LCRA Retirement Plan
Report of an Actuarial Audit
Final Actuarial Audit Report in Accordance with Section 802.1012(f)
of the Texas Government Code
August 21, 2018

Board of Trustees
Lower Colorado River Authority
3700 Lake Austin Blvd
Austin, TX 78703

Re: Final Report on the Actuarial Audit of the Lower Colorado River Authority Retirement Plan

Dear Trustees:

Gabriel, Roeder, Smith & Company (GRS) is pleased to present this report of an actuarial audit of the January 1, 2018 Actuarial Valuation of the Lower Colorado River Authority Retirement Plan (the Plan). The following documents are intended to demonstrate that the plan sponsor has complied with Section 802.1012 of the Texas Government Code which requires an actuarial audit of public retirement systems with total assets of at least $100 million every five years.

The following three documents will constitute the final actuarial audit report, as required by Section 802.1012(h) of the Texas Government Code:

1. This cover letter,
2. Preliminary draft of the actuarial audit report, dated July 20, 2018, and
3. The plan sponsor’s response to the preliminary draft of the actuarial audit report, dated August 20, 2018.

Following the delivery of the preliminary draft of the actuarial audit report on July 20, 2018, GRS requested a response to the preliminary draft, as required by Section 802.1012(g) of the Texas Government Code. The plan sponsor provided a response to the preliminary draft on August 20, 2018.

GRS is pleased to report that, in our professional opinion, we believe the January 1, 2018 Actuarial Valuation of the Lower Colorado River Authority Retirement Plan was reasonable, used appropriate assumptions and adhered to Actuarial Standards of Practice and Texas PRB Pension Funding Guidelines.
The signing actuaries are independent of the plan sponsor. Mr. Siblik is an Associate of the Society of Actuaries and a Member of the American Academy of Actuaries. Mr. Falls is an Enrolled Actuary, a Fellow of the Society of Actuaries, and a Member of the American Academy of Actuaries. They meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

Daniel J. Siblik, ASA, MAAA, EA
Consultant

R. Ryan Falls, FSA, MAAA, EA
Senior Consultant
LCRA Retirement Plan
Report of an Actuarial Audit
Preliminary Draft in Accordance with Section 802.1012(f) of the Texas Government Code
July 20, 2018
July 20, 2018

Board of Trustees  
Lower Colorado River Authority  
3700 Lake Austin Blvd  
Austin, TX 78703

Dear Trustees:

Gabriel, Roeder, Smith & Company (GRS) is pleased to present this report of an actuarial audit of the January 1, 2018 Actuarial Valuation of the Lower Colorado Retirement Plan Retirement Plan (the Plan). We are grateful to the Lower Colorado River Authority (LCRA) staff and Rudd and Wisdom, Inc., the retained actuary, for their cooperation throughout the actuarial audit process.

This actuarial audit involves an independent verification and analysis of the assumptions, procedures, methods, and conclusions used by the retained actuary for LCRA, in the valuation of the Plan as of January 1, 2018, to ensure that the conclusions are technically sound and conform to the appropriate Standards of Practice as promulgated by the Actuarial Standards Board.

GRS is pleased to report to LCRA that, in our professional opinion, the January 1, 2018 Actuarial Valuation prepared by the retained actuary provides a fair and reasonable assessment of the financial position of the Plan.

Throughout this report we make suggestions for ways to improve the work product. We hope that the retained actuary and LCRA find these items helpful. Thank you for the opportunity to work on this assignment.

Mr. Siblik and Mr. Falls are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

Daniel J. Siblik, ASA, MAAA, EA  
Consultant

R. Ryan Falls, FSA, MAAA, EA  
Senior Consultant

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SECTION A

EXECUTIVE SUMMARY
Executive Summary

LCRA issued a Request for Proposal (RFP) for an Actuarial Audit of the LCRA Retirement Plan (the Plan) and a peer review, including test lives (separated by defined benefit and cash balance plan), of the January 1, 2018 actuarial valuation performed by the retained actuary. LCRA selected Gabriel, Roeder, Smith & Company (GRS) to perform the actuarial audit. The project commenced in June of 2018.

This Actuarial Audit includes the following:

- Review and analysis of the calculation results as well as a review of the mathematical calculations for completeness and accuracy, based on a detailed review of a representative sample of the current plan participants.
- Verification that all appropriate benefits have been valued and valued accurately.
- Evaluation of the actuarial cost method and the actuarial asset valuation method in use and whether other methods may be more appropriate for LCRA.
- Verification of the reasonableness of the calculation of the unfunded actuarial accrued liability and the amortization period used under the actuarial cost method.
- Review of the demographic and economic actuarial assumptions for consistency, reasonableness and compatibility. Such assumptions shall include, but are not limited to: mortality, retirement and separation rates, levels of pay adjustments, rates of investment return, and disability factors.
- Assessment of the adherence to relevant Actuarial Standards of Practice (ASOPs) published by the American Academy of Actuaries.
- Assessment of the adherence to the Texas Pension Review Board (PRB) Pension Funding Guidelines.
- A full replication of the January 1, 2018 actuarial valuation results was not covered under the scope of this engagement.

This actuarial audit will satisfy the requirements of Section 802.1012 of the Texas Government Code which requires an actuarial audit of public retirement systems in Texas with total assets of at least $100 million every five years.

Summary of Findings

Based on our review, the actuarial valuation, studies, and reports of the Plan are reasonable, used appropriate assumptions and adhered to Actuarial Standards of Practice and Texas PRB Pension Funding Guidelines. We offer the following recommendations based on the valuation methods and assumptions used by the retained actuary in the January 1, 2018 actuarial valuation.

Actuarial Assumptions

- In the next experience study report, we recommend that the retained actuary include more detail regarding the mortality experience for the Plan as well as detail regarding the “exposures” for each experience group studied.
At the next experience study, we recommend that the retained actuary consider gender-distinct rates of withdrawal and retirement.

The retained actuary should continue to monitor the actual administrative expenses and ensure the estimate for future administrative expenses remains reasonable.

