Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

NORTH CAROLINA

OFFICE of the STATE AUDITOR

REPORT OF AN ACTUARIAL REVIEW

OF ACCOUNTING DISCLOSURES

www.CavMacConsulting.com

Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

November 17, 2014

Ms. Joyce Boni
Audit Manager
Office of the State Auditor
20601 Mail Service Center
Raleigh, NC 27699-0601

Subject: Report of the Review of Accounting Disclosures for the North Carolina Retirement Systems

Dear Ms. Boni:

Cavanaugh Macdonald Consulting, LLC was selected by the North Carolina Office of the State Auditor (OSA) to provide this independent actuarial review of certain work performed by the North Carolina Retirement Systems' actuary, Buck Consultants (Buck). The audit primarily reviewed the reasonableness and soundness of Buck's work in preparing the accounting disclosures for the fiscal year ending June 30, 2014 based principally on the December 31, 2013 actuarial valuation of the Teachers' and State Employees' Retirement System of North Carolina and the North Carolina Local Governmental Employees' Retirement System.

The scope of the review was limited to assessing the reasonableness of valuation results that form the basis for the accounting disclosures through the review of a sample set of individual calculations selected from each retirement system rather than a complete replication of the results. Our findings are outlined in this report's executive summary with the details of our findings and recommendations provided in the section applicable to each review task.

We would like to thank the OSA staff for their responsiveness in providing all items we requested during the course of our review. We would also like to thank Buck for their cooperation and assistance in providing the requested information to us, and their timely and thoughtful responses to our questions. We look forward to answering any questions concerning the information provided herein.

200 Main Street, Suite 201H, Hilton Head Island, SC 29926
Phone (843) 686-3088 • Fax (678) 388-1730
www.CavMacConsulting.com
Offices in Englewood, CO • Kennesaw, GA • Bellevue, NE • Hilton Head Island, SC

The undersigned is a member of the American Academy of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report.

Sincerely,

Thomas J. Cavanaugh, FSA, FCA, MAAA, EA
Chief Executive Officer

TC:kc
S:\North Carolina Office of State Auditor\NCOSA Review Report Draft.docx

Table of Contents

	Section	Page
1.	Executive Summary	1
2.	Review Task 1 – Review of December 31, 2013 Actuarial Valuation Reports and Results	5
3.	Review Task 2 - Review of Demographic and Economic Actuarial Assumptions	10
4.	Review Task 3 - Evaluation of Data Procedures and Test Case Results	14
5.	Conclusion	16

1. EXECUTIVE SUMMARY

As independent reviewing actuary, Cavanaugh Macdonald Consulting, LLC (CMC) has been tasked to provide a general overview and express an opinion of the reasonableness and soundness of the work performed by Buck Consultants (Buck) for the North Carolina Retirement Systems and in particular the accounting disclosures for the State for the fiscal year ending June 30, 2014. This work, requested by the North Carolina Office of the State Auditor (OSA), encompasses the disclosures for the Teachers' and State Employees' Retirement System of North Carolina (TSERS) and the North Carolina Local Governmental Employees' Retirement System (LGERS).

Specifically the Scope of Work in the contract with OSA calls for CMC to provide the following services:

> The Contractor will evaluate the actuarial valuations of TSERS and LGERS used in the State's financial statement for the period ending June 30, 2014. The Contractor will conduct a review of all assumptions, procedures, and methodology utilized by the actuary of the TSERS and LGERS' plans. This review should include:
>
> 1. A review of the valuation reports and results and how they comply with actuarial standards, and whether such valuations reflect appropriate disclosure information under required reporting.
>
> 2. An analysis and benchmarking of the actuarial assumptions, including a review of the most recent experience studies, and a review of the actuarial methods used in determining the pension liability for compliance with generally accepted actuarial principles.
>
> 3. An analysis of the procedures used to validate the participant data, a test of select test lives from the membership groups (active and retired) to validate key components, and a detailed review of the results.
>
> The Contractor will provide a report on their work and the results, including an opinion regarding the reasonableness and accuracy of the actuarial assumptions, actuarial cost methods, procedures, and valuation results; and to certify that the plans' actuarial valuations were prepared in accordance with GASB, principles and practices prescribed by the Actuarial Standards Board, and that the actuarial

calculations were performed by qualified actuaries in accordance with accepted actuarial procedures.

