Agenda

ND Teachers' Fund for Retirement Board Meeting

Thursday, March 17, 2016
1:00 pm

Peace Garden Room
State Capitol, Bismarck, ND

1. Call to Order and Approval of Agenda - Pres. Gessner (Board Action) 5 min

2. Approval of Minutes January 21, 2016 Meeting – Pres. Gessner (Board Action) 5 min

3. Actuarial Audit Consultant Presentations – Fay Kopp (Information) 60 min each
   **Competitors will be sequestered during finalist presentations per NDCC 44.04.19.2 (6).*

   1:15 Gabriel, Roeder, Smith & Co – Ryan Falls, Joe Newton

   2:15 Cavanaugh Macdonald Consulting – Patrice Beckham, Brent Banister

BREAK

4. Actuarial Audit Consultant Selection - Fay Kopp (Board Action) 30 min

5. Eligible Salary Determination – Fay Kopp (Board Action) 30 min

6. TFFR Quarterly Investment Update – Dave Hunter (Information) 10 min

7. Audit Services Quarterly Update – Terra Miller Bowley (Information) 10 min

8. 2016-17 Board Calendar and Education Plan – Fay Kopp (Board Action) 10 min

9. Trustee Educational Conferences – Fay Kopp (Information) 5 min

10. Consent Agenda – (Board Action) 5 min
    Applications:
    QDRO (2)
    Disability (1)
    **Executive Session possible if Board discusses confidential information under NDCC 15-39.1-30.

11. Other Business
    Next Board Meeting: April 21, 2016

12. Adjournment

Any person who requires an auxiliary aid or service should contact the Retirement and Investment Office at 701-328-9885 at least three (3) days before the scheduled meeting.

NORTH DAKOTA TEACHERS' FUND FOR RETIREMENT
MINUTES OF THE
JANUARY 21, 2016, BOARD MEETING

BOARD MEMBERS PRESENT: Mike Gessner, President
Kirsten Baesler, State Superintendent
Mike Burton, Trustee
Kim Franz, Trustee
Rob Lech, Trustee
Mel Olson, Trustee
Kelly Schmidt, State Treasurer

STAFF PRESENT: David Hunter, ED/CIO
Fay Kopp, Deputy ED/CRO
Terra Miller Bowley, Audit Services Supervisor
Darlene Roppel, Retirement Assistant
Darren Schulz, Deputy CIO
Shelly Schumacher, Retirement Program Manager

OTHERS PRESENT: Paul Erlendson, Callan Associates
Julia Moriarty, Callan Associates
Janilyn Murtha, Attorney General's Office
Nancy Peterson, NDU-Retired

CALL TO ORDER:
Mr. Mike Gessner, President of the Teachers' Fund for Retirement (TFFR) Board of Trustees, called the board meeting to order at 1:00 p.m. on Thursday, January 21, 2016, in the Peace Garden Room at the State Capitol in Bismarck, ND.

THE FOLLOWING MEMBERS WERE PRESENT REPRESENTING A QUORUM: MR. BURTON, MRS. FRANZ, MR. GESSNER, MR. LECH, MR. OLSON AND TREASURER SCHMIDT.(Supt. Baesler notified the TFFR board that she would be delayed due to another meeting, and requested to be excused.)

APPROVAL OF AGENDA:
The Board considered the meeting agenda.

MRS. FRANZ MOVED AND MR. LECH SECONDED TO APPROVE THE AGENDA AS PRESENTED.

AYES: TREASURER SCHMIDT, MR. BURTON, MR. LECH, MRS. FRANZ, MR. OLSON, AND PRESIDENT GESSNER
NAYS: NONE
MOTION CARRIED.
ABSENT: SUPT. BAESLER

MINUTES:
The board considered the minutes of the TFFR board meetings held October 22 and December 30, 2015.

MR. LECH MOVED AND MR. BURTON SECONDED TO APPROVE THE MINUTES OF THE TFFR BOARD MEETINGS HELD OCTOBER 22 AND DECEMBER 30, 2015.

AYES: MR. LECH, MR. OLSON, TREASURER SCHMIDT, MR. BURTON, MRS. FRANZ, AND PRESIDENT GESSNER
NAYS: NONE
MOTION CARRIED.
ABSENT: SUPT. BAESLER

QUARTERLY TFFR INVESTMENT UPDATE AND INVESTMENT BENCHMARKS EDUCATION:
Mr. Hunter provided the investment update for the quarter ended September 30, 2015. For the fiscal year ended September 30, 2015, TFFR generated a net investment return of -0.5% versus a policy benchmark of -1.2%. TFFR generated a net return of 7.8% for the 5-years ended September 30, 2015, which exceeded the policy benchmark by over 0.78%. During the last 5 years, asset allocation and active management generated approximately $635 million (90%) and $70 million (10%) of TFFR's overall investment income, respectively. Mr. Hunter also noted TFFR's investment returns have consistently ranked in the 1st or 2nd quartile of the Callan Database over the last 1, 3, and 5 year periods ended September 30, 2015. TFFR risk has declined from over 115% down to 105% on a rolling 3 and 5 year basis. Board discussion followed.

