore, if other retirement systems, such as LASERS, TRSL or other state or statewide systems give COLAs in a given year, MPERS board members will feel some pressure to grant a COLA if allowed.

- Finally, if the funded ratio of the System continues to improve as it is expected to do, board members might feel like sharing that success with the plan members by granting a COLA.

These are strong forces that are likely to press board members to grant COLAs whenever allowed.

On the other hand, the direction of the employer contribution rate (going upward or downward) also influences the willingness to grant a COLA. Indeed, there are fiscal pressures that move board members at times to refrain from granting benefits when allowed if the employer contribution rate goes up by sufficient margins or if the funded ratio falls.

The following table illustrates recent history of when MPERS COLAs were allowed to be granted and how much.

MPERS COLAs Granted			
Evaluated June 30	**Effective January 1**	**Allowed to Grant COLA?**	**% COLA Granted**
2016	2017	No	0.00%
2015	2016	No	0.00%
2014	2015	No	0.00%
2013	2014	Yes	3.00%

* *A full and detailed interpretive decision tree is needed to evaluate the actuary's conclusion that a COLA was not allowed.*

Given the recent example of granting a COLA when allowed (measured at the fiscal year ending June 30, 2013), coupled with the analysis above, in our opinion that there is a reasonable probability that the board will grant a COLA whenever allowed; maybe not every time (100%), but half the time (50%) would be a reasonable estimate (on the low side). It seems inappropriate to "assume" a 0% chance of

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granting a COLA in future years when otherwise allowed. The board members themselves may dispute that assumption about their future behavior toward plan members' benefits.

Important and material plan provisions like these COLA provisions require objective analysis, careful attention and reasonable actuarial judgement of the future to appropriately measure the cost and liability of a retirement plan.

How much

The statutory mechanism for *how much* COLA the MPERS board may grant (assuming it is allowed to do so based on the conditions above) depends on (a) how far above the threshold the funded ratio is, (b) how far above the assumed valuation rate the actuarial valuation rate actually was during the year, (c) how much the present value of benefits for eligible members is measured to be, (d) whether it is a base COLA, in which case the increase amount for each eligible member is 3.0% per year, (e) whether it is an additional COLA, in which case the additional increase amount is 2% of the eligible member's initial commencement amount and (f) whether the A+B method in R.S. 11:241 is applied.

Legislative Framework Expects COLAs

The COLA provisions are in the Louisiana statutes for a reason: To pay COLAs -- sometimes. The sponsors and other legislators fully expect COLAs to be granted periodically, even if only every two or three or four years. If not, these statutory provisions probably would not have been codified.

It is incumbent upon the actuary to recognize the possibility and likelihood that COLA benefits will be paid with some regularity, even if only every two or three or four years. That is why we believe the statutory provision is there. Failure to recognize (even if making only a rough estimate) the cost and liability of the statutes' COLA provisions is to deny the purpose.

Something is Better Than Nothing

Traditional actuarial methods model the payment of various plan benefits over time, none of which are known with certainty either. For example: the times when members will terminate, become disabled, die or retire are not known with certainty; how much employees' pensionable compensation will increase over time is not known with certainty; nor do we know with certainty what the future investment returns or future inflation will be. Nevertheless, these uncertainties do not stop us from making reasonable projections in reasonable calculations of the future costs and liabilities associated with any given plan benefit provisions. Decrement events and benefits do not need to be fully predictable before an actuary recognizes their likelihood within an actuarial valuation.

While COLA benefits are different from other benefit provisions in the events and conditions in which the actual benefits arise, they are the same as any other benefit provision in the sense that (a) they are well-defined benefits payable to plan members, (b) certain aspects of their eligibility and calculations can be programmed and calculated, and (c) other aspects of their eligibility/approval may be discretionary but they do have a reasonably likely chance of being approved whenever allowed. Actuarially measuring the future costs and liabilities of COLA benefits (recognizing a degree of likelihood and timing) is consistent with our traditional practice of actuarially measuring other legal plan benefit provisions (recognizing a degree of likelihood and timing).

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Refer to the Appendix at the end of this letter for several citations from the Actuarial Standards of Practice (ASOPs).

Other Truly Ad Hoc COLAs

Other plans around the country have no special provisions for COLAs, no well-defined criteria or hurdle to satisfy for granting COLAs, and have no history (or no discernible pattern) of granting ad hoc COLAs. Those are different. In those cases, there is no good reason to expect COLAs to be paid in the future, until or unless some pattern (even if erratic) of truly ad hoc COLAs emerges. But MPERS is different, as are other Louisiana retirement systems.

There is a long and specific statutory history with detailed conditions for granting COLAs, fully contemplating that COLAs would be granted. In the past five years, the only time when a COLA was allowed to be granted for satisfying the statutory conditions, the board did indeed grant the specified COLA. That, together with other facts presented above, is a strong indicator that there is some likelihood that a COLA will be granted sometimes.

Reasonable Actuarial Estimates

There are at least two approaches to actuarially measuring the cost and liabilities of MPERS's COLA provision: stochastic modelling and rough estimating. Both methods result in assuming that an annual or biennial COLA increase of X% serves as a reasonable proxy for what would likely actually happen in the years to come. The value of X% serves as the single equivalent COLA, and is treated in the valuation "as if" it is a regular COLA increase. The only challenge is to make a reasonable estimate of X%.

1. An open group forecast valuation of the system forms the basis for a stochastic estimation of the current present values of future COLA benefits. There are other unforeseen benefits to an open group forecast that prove useful to both actuary and board members as they manage the funding of the system. Once the process solves for X%, the usual closed group valuation is then performed using the X% as a regular COLA.