**Actuarial Methods and Funding Policy**

We recommend a modification to the application of the actuarial cost method to eliminate the disconnect between the calculation of Total Present Value of Plan Benefits (TPV) and Present Value of Future Salary (PVFS). We have described a method of determining PVFS that we believe is the most appropriate application of the Entry Age Normal actuarial cost method. Since the TPV is being appropriately accounted for in the actuarial valuation, the implementation of this method for LCRA should not have a significant impact on the valuation results and contribution requirements.

**Actuarial Valuation Results**

In the next actuarial valuation, we recommend the retained actuary update the mortality assumption for lump sum conversions to accommodate the unisex provisions defined in the definition of actuarial equivalence.

**Content of Valuation Report**

In order to improve the ability of the report to communicate the understanding of the summary results, the assumptions and methods as well as the benefit provisions incorporated into the January 1, 2018 actuarial valuation, we recommend that the retained actuary incorporate the noted enhancements to Section II (Summary of Actuarial Valuations), Section IV (Actuarial Methods and Assumptions) and Section V (Outline of Principal Plan Eligibility and Benefit Provisions as of January 1, 2018) of the January 1, 2018 actuarial valuation report.
SECTION B

GENERAL ACTUARIAL AUDIT PROCEDURE
General Actuarial Audit Procedure

At the commencement of this engagement, GRS requested the information necessary to thoroughly review the work product of the retained actuary. Specifically, GRS received and reviewed the following items:

- Actuarial valuation report as of January 1, 2018,
- The most recent experience study dated June 7, 2016,
- The Plan’s Master Statement of Investment Policies and Objectives, amended June 16, 2015,
- The Lower Colorado River Authority Retirement Plan and Trust Agreement, amended and restated effective January 1, 2014,
- Detailed calculations from the retained actuary for a sampling of 30 plan participants as of January 1, 2018.

In performing our review, we:

- Reviewed the plan document to understand the benefits provided by the Plan,
- Reviewed the appropriateness of the actuarial assumptions,
- Reviewed the actuarial reports/studies, and
- Reviewed the detailed liability calculation of the 30 sample test lives to ensure that the calculations were consistent with the stated plan provisions, actuarial methods and assumptions.

The entire review, which follows, is based on our review of this information and subsequent correspondence with the retained actuary for clarification and further documentation.

Key Actuarial Concepts

An actuarial valuation is a detailed statistical simulation of the future operation of a retirement plan using the set of actuarial assumptions adopted by the plan sponsor. It is designed to simulate all of the dynamics of such a retirement plan for each current participant of the plan, including:

- Accrual of future service,
- Changes in compensation,
- Leaving the plan through retirement, disability, withdrawal, or death, and
- Determination of and payment of benefits from the plan.

This simulated dynamic is applied to each active participant of the plan. This simulation results in a set of expected future benefit payments to that participant. Discounting those future payments for the likelihood of survival and at the assumed rate of investment return, produces the Total Present Value of Plan Benefits (TPV) for that participant. The actuarial cost method will allocate this TPV between the participant’s past service (actuarial accrued liability) and future service (future normal costs).
PRB Pension Funding Guidelines

During our actuarial audit of the Plan, we reviewed the actuarial valuation of the Plan from the perspective of the Texas Pension Review Board’s Pension Funding Guidelines, as adopted January 26, 2017, effective June 30, 2017. The Guidelines are:

1. The funding of a pension plan should reflect all plan obligations and assets.
2. The allocation of the normal cost portion of the contributions should be level or declining as a percent of payroll over all generations of taxpayers, and should be calculated under applicable actuarial standards.
3. Funding of the unfunded actuarial accrued liability should be level or declining as a percentage of payroll over the amortization period.
4. Actual contributions made to the plan should be sufficient to cover the normal cost and to amortize the unfunded actuarial accrued liability over as brief a period as possible, but not to exceed 30 years, with 10 - 25 years being the more preferable target range.* For plans that use multiple amortization layers, the weighted average of all amortization periods should not exceed 30 years. Benefit increases should not be adopted if all plan changes being considered cause a material increase in the amortization period and if the resulting amortization period exceeds 25 years.
5. The choice of assumptions should be reasonable, and should comply with applicable actuarial standards.
6. Retirement systems should monitor, review and report the impact of actual plan experience on actuarial assumptions at least once every five years.

* Plans with amortization periods that exceed 30 years as of 06/30/2017 should seek to reduce their amortization period to 30 years or less as soon as practicable, but not later than 06/30/2025.

These key actuarial concepts will be discussed in more detail throughout this report.
SECTION C

ACTUARIAL ASSUMPTIONS
Actuarial Assumptions

Overview

The actuarial valuation report contains a description of the actuarial assumptions which were used in the actuarial valuation as of January 1, 2018. Additionally, the retained actuary published an actuarial experience report, dated June 7, 2016. We have reviewed this report in detail in order to assess the reasonableness of the assumptions used in the actuarial valuation.

The set of actuarial assumptions is one of the foundations upon which an actuarial valuation is based. An actuarial valuation is, essentially, a statistical projection of the amount and timing of future benefits to be paid under the retirement plan. In any statistical projection, assumptions as to future events will drive the process. Actuarial valuations are no exception.

It is important to understand the nature of the retirement plan and the plan sponsor when assessing the reasonableness of the actuarial assumptions. No projection of future events can be labeled as “correct” or “incorrect”. However, there is a “range of reasonableness” for each assumption. We evaluate individual elements as follows:

• Whether or not they fall within the range of reasonableness, and
• If they fall within that range, whether they are reasonable for the actuarial valuation of the Plan.

Actuarial assumptions for the valuation of retirement plans are of two types: (i) demographic assumptions, and (ii) economic assumptions. We have assessed the reasonableness of both types as part of this actuarial audit.

Demographic Assumptions

General

These assumptions simulate the movement of participants into and out of plan coverage and between status types. Key demographic assumptions are:

• turnover among active participants,
• retirement patterns among active participants, and
• healthy retiree mortality.

In addition, there are a number of other demographic assumptions with less substantial impact on the results of the process, such as:

• disability incidence and mortality among disabled benefit recipients,
• mortality among active participants,
• distribution of form of payment selection, and
• percent of active participants who are married and the relationship of the ages of participants and spouses.
Demographic assumptions for a retirement plan such as LCRA are normally established by statistical studies of recent actual experience, called experience studies. Such studies underlie the assumptions used in the valuations.