We requested full participant and financial data of the pertinent employee groups from OSA along with reports, plan descriptions and miscellaneous pertinent information. We also requested from Buck participant data as reconciled for the December 31, 2013 valuations as well as complete descriptions of assumptions, methods and valuation procedures. Once we had reviewed the raw data, we requested a set of detailed individual calculations of participants, called test lives, pertaining to all participant groups in the two systems, with specific demographics to allow for review of the accuracy of benefit calculations, the development of the present value of benefits, the normal cost and the actuarial accrued liability, as well as the correct application of assumptions.

In performing this review, we attempted to limit discussions concerning differing opinions and focus more on the accuracy of calculations, the completeness and reliability of reporting, and the compliance with acceptable actuarial principals and standards in all work reviewed.

We summarize our findings for each major review task as follows:

1. **Review the valuation reports and results to determine if they comply with actuarial standards, and if such valuations reflect appropriate disclosure information under required reporting.**

   Our findings are based on a review of the participant and financial data; our review of test lives; our review of the assumptions and methods developed in the TSERS and LGERS Actuarial Experience Studies for the period ending December 31, 2009 and as used in the December 31, 2013 actuarial valuations; and the review of the development of the valuation and GASB 67 results. *We find that Buck's actuarial work is technically sound and complies with generally accepted actuarial standards*. In Section 2, we provide the details of the audit of the valuation and GASB 67 procedures as well as some minor recommendations.

2. **Analyze and benchmark the actuarial assumptions, including a review of the most recent experience study, and a review of the actuarial methods used in determining the pension liability for compliance with generally accepted actuarial principles.**

Based on our general review of the demographic Actuarial Experience Studies for the five year period ending December 31, 2009, the Discussion of Economic Assumptions and Funding Methods dated July 2010 and our review of the assumptions and methods utilized in the December 31, 2013 actuarial valuation, *we find the demographic and economic assumptions are consistent, reasonable and compatible.* In Section 3 we provide our findings and recommendations for this audit task.

Based on our review of the most recent experience study and 2013 actuarial valuations, *we find that use of the entry age normal cost method (as a level percentage of salary) for TSERS and the entry age normal cost with frozen initial liability method for LGERS are both reasonable and appropriate. In addition, the 5-year smoothing of the difference between actual and expected market return on investments (with a 20% market value corridor) is both reasonable and appropriate as well.* We note that Buck utilized the prescribed Entry Age Normal methodology for developing the GASB 67 required accounting items for both TSERS and LGERS.

3. **Analyze the procedures used to validate the participant data, test a selection of test lives from the membership group (active and retired) to validate key components, and perform a detailed review of the results.**

We reviewed the December 31, 2013 actuarial valuation data procedures utilized by Buck. In our opinion, the data used for valuation purposes appropriately reflects the active and inactive membership of TSERS and LGERS.

The results of our test life comparison indicates overall a very close total liability, actuarial accrued liability and present value of future service. There was one difference that we were able to reconcile with Buck. It has no material impact on the GASB 67 or actuarial valuation results.

Based on our analysis of the work performed by Buck within the scope of the review, we find Buck's work to be based on reasonable processes, technically sound, and fairly presented. We have no findings of material discrepancies with generally accepted actuarial principles and professional standards. Our recommendations are limited to suggesting minor improvements to the GASB 67 and valuation processes.

1. EXECUTIVE SUMMARY

The remainder of this report provides the basis for our findings and recommendations for each of the three major review tasks and our conclusions.