   An Excel spreadsheet can be developed with the necessary liability projections, projected fund values based on an investment return for each future year, and annual valuation calculations built into the spreadsheet. With the same expected return every year, the spreadsheet produces deterministic forecast valuations. But if Excel's random number generator selects return assumptions in a macro from its internal lognormal distribution function, the System's return varies from year to year, producing a stochastic forecast of future valuations.

   Running that forecast valuation with and without COLAs, the single equivalent X% can be solved so as to approximate the present value of simulated COLAs.

   Some have argued that this is too complicated and expensive for a small plan. However, this is not too complicated for an actuary to design and run. It is being done more and more in many firms across the country. Furthermore, the cost should not be considered too much for a plan the size of MPERS (approximately $1.8 billion in assets) for the worthy benefit of obtaining a decent actuarial measure of the cost and liability for providing these COLA benefits.

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Furthermore, once it is built, it can be adjusted for use on behalf of other retirement systems, thereby spreading the costs.

2. However, even a rough estimate would be better than nothing. Just following the reasoning set forth in the pages above, it is reasonable to expect COLAs to be allowed every three or four years in the next decade or so, but every other year thereafter, in the amount of 2.0% to 5.0% each time granted. With an assumption of granting every time allowed, that might work out to a single equivalent annual COLA of approximately 1.0% to 2.0% over the next 30 years. If only a 50-50 chance of granting when allowed, that might work out to be a single equivalent annual COLA of approximately 0.50% to 1.0%.

   Although, not very scientific and a more detailed version of this rough estimate is contemplated, this is better than nothing.

Actuarially-determined contributions are required. Recognizing non-zero COLA benefits in advance using reasonable assumptions will effectively require funding the expected benefit in advance. Failing to reflect any COLA until it is granted means that funding always occurs in arrears. Recognizing estimated COLAs in advance is good governance and is more consistent with the State Constitution's requirement to "attain and maintain actuarial soundness."

Much of the description of the COLA conditions and benefits above are merely summaries and are based on our interpretation of statutes. This letter report should not be considered a legal opinion. The statutes should be consulted for more detailed descriptions and we defer to the Legislative Auditor's legal counsel and other authoritative sources for legal interpretations.

5. Calculations and Exhibits

We did not perform an actuarial audit and replication of the results. However, we reviewed the calculations presented in the 2016 funding valuation report to ensure there were no mathematical errors. Based on our review, we believe all the calculations in the report were done correctly and without any mathematical errors.

Pages 10-11 of the 2016 Actuarial Valuation include a few paragraphs with basic conclusions about whether a COLA is allowed, with reference to a few statutes. In the interest of transparency and ASOP No. 4 Section 4.1(i) and ASOP No. 41 Section 3.2, we would prefer to see a detailed exhibit that presents a step-by-step (decision tree) exhibit that demonstrates the path for determining whether a COLA is allowed and how much the COLA could be or will be.

This communication should not be construed to provide tax advice, legal advice, or investment advice.

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6. Actuarial Certification

Although assisted by other actuaries, the actuarial opinions expressed in this report are the opinions of Paul T. Richmond, Manager of Actuarial Services for the LLA. This report was prepared under Mr. Richmond's supervision. He received support from actuaries employed by Gabriel, Roeder, Smith & Company. Mr. Richmond is a member of the American Academy of Actuaries and meets the qualification standards of the Academy necessary to render the professional actuarial opinions contained herein. His supporting actuaries are also members of the Academy and meet the qualification standards that allow Mr. Richmond to rely on their advice and work products.

Paul T. Richmond, ASA, MAAA, EA, FCA

2/3/17
Date

APPENDIX

ACTUARIAL STANDARDS OF PRACTICE (ASOPs)

ASOP No. 4 Section 3.5

3.5 Plan Provisions—When measuring pension obligations and determining **periodic costs** or **actuarially determined contributions**, the actuary should reflect all significant **plan provisions** known to the actuary as appropriate for the purpose of the measurement. However, if in the actuary's professional judgment, omitting a significant **plan provision** is appropriate for the purpose of the measurement, the actuary should disclose the omission in accordance with section 4.1(d).

ASOP No. 4 Section 3.5.3

3.5.3 Plan Provisions that are Difficult to Measure—Some **plan provisions** may create pension obligations that are difficult to appropriately measure using traditional valuation procedures. Examples of such **plan provisions** include the following:

a. gain sharing provisions that trigger benefit increases when investment returns are favorable but do not trigger benefit decreases when investment returns are unfavorable;

b. floor-offset provisions that provide a minimum defined benefit in the event a **participant's** account balance in a separate plan falls below some threshold;

c. benefit provisions that are tied to an external index, but subject to a floor or ceiling, such as certain cost of living adjustment provisions and cash balance crediting provisions; and

d. benefit provisions that may be triggered by an event such as a plant shutdown or a change in control of the plan sponsor.

For such **plan provisions**, the actuary should consider using alternative valuation procedures, such as stochastic modeling, option-pricing techniques, or deterministic procedures in conjunction with assumptions that are adjusted to reflect the impact of variations in experience from year to year. When selecting alternative valuation procedures for such **plan provisions**, the actuary should use professional judgment based on the purpose of the measurement and other relevant factors.

The actuary should disclose the approach taken with any **plan provisions** of the type described in this section, in accordance with section 4.1(i).

ASOP No. 27 Section 3.11.2

3.11.2 Cost-of-Living Adjustments—Plan benefits or limits affecting plan benefits (including the Internal Revenue Code (IRC) section 401(a)(17) compensation limit and section 415(b) maximum annuity) may be automatically adjusted for **inflation** or assumed to be adjusted for **inflation** in some manner (for example, through regular plan amendments). However, for some purposes (such as qualified pension plan funding valuations), the actuary may be precluded by applicable laws or regulations from anticipating future plan amendments or future cost-of-living adjustments in certain IRC limits.