Once it is determined whether or not an assumption needs adjustment, setting the new assumption depends upon the extent to which the current experience is an indicator of the long-term future.

- Full credibility may be given to the current experience. Under this approach, the new assumptions are set very close to recent experience.
- Alternatively, the recent experience might be given only partial credibility. Thus, the new assumptions may be set by blending the recent experience with the prior assumption.
- If recent experience is believed to be atypical of the future, such knowledge is taken into account.
- Finally, it may be determined that the size of the plan does not provide a large enough sample to make the data credible. In such cases, the experience of the plan may be disregarded and the assumption is set based upon industry standards for similar groups.

The measurement of experience is normally affected by simply counting occurrences of an event. Thus, for example, in reviewing retirement patterns, an actuary might count the number of actual retirees among males aged 55 with 30 years of service. These retirements would be compared against the number of total people in that group to generate a raw rate of retirement for that group.

**Experience Study Report**

The experience study report, dated June 7, 2016, provides a thorough description of each assumption studied, the basis of the proposed assumption, a summary of the current and proposed assumptions, and the impact of the changes on the actuarial valuation.

We believe that the experience study report did a very good job describing the assumptions, providing context for the basis of the assumptions, and outlining the reasoning for the proposed assumptions (and applicable changes, if any) going forward. It is best practice to review the definition of actuarial equivalence whenever assumption changes are being considered and presenting this information in the experience study report allows the decision makers to consider all of the proposed changes at the same time.

The experience study prepared by the retained actuary in 2016 is thorough and well documented. We have two minor suggestions to improve the overall completeness of the next experience study report:

**Summarize Mortality Experience**

The experience study report includes a detailed summary of the actual experience of the Plan over the five-year experience study period for the retirement rates and termination rates. These summaries include the “expected” number of decrements based on the current assumptions and the “actual” number of decrements that occurred over the experience period. As mentioned in our prior actuarial
audit, in the next experience study report, we recommend that the retained actuary include similar summaries for the mortality experience.

The retained actuary notes that the Plan is not large enough for its actual mortality experience to be the basis of the mortality assumption and, therefore, the retained actuary recommends published mortality tables that are considered appropriate for the Plan. It is true that the Plan is not large enough for the actual experience to be the sole basis for the mortality assumption, but it is important to consider the actual mortality experience of the Plan when setting the mortality assumption. Tracking the actual experience continues to be important as ASOP No. 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations indicates that the actuary should consider the effect of mortality improvement both prior to and subsequent to the valuation date.

**Summarize Exposures**

Four tables in the experience study report (Table 1, Table 3, Table 5, and Appendix 4) summarize the actual experience of the Plan over the five-year experience study period. We would encourage the retained actuary to expand these summaries to include the number of “exposures” observed in the experience. In addition, a retirement rate analysis of actual-to-expected broken down by Entry Age Group (as is done in Appendix 4 for termination rates) would be very helpful. This table was in the prior experience study and would help validate the changes made to retirement rates. We understand that there were factors such as the Optional Credited Service purchase and a Voluntary Severance Plan (discussed below) that made analysis of retirement rates more complicated than in the past, but since rates were updated, it would be helpful to see a breakdown of activity.

The relative number of “exposures”, or number of plan participants that were subject to the particular assumption illustrates the credibility of the underlying experience to the reader of the experience study report. Whenever further detail on the exposures for each Entry Age Group and for each Age band can be included, it enhances the information included in the experience study report.

**Observations on Assumptions**

Overall, it appears that the current demographic assumptions are reasonable. Below, we offer general observations and considerations for the retained actuary based on our experiences with similar plans.

**Retirement** – It was very helpful that the actuary pointed out that two major factors affected the analysis of retirement activity over the period that was studied. The amendment to Optional Credited Service (OCS) provisions and the Voluntary Severance Program that was offered made the behavior atypical. The actuary did a very good job of detailing how behavior was affected, including the spike in dollar amounts contributed to purchase OCS in 2011. We understand that these two items made updating the retirement rates difficult and do not disagree with the actuary in slightly increasing certain rates to anticipate earlier retirements than formerly assumed. In addition, the rates at which participants are assumed to retire are based on the participant’s age at hire and their current age and the Plan allows participants to retire with a Rule of 80 (age plus service equals at least 80). It is likely that rates of retirement have some correlation to both the participant’s current age and current service. The current assumption allows both of these
factors to be considered when establishing the retirement assumption. We believe that the retirement rate assumption is appropriate for the Plan.

**Turnover** – The rates at which participants are assumed to withdraw (or turnover) are based on the participant’s age at hire and their current service. In the experience study, the experience of cash balance participants was combined with the pension plan participants, which we do not disagree with, as there is no reason to believe they would exhibit different behavior regarding terminating service. The current assumption was also developed to be consistent with the actual experience over the most recent experience study period and we believe that the withdrawal rate assumption is appropriate for the Plan.

**Disability Incidence** – In general, very little retirement plan experience exists in order to set a reasonable assumption based on actual retirement plan experience, and the actuary explains this in the report. They then mention that one of the statewide retirement systems, the Texas County and District Retirement System (TCDRS), would be a good fit. The current assumption for disability incidence that is based on the TCDRS pension plan assumptions seems reasonable. However, since the conclusion of the LCRA experience study, TCDRS has completed a new experience study (late 2017) and disability rates were updated for that plan. The actuary may want to consider using the updated rates in the upcoming actuarial valuations.

**Mortality** – The main demographic assumption in an actuarial valuation is mortality because this assumption is a predictor of how long pension payments will be made by the trust (excluding lumps sums paid by the cash balance plan). The current mortality assumption for active participants, healthy annuitants, and disabled annuitants is based on the RP-2000 Combined Health Mortality Tables with mortality improvements projected to the year 2024 (projected to 2018 for lump sum conversion purposes). This is an established mortality assumption and is appropriate for this purpose. We would like to point out that many pension plans now use generational mortality adjustments that create a dynamic, rather than static, table that automatically updates the assumption with improved mortality in future years. It is true that the actuary is projecting mortality beyond the valuation date, but since the experience study is only done every five years, the projection to 2024 is six years ahead of the current valuation date of 2018. As of the following valuation, it will only be projected five years beyond the valuation date. The year after that, it will only be projected four years beyond the valuation date, etc. However, adopting a generational mortality assumption would prevent the need to keep updating the mortality assumption with each experience study.