2. REVIEW TASK 1 – REVIEW OF DECEMBER 31, 2013 ACTUARIAL VALUATION REPORTS AND RESULTS

The December 31, 2013 actuarial valuations of TSERS and LGERS form the basis for the accounting disclosures needed for the State of North Carolina financial statements as of June 30, 2014 to conform to Governmental Accounting Standards Board Statement No. 67 (GASB 67). The review of the actuarial valuations is to provide a determination as to whether Buck's procedures are technically sound and based on generally accepted actuarial standards. This section provides our findings and recommendations for Review Task 1 which includes the verification of the actuarial methodology, the review of the accounting disclosure items for completeness and conformity with GASB 67, and the verification that all appropriate benefits are being valued.

The actuarial calculations required to produce an actuarial valuation are extremely complex; even on the individual participant level. Acceptable actuarial principals and standards provide actuaries with guidance and a framework for performing the calculations but there often exist differences as to precisely how the calculations are performed by different actuaries. Some of these differences are due to differing opinions and judgment while other differences exist within the details of the highly complex calculations and programming routines of valuation software. Where measurable differences occurred in our review of the test life calculations, we have discussed those differences with Buck. Material differences, if any, not satisfactorily reconciled with Buck would be included in our findings; there were none.

Our review of reports and results is limited to the December 31, 2013 actuarial valuation reports for TSERS and LGERS. Both reports meet the requirements of the Actuarial Standards of Practice dealing with producing and communicating pension valuation results. The reports are signed by actuaries currently meeting the qualification standards of the American Academy of Actuaries necessary to render the opinions contained in the reports. Comments regarding the valuation results can be found in Section 4 in conjunction with the discussion of test life case results.

GASB 67 Review

As noted, the valuation results form the basis for the GASB 67 information provided by Buck. The GASB 67 results were included in separate letters for both TSERS and LGERS dated August 26, 2014. The letters provide most but not all of the information needed to complete the June 30, 2014 CAFR. The items not provided are discussed at the end of this section.

The Governmental Accounting Standards Board issued Statement No. 67, "Financial Reporting For Pension Plans", in June 2012. GASB 67's effective date is for plan years beginning after

June 15, 2013. Thus the first year it is applicable for North Carolina is the year ending June 30, 2014, which is the required measurement date under the new GASB 67 standard.

GASB 67 replaces GASB 25, and represents a significant departure from the requirements of that older statement. GASB 25 was issued as a funding friendly statement that required pension plans to report items consistent with the results of the plan's actuarial valuations, as long as those valuations met certain parameters. GASB 67 basically divorces accounting and funding, creating disclosure and reporting requirements that may or may not be consistent with the basis used for funding the System.

A major change in GASB 67 is the requirement to determine the Total Pension Liability (TPL) utilizing the Entry Age Normal actuarial funding method. The Net Pension Liability (NPL) is then set equal to the TPL minus the System's Fiduciary Net Position (FNP) (basically the market values of assets).

Among the assumptions needed for the liability calculation is a Single Equivalent Interest Rate (SEIR). To determine the SEIR, the FNP must be projected into the future for as long as there are anticipated benefits payable under the plan's provision applicable to the membership and beneficiaries of the System on the Measurement Date. If the FNP is projected to not be depleted at any point in the future, the long term expected rate of return on plan investments expected to be used to finance the benefit payments may be used as the SEIR.

If, however, the FNP is projected to be depleted, the SEIR is determined as the single rate that will generate a present value of benefit payments equal to the sum of the present value determined by discounting all projected benefit payments through the date of depletion by the long term expected rate of return, and the present value determined by discounting those benefits after the date of depletion by a 20-year tax-exempt municipal bond (rating AA/Aa or higher) rate. The rate used, if necessary, for this purpose is the Bond Buyer General Obligation 20-year Municipal Bond Index published monthly by the Board of Governors of the Federal Reserve System.

The Buck GASB letters detail the projection results used to set the SEIR for both TSERS and LGERS. We find the projections meet the requirements of GASB 67 and support the use of a 7.25% interest rate for both systems.