As the actuary notes in their experience study, they anticipate the mortality study of public plans to be completed by the time of the next experience study. In fact, the Retirement Plans Experience Committee (RPEC) and the Society of Actuaries are currently working on developing mortality tables and projection scales specifically for public pension plans. This work is estimated to be completed with a release of the tables in late summer or early fall of this year (2018). We recommend that the actuary closely review these tables (with any adjustments necessary to align with recent mortality experience) along with generational mortality projections in upcoming experience studies.

**Use of Blended Rates** – The experience study report summarizes the withdrawal rate and retirement rate experience without regard to gender (males and females are added together). When the population of a
plan is not primarily one gender (90% or more), we believe it may be appropriate that gender-distinct experience be studied and incorporated into the demographic assumptions when there is a distinct difference based on gender. As we stated in the prior actuarial audit, we would recommend that gender-distinct rates at least be studied for withdrawal and retirement. If gender-distinct patterns are apparent, then gender-distinct rates should be used.

**Economic Assumptions**

**General**

These assumptions simulate the impact of economic forces on the amounts and values of future benefits. Key economic assumptions are the assumed rate of investment return and assumed rates of future salary increase. All economic assumptions are built upon an underlying inflation assumption.

**Inflation**

Inflation refers to mean price inflation as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies most of the other economic assumptions. It primarily impacts investment return and salary increases.

The current explicit inflation assumption is 2.75%. The inflation assumption was lowered from 3.00% resulting from the June 7, 2016 Experience Study to 2.75% in the January 1, 2017 actuarial valuation and remained at 2.75% for the January 1, 2018 actuarial valuation.

All investment consulting firms used in our analysis, in setting their capital market assumptions, currently assume that inflation will be at or below 2.50%. In our review of the 2017 capital market assumption sets for the eleven investment consulting firms listed on the next page, the average assumption for inflation was approximately 2.2%, with a range of 1.95% to 2.50%. It should be noted that all of these investment consulting firms set their assumptions based on approximately a ten-year outlook, while actuaries generally must make longer projections.

In the Social Security Administration’s 2017 Trustees Report, the Office of the Chief Actuary projected a long-term average annual inflation rate of 2.6% under the intermediate cost assumption. (The low-cost assumption was 3.2% and the high cost assumption was 2.0.%). These inflation assumptions forecasts have not materially changed for several years.

The Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters. In their forecast immediately preceding the 2017 actuarial valuation, fourth quarter of 2016, was for inflation over the next ten years to average 2.2%. Over the shorter term, the society of Professional Forecasters are predicting inflation to average 2.2% for the calendar years 2017 and 2018, so they are expecting inflation to consistently stay around 2.2% over the next 10 years.

We consider the 2.75% assumption to be within the reasonable range; however we believe that it is closer to the top end of the reasonable range than the bottom. We also recommend that the retained actuary continue to monitor this assumption (which they appear to be doing annually) to ensure that it remains within their reasonable range.
**Investment Return**

The investment return assumption is one of the principal assumptions in any actuarial valuation of a retirement plan. It is used to discount future expected benefit payments to the valuation date, in order to determine the liabilities of the retirement plan. Even a small change to this assumption can produce significant changes to the liabilities and contribution rates. The current assumption incorporates inflation of 2.75% per annum plus an annual real rate of return of 4.50%, net of investment-related expenses paid from the trust, for an assumed nominal rate of return of 7.25%. Note these assumptions are different than those recommended by the June 7, 2016 Experience Study. While the total investment return assumption is still 7.25%, the components have changed. The inflation rate has been lowered from 3.00% to 2.75%. Therefore, the annual real rate of return has been increased from 4.25% to 4.50%. This appears to have occurred with the January 1, 2017 valuation. We mention this because increasing the real rate of return assumption in the current investment climate goes against industry trends as investment consultants continue to decrease their capital market return outlooks.

We believe an appropriate approach to reviewing an investment return assumption is to determine the median expected portfolio return given the retirement plan’s target allocation and a given set of capital market assumptions. Per the Plan’s Master Statement of Investment Policies and Objectives, amended June 16, 2015, the Plan’s current target asset allocation is:

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Cap Domestic Equities</td>
<td>22.0%</td>
</tr>
<tr>
<td>Small Cap Domestic Equities</td>
<td>5.5%</td>
</tr>
<tr>
<td>Long/Short Equity</td>
<td>15.0%</td>
</tr>
<tr>
<td>International Equities</td>
<td>27.5%</td>
</tr>
<tr>
<td>Domestic Fixed Income</td>
<td>15.0%</td>
</tr>
<tr>
<td>Absolute Return</td>
<td>10.0%</td>
</tr>
<tr>
<td>Global Fixed Income</td>
<td>5.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Because GRS is a benefits consulting firm and does not develop or maintain our own capital market assumptions, we reviewed assumptions developed and published by the following investment consulting firms:

- Aon
- BNY Mellon
- Callan
- JP Morgan
- Marquette
- Mercer
- NEPC
- PCA
- RV Kuhns
- Summit
- Wilshire

These investment consulting firms periodically issue reports that describe their capital market assumptions, that is, their estimates of expected returns, volatility, and correlations. While these assumptions are developed based upon historical analysis, many of these firms also incorporate forward looking adjustments to better reflect near-term expectations. The estimates for core investments (i.e.
fixed income, equities, and real estate) are generally based on anticipated returns produced by passive index funds.