2. REVIEW TASK 1 – REVIEW OF DECEMBER 31, 2013 ACTUARIAL VALUATION REPORTS AND RESULTS

GASB 67 allows the valuation used as the basis for the NPL to be any date no more than 24 months before the end of the fiscal year in question. Buck has used the results of the December 31, 2013 actuarial valuation for this purpose. Since the liabilities are not determined as of the end of the plan year, they must be rolled forward from the valuation date to the measurement date of June 30, 2014. Although the Buck letter is silent as to how that roll forward was conducted, we were subsequently provided details of Buck's roll forward procedure. Buck provided the amounts shown in the table below ($ in thousands).

	TSERS	LGERS
(a) TPL as of December 31, 2013	$65,805,555	$21,855,372
(b) Entry Age Normal Cost for the Period January 1, 2014 – June 30, 2014	754,549	323,931
(c) Estimated Benefit Payments for the Period January 1, 2014 – June 30, 2014	2,105,334	583,271
(d) TPL as of June 30, 2014 = $[(a) + (b)] \times (1.0725)^{\wedge 1/2} - (c) \times (1.0725)^{\wedge 1/4}$	$66,788,196	$22,375,668

While we agree with the basic methodology and the arithmetic, we would suggest it would be more appropriate to use actual benefit payments during the period January 1, 2014 – June 30, 2014 rather than the estimated benefit payments. Although the GASB 67 Implementation Guide is silent on the specific issue of roll forward procedures, it does address the development of the change in NPL that is required to be disclosed. Q&A 61 is instructive in that regard:

61. Q – If the approach used in the preceding question is used to determine the service cost reported in the schedule of changes in the net pension liability for the pension plan's fiscal year ended June 30, 20X5, should the amounts identified as interest on the total pension liability be calculated on the beginning total pension liability, adjusted for projected service cost and *actual* benefit payments (including refunds of plan member contributions), or *projected* benefit payments from the actuarial valuation that is used to determine the service cost be used for purposes of the adjustment?

A – Interest on the total pension liability should be determined based on the beginning total pension liability, adjusted for projected service cost and *actual* benefit payments. Because the actual amounts of benefit payments and contributions are components of the total change in the plan's fiduciary net position, it would be consistent to use actual amounts to determine other components of the change in the net pension liability, including the changes in the total pension liability resulting from benefit payments and interest on the total pension liability.

Buck does use actual benefit payments in the schedule of the change in NPL shown in their August 26th GASB letters. We would recommend using actual payments for the roll forward procedure for consistency at least. It should be noted however that if actual benefit payments were used the impact on the TPL would be small.

The assets, or FNP, used for GASB 67 purposes must be as of the measurement date. Based on information provided by OSA we have confirmed that the correct asset amounts have been used, and that therefore the NPLs calculated by Buck are the correct amounts for use in the financial statements.

The Buck letters provide the information needed to complete the table required under paragraph 32(a) of GASB 67 showing the schedule of changes in the net pension liability. We have reviewed all the entries in that table and concur with each amount. Buck also provides most of the information needed for the table required under paragraph 32(b), except for explicitly showing the covered employee payroll and the NPL as a percentage of that payroll. We suggest these items be added to the GASB reports.

The final item required for GASB 67, which was not included in the Buck letters, is the ten year history of actuarially determined contributions required under paragraph 32(c). As we do not have access to the historical information, we could not provide the table needed to meet this requirement. It is our understanding that Buck has supplied this table independent of their GASB reports. We would suggest also adding this information to the GASB reports.

3. REVIEW TASK 2 – REVIEW OF DEMOGRAPHIC AND ECONOMIC ACTUARIAL ASSUMPTIONS

This section provides our findings and recommendations for Review Task 2 – the review of demographic and economic actuarial assumptions for consistency, reasonableness and compatibility and the actuarial methods for compliance with generally accepted actuarial principles. In performing this task we reviewed the reports of the Actuarial Experience Studies for TSERS and LGERS covering the demographic experience for the five-year period ending December 31, 2009. In addition, we reviewed the economic experience discussion report dated July 2010 that encompassed both systems.