Given the Plan’s current target asset allocation and the investment firms’ capital market assumptions for 2018, the development of the average nominal return, net of investment fees paid from the trust, is provided in the following table:

<table>
<thead>
<tr>
<th>Investment Consultant</th>
<th>Expected Nominal Return</th>
<th>Investment Consultant Inflation Assumption</th>
<th>Expected Real Return (2)–(3)</th>
<th>Actuary Inflation Assumption</th>
<th>Expected Nominal Return (4)+(5)</th>
<th>Standard Deviation of Expected Return</th>
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</thead>
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<tr>
<td>Average</td>
<td>6.69%</td>
<td>2.20%</td>
<td>4.49%</td>
<td>2.75%</td>
<td>7.24%</td>
<td>12.10%</td>
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<td>1</td>
<td>6.06%</td>
<td>2.26%</td>
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<td>6.55%</td>
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<td>2</td>
<td>6.50%</td>
<td>2.50%</td>
<td>4.00%</td>
<td>2.75%</td>
<td>6.75%</td>
<td>12.80%</td>
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<td>3</td>
<td>6.04%</td>
<td>2.00%</td>
<td>4.04%</td>
<td>2.75%</td>
<td>6.79%</td>
<td>10.58%</td>
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<td>4</td>
<td>6.07%</td>
<td>2.00%</td>
<td>4.07%</td>
<td>2.75%</td>
<td>6.82%</td>
<td>10.54%</td>
</tr>
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<td>5</td>
<td>6.76%</td>
<td>2.50%</td>
<td>4.26%</td>
<td>2.75%</td>
<td>7.01%</td>
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<td>6</td>
<td>6.61%</td>
<td>2.31%</td>
<td>4.30%</td>
<td>2.75%</td>
<td>7.05%</td>
<td>12.00%</td>
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<td>7</td>
<td>6.54%</td>
<td>2.20%</td>
<td>4.34%</td>
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<td>7.09%</td>
<td>10.93%</td>
</tr>
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<td>8</td>
<td>6.82%</td>
<td>2.26%</td>
<td>4.56%</td>
<td>2.75%</td>
<td>7.31%</td>
<td>12.90%</td>
</tr>
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<td>9</td>
<td>7.09%</td>
<td>1.95%</td>
<td>5.14%</td>
<td>2.75%</td>
<td>7.89%</td>
<td>11.41%</td>
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<tr>
<td>10</td>
<td>7.38%</td>
<td>2.00%</td>
<td>5.38%</td>
<td>2.75%</td>
<td>8.13%</td>
<td>11.87%</td>
</tr>
<tr>
<td>11</td>
<td>7.74%</td>
<td>2.25%</td>
<td>5.49%</td>
<td>2.75%</td>
<td>8.24%</td>
<td>16.66%</td>
</tr>
</tbody>
</table>

We determined for each firm the expected nominal return rate based on the Plan’s target allocation, and then subtracted that firm’s expected inflation to arrive at their expected real return in column (4). Then we added back the Plan’s current 2.75% inflation assumption to get a net nominal return. As the table shows, the resulting average one-year return of the 11 firms is 7.24%.

In addition to examining the expected one-year return, it is important to review anticipated volatility of the investment portfolio and understand the range of long-term net return that could be expected to be produced by the investment portfolio. Therefore, the following table provides the 40th, 50th, and 60th percentiles of the 20-year geometric average of the expected nominal return, net of investment-related expenses paid from the trust, as well as the probability of exceeding the current 7.25% assumption.
The table above shows that the resulting 20-year geometric average of the expected nominal return is 6.55%. Additionally, the table above documents that the average probability of exceeding the current 7.25% investment return assumption over a 20-year period is 40%.

As a point of reference, the National Association of State Retirement Administrators (NASRA) published an issue brief updated as of February 2018 of 129 large public retirement systems which reflects the nominal assumption in use, or announced for use, as of the date of the survey. The average investment return assumption for responding systems was 7.50%. The brief also noted that approximately 75% of the 129 plans measured have reduced their investment return assumption since fiscal year 2010. It should also be noted that the LCRA Retirement System is a closed plan and will see incoming contributions in the future at a slower pace than an open pension plan – effectively the plan is winding down over time. This means a higher percentage, over time, of current assets will go toward paying out retirement benefits. This will likely put downward pressure on the investment returns as the time-horizon for the plan declines. Therefore, in our opinion, it would be better to be on the lower end of the spectrum.

The current investment return assumption falls within our best-estimate range and we believe that the assumption is reasonable for this purpose.

**Expenses**

As previously noted, the investment return assumption is stated as being net of expected investment-related fees paid from the trust. As of the 2014 actuarial valuation, the assumption for General Administrative Expenses has been $300,000 per year and is treated as part of the recommended contribution. Reported actual administrative expenses have been less than $10,000 in the most recent two actuarial valuation reports. The retained actuary pointed out that certain legal, audit and actuarial fees had previously been classified as investment expenses instead of administrative expenses. The final
audited financial statements as of December 31, 2017 show that $316,000 was, in fact, paid in general administrative expenses for 2017. As a result, the current assumption is reasonable.

The actuary may want to consider increasing the $300,000 assumption by the inflation assumption each year to estimate that the costs of goods and services tend to go up from year-to-year. We do believe the $300,000 assumption is currently reasonable for expenses.

**Earnings Progression**

In general, assumed rates of pay increase are often constructed as the total of three main components:

- Price inflation – currently 2.75%
- Economic Productivity Increases – currently 0.50%
- Merit, Promotion, and Longevity – This portion of the salary increase assumption reflects components such as promotional increases as well as increases for merit and longevity. This portion of the assumption is not related to inflation. The current assumptions vary this component based on the participant’s age at hire and their current service.

In the context of a typical employer pay scale, pay levels are set for various employment grades. In general, this pay scale is adjusted as follows:

- The inflation and economic productivity assumptions, collectively referred to as wage inflation, reflect the overall increases of the entire pay scale, and
- The Merit, Promotion, and Longevity increase assumption reflects movement of participants through the pay scale.

Based on the building block approach outlined above, the earnings progression assumption is based on the sum of the expected pay increases related to wage inflation plus a component for merit, promotion and longevity. The current assumption was developed to be consistent with the actual experience over the most recent experience study period. We believe that the earnings progression assumption is reasonable for the Plan.