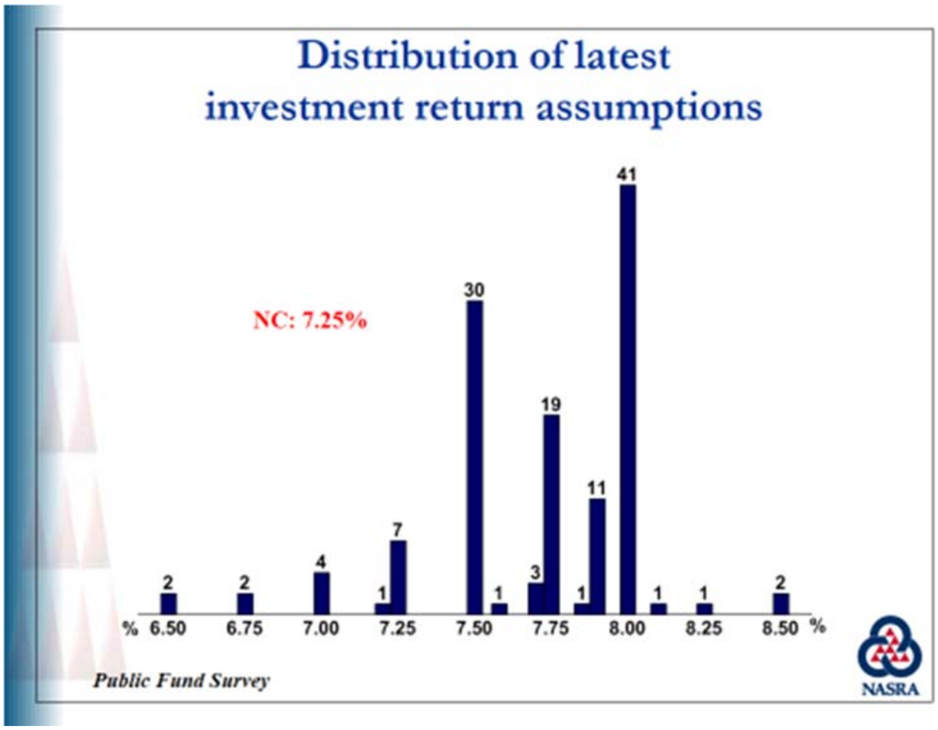
We reviewed all recommended assumptions and methods presented in the reports with particular attention paid to the most material assumptions to include the investment rate of return, salary increases, retirement rates, and post-retirement mortality assumptions.

We find the development of the economic and demographic assumptions contained in the reports of the experience study conforms with generally accepted actuarial principles and the Actuarial Standards of Practice (ASOPs) as currently maintained by the Actuarial Standards Board. However, we would have preferred that the reports provided a more detailed discussion of Buck's findings and analysis to support their recommendations. In a few instances we find that the reports indicate the recommendations more closely follow the experience when in fact they appear to do the opposite (e.g., TSERS General Employee reduced retirement rates). An in-depth analysis of the impact of any adjustments to the demographic assumptions is beyond the scope of this review, but in our opinion any changes that might be made are within a reasonable range and would not be expected to result in a material change in the valuation results used for the GASB calculations.

With regard to the economic assumptions, overall we find them to be within a reasonable range. The full set of capital market assumptions (CAPM) used to develop the range of expected real returns shown in the 2010 presentation were not available to us. However we did use a range of recent CAPM from a number of investment consultants, along with the asset allocation shown in the 2010 presentation, to develop expected median long term real rates of return. The spread of those results was 3.34% - 4.87%. The 4.25% currently in use by Buck falls comfortably within that range.

With regard to the inflation assumption, the 3.00% annual increase used in the valuation is again within the current reasonable range utilized by actuaries in performing such work. As an example, the most recent Social Security trustees report utilizes a range of 1.8% - 3.8% for their analysis of the long term solvency of that program.