**Summary**

The set of actuarial assumptions and methods, taken in combination, are within the range of reasonableness and established in accordance with ASOP No. 27, Selection of Economic Assumptions for Measuring Pension Obligations, ASOP No. 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations, and the Texas PRB Guidelines for Actuarial Soundness.

We have the following recommendations regarding the actuarial assumptions:

1. In the next experience study report, we recommend that the retained actuary include more detail regarding the mortality experience for the Plan as well as detail regarding the “exposures” for each experience group studied.
(2) At the next experience study, we recommend that the retained actuary consider gender-distinct rates of withdrawal and retirement.

(3) The retained actuary should continue to monitor the actual administrative expenses and ensure the estimate for future administrative expenses remains reasonable.
Actuarial Methods and Funding Policy

Actuarial Cost Methods

General

The ultimate cost of the Plan is equal to the benefits paid plus the expenses related to operating the Plan. This cost is funded through contributions to the Plan plus the investment return on accumulated contributions which are not immediately needed to pay benefits or expenses. The level and timing of the contributions needed to fund the ultimate cost are determined by the actuarial assumptions, plan provisions, participant characteristics, investment experience, and the actuarial cost method.

An actuarial cost method is a mathematical process for allocating the dollar amount of the Total Present Value of Plan Benefits (TPV) between future normal costs and the Actuarial Accrued Liability (AAL). The retained actuary uses the Entry Age Normal actuarial cost method, characterized by:

1. Normal Cost (NC) – the level percent of payroll contribution, paid from each participant’s date of hire to date of retirement, which will accumulate enough assets at retirement to fund the participant’s projected benefits from retirement to death.

2. Actuarial Accrued Liability – the excess of the TPV over the present value of all future remaining normal costs.

The Entry Age Normal actuarial cost method is the most prevalent funding method in the public sector. It is appropriate for the public sector because it produces costs that remain relatively stable as a percentage of payroll over time, resulting in intergenerational equity for taxpayers. Historically, most public plans have used the Entry Age Normal actuarial cost method. Therefore, the retained actuary’s stated methods for allocating the liabilities of the Plan are certainly in line with national trends.

Comments on the Cost Method

We believe that the use of the Entry Age Normal actuarial cost method is reasonable in this situation.

Application of the Cost Method

In order to determine the normal cost as a level percentage of pay, the valuation must determine the Present Value of Future Salaries (PVFS) over which the Plan participants will accrue benefits. The calculation of PVFS should be determined in the same manner as the TPV. That is, the calculation of the PVFS should include the same salary that the participant is expected to receive and should incorporate the same interest discount and decrement timing.

For the January 1, 2018 actuarial valuation, the TPV was developed assuming that participants leave active service (retirement, disability, withdrawal or death) at the beginning of the year. However, the PVFS was developed slightly differently – by assuming that participants leave active service at the end of
the year. In other words, the TPV was determined based on projected benefits and eligibilities at the beginning of the year (where any participant assumed to leave active service in that year would be expected to receive essentially no pay for that year) and the PVFS was allocated across future pay that assumes the participant leaves active service at the end of the year (where the participant would, in fact, be expected to receive a complete year of pay).

This difference results in a disconnect between the TPV and PVFS that can impact the allocation of TPV between AAL and NC. An application that would align the two present values more similarly would be for the PVFS to account for the same probabilities/decrements of exiting the plan the same as the benefits under TPV. The recommended modification to the Entry Age Normal cost method will only impact the allocation of the TPV between future normal costs and actuarial accrued liability. We believe that this method of determining PVFS is the most appropriate application of the Entry Age Normal cost method. The implementation of this method for LCRA should not have a material impact on the valuation results and contribution requirements since the TPV remains unchanged. However, a complete analysis of the impact of this method change is beyond the scope of this audit.

**Asset Valuation Method**

Sharp short-term swings in market value can result in large fluctuations in the contributions required to fund the Plan. Thus, many actuaries use an asset valuation method which smooths out these fluctuations in support of achieving level contributions. A good asset valuation method places values on a retirement plan’s assets which are related to current market value but which will also produce a smoother pattern of costs.

ASOP No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations, provides a framework for the determination of the actuarial value of assets (AVA) emphasizing that the method should bear a reasonable relationship to the market value of assets (MVA), recognize investment gains and losses over an appropriate time period, and avoid systematic bias that would overstate or understate the AVA in comparison to MVA.

The actuarial valuation of the Plan currently utilizes a smoothed asset valuation method that immediately recognizes income equal to the expected return on valuation assets, based on the assumed valuation interest rate (7.25%). Differences between the assumed investment return on valuation assets and the actual market investment return is recognized over a five-year period. Further, the AVA is constrained to be within 80% and 120% of the MVA. This “corridor” assures that the AVA will always be within a reasonable range around the MVA.

The smoothing method used for the actuarial valuation of the Plan is very common among public employee retirement systems. We feel that this method complies with ASOP No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations. Additionally, this method is reasonable and appropriately applied for the valuation.
**Funding Policy**

The LCRA Retirement Plan was closed to new entrants as of May 1, 2012. As a result, the retained actuary proposed a new funding policy for the April 1, 2012 actuarial valuation where LCRA would contribute the Plan’s normal cost and an amount sufficient to amortize the Plan’s unfunded AAL over a 25-year period. Since the group of active Plan participants is now closed, the retained actuary further recommended that the contribution toward the unfunded AAL be calculated based on a level dollar basis and over a closed 25-year period.

Sections 6.02 and 6.03 of the Lower Colorado River Authority Retirement Plan and Trust Agreement, as amended and restated effective January 1, 2014, direct the actuary to recommend a funding policy that determines the contributions “necessary to fund the benefits of the Plan on a sound actuarial basis”.

This is a reasonable funding policy and complies with the provisions of the Plan and the Texas PRB Pension Funding Guidelines.

**Summary**

We have the following recommendation regarding the application of the actuarial methods and funding policy:

(1) We recommend a modification to the application of the actuarial cost method to eliminate the dissimilar treatment of TPV and PVFS. We believe that the proposed method of determining PVFS is the most appropriate application of the Entry Age Normal actuarial cost method. Since the TPV is being appropriately accounted for in the actuarial valuation, the implementation of this method for LCRA should not have a significant impact on the valuation results and contribution requirements.
SECTION E

ACTUARIAL VALUATION RESULTS
Actuarial Valuation Results

Benefits

Every employer is different and every employer’s retirement plan is different. Each employer has a set of business needs that dictate the type of retirement benefit that is most appropriate for their employees. Additionally, the amount of resources available to allocate to the retirement plan will dictate the level of benefits provided by the retirement plan. Regardless of the reasons for the benefit design, the employer must understand the liability and contribution requirements associated with the benefits promised. As a result, the actuarial valuation and the resulting funding policy contribution must properly reflect the benefit structure of the retirement plan.

In general, the benefits promised by the Plan were reasonably incorporated in the actuarial valuation of the Plan.

Actuarial Valuation Results

As part of our review, GRS requested sample participant test life calculations from the retained actuary to ensure that the retained actuary valued the correct benefit levels, used the correct assumptions, and calculated the liabilities correctly on an individual basis.

Generally accepted actuarial standards and practices provide actuaries with the basic mathematics and framework for calculating the actuarial results. When it comes to applying those actuarial standards to complex calculations, differences may exist due to individual opinion on the best way to make those complex calculations. This may lead to differences in the calculated results, but these differences should not be material.

Active Participants. At the onset of the review, we requested that the retained actuary provide sample test life calculations for 15 active participants. The retained actuary provided the information we requested regarding the active participants with sufficient detail to allow for a thorough review of the calculations.

We have previously noted our opinion on the application of the actuarial cost method and the assumptions. We identified one additional element of the actuarial valuation of active participants that should be corrected for the next valuation.

Lump Sum Conversions - The basis for Actuarial Equivalence for purposes of converting payment forms to lump sum payments defines mortality as being a unisex blend of 75% of the RP-2000 Combined Healthy Male Mortality table projected to 2018 and 25% of the RP-2000 Combined Healthy Female Mortality table projected to 2018. Our review showed that the retained actuary used lump sum conversion assumptions that did not use a unisex blend but instead used only the participant’s gender as the basis for mortality table in that calculation.

Based on our review of the aspects of the actuarial valuation, the liability determination of active participants was reasonable and appropriately determined.
**Participants with deferred benefits.** At the onset of the review, we requested that the retained actuary provide sample test life calculations for five deferred vested participants waiting to commence their retirement benefits. The retained actuary provided the information we requested regarding these participants with deferred benefits with sufficient detail to allow for a thorough review of the calculations.

Based on our review, the liability determination of these participants was reasonable and consistent with the stated assumptions and methods.

**Annuitants.** At the onset of the review, we requested that the retained actuary provide sample test life calculations for 10 annuitants. The retained actuary provided the information we requested regarding the annuitants with sufficient detail to allow for a thorough review of the calculations.

Based on our review, the liability determination of annuitants was reasonable and consistent with the stated assumptions and methods.

**Summary**

Besides the comments made in Sections C and D of this report, we believe that the valuation results are developed in a reasonable manner. In the next actuarial valuation, we recommend that the retained actuary review the use of the lump sum mortality table throughout the actuarial valuation process to ensure the appropriate table is used in the development of the plan liabilities for all purposes.

Additionally, since it is likely that the retained actuary provides the plan administrator with lump sum factors for determining lump sum payouts to plan participants, we recommend the retained actuary review these factors to ensure that the appropriate lump sum mortality tables are used for plan administration and benefit calculation purposes.
SECTION F

CONTENT OF THE VALUATION REPORT
Content of the Valuation Report

ASOP No. 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions, and ASOP No. 41, Actuarial Communications, provide guidance for measuring pension obligations and communicating the results. The Standards list specific elements to be included, either directly or by references to prior communication, in pension actuarial communications. The pertinent items that should be included in actuarial valuation report on a pension plan should include:

- The name of the person and/or firm retaining the actuary and the purposes that the communication is intended to serve.
- A statement as to the effective date of the calculations, the date as of which the participant and financial information were compiled, and the sources and adequacy of such information.
- An outline of the benefits being discussed or valued and of any significant benefits not included in the actuarial determinations.
- A summary of the participant information, separated into significant categories such as active, retired, and terminated with future benefits payable. Actuaries are encouraged to include a detailed display of the characteristics of each category and reconciliation with prior reported data.
- A description of the actuarial assumptions, cost method and the asset valuation method used. Changes in assumptions and methods from those used in previous communications should be stated and their effects noted. If the actuary expects that the long-term trend of costs resulting from the continued use of present assumptions and methods would result in a significantly increased or decreased cost basis, this should also be communicated.
- A summary of asset information and derivation of the actuarial value of assets. Actuaries are encouraged to include an asset summary by category of investment and reconciliation with prior reported assets showing total contributions, benefits, investment return, and any other reconciliation items.
- A statement of the findings, conclusions, or recommendations necessary to satisfy the purpose of the communication and a summary of the actuarial determinations upon which these are based. The communication should include applicable actuarial information regarding financial reporting. Actuaries are encouraged to include derivation of the items underlying these actuarial determinations.
- A disclosure of any facts which, if not disclosed, might reasonably be expected to lead to an incomplete understanding of the communication.

We have reviewed the actuarial valuation report prepared by the retained actuary and there are a few modifications to the report that would allow it to adhere more closely with ASOP Nos. 4 and 41.

Section IV – Actuarial Methods and Assumptions

The presentation of actuarial methods and assumptions is generally complete and understandable. The methods described in this section are reasonable and appropriate for public retirement plans.
We do have a few suggestions to improve the overall communication of the certain components of the valuation report.

**Summary of Actuarial Valuations (Section II, Item 9)** – The table indicates the Recommended Annual LCRA Contributions which are payable one year after the valuation date. It is our understanding that the calculation incorporates the recommended contribution from the prior year as well as applicable normal cost to get the value one year beyond the valuation date, but the derivation of the contribution amount is not easily determinable by the reader. It may be helpful to give more details on the actual components of the calculation and how the amounts are adjusted for the one-year lag.