Combining the real rate of return and the inflation assumption produces a nominal return assumption of 7.25%. Again it is our opinion that this result is within a reasonable range. As support for that comment, the table below provides the latest assumptions reported in the Public Fund Survey compiled by the National Association of State Retirement Administrators for a wide range of large public retirement plans.



As is likely going to be the case since experience investigations tend to be conducted every four to five years, we would recommend that all the assumptions be reviewed again to determine if there are any changes that should be considered, particularly in light of updates to both the CAPM and the asset allocation for the funds.

We also find in the course of reviewing detailed individual test lives that the assumptions are accurately implemented in the calculations we reviewed.

Actuarial Cost Method

The actuarial funding method used by TSERS is the traditional Entry Age Normal actuarial cost method which is the most widely used cost method among large public plans. Buck's implementation of the funding method determines the normal cost as a level percent of salary that, if contributed over the expected career of the members, would satisfy the expected present value of benefits at their expected retirement age.

The selection of an actuarial cost method should be linked to long term financing objectives of the system. In our opinion, the use of the Entry Age Normal cost method (as a level percentage of salary) is the best fit for the financial objectives of TSERS, specifically the stability of contribution rates as a percentage of salary and the promotion of intergenerational equity for taxpayers.

The actuarial funding method used by LGERS is the traditional Entry Age Normal – Frozen Initial Liability (FIL) actuarial cost method. Buck's implementation of the funding method determines the normal cost as a level percent of salary that, if contributed over the expected career of the members, would satisfy the expected present value of benefits less the accrued liabilities of participating employers. Given the fact that LGERS is a system comprised of many local government entities, and that a separate accrued liability is determined for each entity when that entity joins LGERS, in our opinion the use of the FIL method is the best fit for the financial objectives of LGERS. It must be noted that, for GASB 67 purposes, the Entry Age Normal method must be utilized in developing the TPL, and Buck follows this requirement.

Actuarial Asset Valuation Method

A primary objective of each Retirement System is to have contributions which will remain approximately level as a percent of active member payroll from year to year. Significant market value of asset fluctuations make this difficult to achieve. Thus most actuaries recommend the utilization of an asset valuation method which smooths out these fluctuations to enhance the year to year stability of required contributions. This is a question of balancing fit (measured against market value) and smoothness of results.

Desirable characteristics of an actuarial asset valuation method include the following:

- The method should be simple to operate. It should be readily calculable from financial statements.

- The actuarial value of assets should be reasonably related to the market value.

- The method should be effective in smoothing the effect of typical market fluctuations.

The asset valuation method utilized by Buck is also commonly used by other large public employee retirement systems, with a slight exception. Under the method utilized by Buck, the difference between the actual return and the expected return based on the actuarial asset value is determined each year. Twenty percent of this difference is recognized in the actuarial value of assets each year. Whereas the more common approach is to recognize the 20% differential over a fixed five year period, Buck does not utilize a fixed period. As a result the actuarial value of assets are constantly approaching, but never reaching market value. The method also utilizes a 20% corridor around the market value of assets that restricts the degree which the actuarial value can vary from market value. The selection of a corridor and the maximum percentage of difference from market value allowed should reflect the System's preference for balancing fit and smoothness. We note that a corridor with a larger percentage of allowable difference (or no corridor) would allow greater variance from market value but would be expected to provide a higher degree of smoothness and smoother asset values could be considered a better fit with certain financing objectives.

In addition, the method utilized is unbiased, meaning it is not expected to favor understating or overstating market value. We prefer the use of this method with a fixed period for recognizing gains and losses, but the method in use meets actuarial standards. The specific selection for a smoothing period, if any, should be based on the System's preference of smoothness of results as compared to variance from market value of assets and within reasonable limits. Further, the method as implemented is in conformance with ASOP No. 44 "Selection and Use of Asset Valuation Methods for Pension Valuations."

In our opinion, the Buck actuarial asset valuation method is reasonable for use by TSERS and LGERS.

4. REVIEW TASK 3 – EVALUATION OF THE DATA PROCEDURES AND TEST CASE RESULTS

In this section we provide our findings and recommendations pertaining to the evaluation of the data procedures and test case results.

Review of Data

We received the participant and financial data as transmitted by the Retirement Systems to Buck for the plan year ended December 31, 2013. Buck also supplied us with active, inactive, terminated vested, retired and beneficiary data for the reviewed employee groups as of December 31, 2013 to review the data processes and procedures they used to prepare the System's data for the valuation.

The data provided by the Systems appears to be clean and complete with a few exceptions. We reviewed the procedures used by Buck to determine the final participant data included in the valuations and agree they are reasonable. We applied these procedures independently and produced results with only slight differences. These differences are immaterial and would have no measurable impact on the valuation results.

Although there are a few instances of missing or invalid data, we believe the procedures and assumptions disclosed by Buck regarding missing information are appropriate. It is our opinion that the minor difference between the data preparation of Buck and our process would not result in material differences in the valuation results of the Systems audited.

Accuracy of Calculations

The review of the accuracy of the actuarial calculations and the inclusion of all appropriate benefits was based upon a review of a sample set of individual members called test lives. The sample set of 44 test lives (22 for each system) was carefully selected from the complete data to ensure the review of all significant calculations and to confirm that all benefits are appropriately valued. The table below provides a summary of the selection of test lives.

Summary of Requested Test Lives

	Records Requested	
System	**Active**	**Retired**
TSERS	13	9
LGERS	13	9

4. REVIEW TASK 3 – EVALUATION OF THE DATA PROCEDURES AND TEST CASE RESULTS

We utilized our actuarial software to independently produce the present value of benefits, the actuarial accrued liability and the present value of future salaries for each test life to assist with our assessment of the results of the test lives Buck provided. We should note that we expect to find non-material differences reflecting the utilization of different software, differences in rounding, and differences in programming routines.

Based on our reconciliation of the calculations in the sample test lives with Buck, we are confident that the individual calculations performed by Buck are technically sound and any differences we identified would not materially impact the valuation results. Therefore, based on our review of the test lives, in our opinion, Buck's results of the detailed calculations provided in the sample set of test lives are reasonable, accurate calculations and include all appropriate benefits.

Overall, the valuation processes and procedures used by Buck are technically sound and produce reasonable results. Based upon our analysis of test cases, we infer that the development of the normal costs and liabilities for the audited Systems is also reasonable. We have reviewed and agree with the development of the System's assets at both market value and actuarial value.

The only recommendation we have deals with those members who had the opportunity to retire under Option 5-2. This option was only available to those who retired prior to July 1, 1993. Buck was valuing these members as though they had elected option 6-2 which includes a pop-up feature. In discussing the issue with Buck they noted the difference also applied to Option 5-3, again available only to those retiring prior to July 1, 1993. Buck will correct the form of benefit receipt in future valuations. Buck has determined that the change will result in less than a 0.01% change in liability for both TSERS and LGERS. We both agree this is immaterial.

5. CONCLUSION

As stated in the contractual agreement, “It is the intent of the Office of the State Auditor to have a qualified actuarial consulting firm (Contractor) provide an independent review of the actuarial results provided to the Department of State Treasurer for the pension plans of the North Carolina Teachers’ and State Employees’ Retirement System and the North Carolina Local Governmental Employees’ Retirement System (the pension plans).” As the firm selected to conduct the review, OSA expects our opinion regarding the reasonableness of the assumptions, methodology, and actuarial reports. The sections contained in our report cover various aspects of the review but consistently find the work performed by Buck and reviewed in the scope of this work to be based on reasonable processes, to be technically sound, and to be fairly presented.

To reiterate, we have no findings of material discrepancies with generally accepted actuarial principles and professional standards and our recommendations are limited to suggesting minor improvements to the GASB 67 calculation process.