**Amortization Method (Section IV, Item A.2.)** – The valuation report indicates that the UAAL is amortized “over a 25-year closed period that began in 2012 with level dollar payments in accordance with LCRA’s funding policy recommended by Rudd and Wisdom, Inc.”. When the policy was implemented in 2012, the plan year began on April 1 and ended on March 31 of the following year. In that scenario, it would seem that the amortization period would end on March 31, 2037 after 25 years. Starting with the 2017 actuarial valuation, the plan year was switched to a calendar year. The valuation report states that the amortization period is ending in 2036 (cover letter of report). It appears that the amortization period was shortened when the plan year was changed in 2017. As a result, LCRA and retained actuary may want to modify the current funding policy to indicate the actual date the plan is expected to be fully funded to avoid any confusion.

**Actuarial Assumptions (Section IV, Item B.1.)** – Mortality is defined as being RP-2000 Combined Healthy Mortality projected to 2024 but it does not indicate what projection scale is being used for the projection to 2024. The actuary indicated that Scale AA is being used. A reference to this mortality projection scale should be added to the mortality disclosure in this section.

**Eligibility for Retirement (Section V, Item 4)** – The Rule of 80 is defined under Early Retirement but the plan document defines Normal Retirement Date as including “the date on which the Participant’s age and service, computed in years and months rounded to the next month, is equal to eighty (80) years (hereinafter referred to as “Rule of 80”).” We recommend that the retained actuary confirm the benefit summary in the actuarial valuation report is consistent with the plan document for these benefits.

**Basis for Actuarial Equivalence (Section V, Item 10)** – Similar to the comment on mortality for Section IV, Item B.1. mentioned above, the mortality description for Actuarial Equivalence purposes should disclose the scale used for projecting mortality to 2018. The actuary indicated that Scale AA was used. A reference to this mortality projection scale should be added to the mortality disclosure in this section.

**Summary**

In general, the actuarial valuation report complied with the applicable Actuarial Standards of Practice. In order to improve the ability of the report to communicate the assumptions, methods and benefit provisions incorporated into the January 1, 2018 actuarial valuation, we recommend that the retained actuary incorporate the noted enhancements to Section II (Summary of Actuarial Valuations), Section IV
(Actuarial Methods and Assumptions) and Section V (Outline of Principal Plan Eligibility and Benefit Provisions as of January 1, 2018) of the January 1, 2018 actuarial valuation report.
SECTION G

FINAL REMARKS
Final Remarks

The auditing actuarial firm, Gabriel, Roeder, Smith & Company (GRS), is independent of LCRA, the plan sponsor and retained actuarial firm. The auditing actuaries are not aware of any conflict of interest that would impair the objectivity of this work.

We have presented many suggestions for areas where we believe the product can be improved and we hope that LCRA, the plan sponsor and the retained actuary find these suggestions useful. The retained actuary has access to information and a long history of experience with LCRA. We understand that the retained actuary may agree with some of our recommendations, while rejecting others. We ask that the retained actuary and LCRA consider our recommendations carefully.
August 20, 2018

Mr. R. Ryan Falls, Senior Consultant
Mr. Daniel J. Siblik, Consultant
Gabriel Roeder Smith & Company
5605 N. MacArthur Blvd., Suite 870
Irving, Texas 75038-2631

Re: Comments on Actuarial Audit of January 1, 2018 Actuarial Valuation

Dear Mr. Falls and Mr. Siblik:

The state law requiring actuarial audits of public employee pension plans gives the LCRA Retirement Plan Board of Trustees the opportunity to make written comments on your actuarial review of the actuarial valuation of the LCRA Retirement Plan prepared by Rudd and Wisdom, Inc. The Board has asked them for assistance in preparing these comments. We have reproduced the summary of your recommendations from pages 2 and 3 of your preliminary report and inserted our comments in bold print for inclusion in your final report.

Actuarial Assumptions

(1) In the next experience study report, we recommend that the retained actuary include more detail regarding the mortality experience for the Plan as well as detail regarding the "exposures" for each experience group studied.

Rudd and Wisdom will consider including the exposures for each experience group studied in the next experience study.

(2) At the next experience study, we recommend that the retained actuary consider gender-distinct rates of withdrawal and retirement.

Rudd and Wisdom will consider including this recommendation in the next experience study.
Actuarial Methods and Funding Policy

(3) The retained actuary should continue to monitor the actual administrative expenses and ensure the estimate for future administrative expenses remains reasonable.

Rudd and Wisdom will continue to monitor the actual administrative expenses and adjust the assumed amount appropriately.

(4) We recommend a modification to the application of the actuarial cost method to eliminate the disconnect between the calculation of Total Present Value of Plan Benefits (TPV) and Present Value of Future Salary (PVFS). We have described a method of determining PVFS that we believe is the most appropriate application of the Entry Age Normal actuarial cost method. Since the TPV is being appropriately accounted for in the actuarial valuation, the implementation of this method for LCRA should not have a significant impact on the valuation results and contribution requirements.

Rudd and Wisdom will consider incorporating this recommendation into future actuarial valuations. They believe it will have a negligible funding impact.

Actuarial Valuation Results

(5) In the next actuarial valuation, we recommend the retained actuary update the mortality assumption for lump sum conversions to accommodate the unisex provisions defined in the definition of actuarial equivalence.

Rudd and Wisdom agrees that this change should be made and will incorporate it into the January 1, 2019 actuarial valuation.
(6) In order to improve the ability of the report to communicate the understanding of the summary results, the assumptions and methods as well as the benefit provisions incorporated into the January 1, 2018 actuarial valuation, we recommend that the retained actuary incorporate the noted enhancements to Section II (Summary of Actuarial Valuations), Section IV (Actuarial Methods and Assumptions) and Section V (Outline of Principal Plan Eligibility and Benefit Provisions as of January 1, 2018) of the January 1, 2018 actuarial valuation report.

Rudd and Wisdom will incorporate these recommended communication enhancements in the January 1, 2019 actuarial valuation report.

Rudd and Wisdom expressed to us their appreciation for the quality of your actuarial audit and the professional way in which you interacted with them and prepared your report.

Sincerely,

Jim Travis
Chair LCRA Retirement Board of Trustees