Mr. Hunter presented board education on investment benchmarks. Benchmarks serve as a proxy against which investment manager performance is compared to determine whether the strategy added value. He reviewed TFFR's overall plan investment benchmarks and explained how they are set. The Retirement and Investment Office (RIO), teaming with the State Investment Board (SIB) monitors the managers. If the benchmark isn't attained over a long period of time (at least three years), the manager may be put on a watch list for monitoring. Mr. Erlendson, Callan Associates, also provided information on benchmarks and money managers.

The estimated fiscal year to date (July 1, 2015-January 21, 2016) net return is down a little over 6%.

ASSET LIABILITY STUDY:
Ms. Moriarty and Mr. Erlendson, Callan Associates, presented the findings of the Asset Allocation and Liability Study. They evaluated the interaction of the three key policies (investment, funding, and benefits) that govern TFFR with the goal of establishing the best investment policy. The appropriate asset allocation should strike a balance between sustainable funded status volatility and minimization of costs over the long run.

Mr. Erlendson reviewed the factors (return objective, time horizon, liquidity needs, actuarial methodology, contribution risk, risk tolerance, liability growth, and funded status) that need to be considered in deciding which asset mix would be appropriate for TFFR. Mr. Erlendson explained the variations of Mix 3, 3A and 3B. After discussions between the RIO staff and Callan, Mix 3B is recommended

because it offers a practical and implementable solution. The asset classes that would be changed are: Domestic Fixed: 12% to 16%, High Yield: from 5% to 4%, Non-US Fixed: from 5% to 3%, Private Equity: from 5% to 6%, and Timberland from 5% to 3%.

The expected return for the proposed new policy mix 3B is about 7.1% with a standard deviation of 14.7%. Callan noted that while TFFR's expected return over the next 10 years may fall short of the 7.75% return assumption, there are mitigating factors that offset the projected 7.1% return. 1) Callan's public market return projections are based on passive implementation (i.e. index fund) and do not incorporate active management premiums. 2) Callan's 10-year projections are cyclically lower than TFFR's longer-term (i.e. greater than 10 years) expectations. 3) The actuary assumes 2.75% price inflation versus Callan's 2.25% assumption. The implication of Callan's lower inflation expectation is that the corresponding liability return is closer to 7.4% than 7.75%. 4) TFFR has a 46% probability of achieving a 7.75% return over the next 10 years.

Mr. Hunter and Mrs. Kopp reviewed the recommended TFFR investment policy changes: 1) Reduce the actuarial rate of return from 8.0% to 7.75% based on recent Experience Study changes. 2) Incorporate the asset class terminology and revised asset allocation (3B), policy targets, and rebalancing ranges based on the Asset Liability Study.

After discussion,

TREASURER SCHMIDT MOVED AND MR. LECH SECONDED TO APPROVE MIX 3B WITH IMPLEMENTATION WITHIN THE NEXT SIX MONTHS, AND TO MAKE NECESSARY CHANGES TO TFFR'S INVESTMENT POLICY STATEMENT AND SUBMIT TO THE SIB FOR APPROVAL AND IMPLEMENTATION.

AYES: TREASURER SCHMIDT, MRS. FRANZ, MR. OLSON, MR. BURTON, MR. LECH AND PRESIDENT GESSNER.
NAYS: NONE
MOTION CARRIED.
ABSENT: SUPT. BAESLER

The board recessed at 2:50 p.m. and reconvened at 3:05 p.m.

Supt. Baesler arrived at 3:00 p.m.

ACTUARIAL AUDIT RFP UPDATE:
Mrs. Kopp reviewed the status of the Actuarial Audit Request For Proposal. The RFP was issued on January 5, 2016, the deadline for questions was January 15, 2016, and the deadline for receipt of proposals is February 16, 2016. Mrs. Kopp, Mrs. Schumacher, and Mr. Hunter will review and rank all proposals that are submitted and choose the top two or three who will be asked to make presentations at the March 17, 2016, TFFR board meeting. The Board will make the final selection of the actuary to perform the actuarial audit.

IRS DETERMINATION LETTER UPDATE:
Mrs. Kopp updated the board on the progress of the Internal Revenue Service (IRS) determination letter application. Ms. Melanie Walker, benefits consultant with Segal Company, conducted an Internal Revenue Code (IRC) compliance review and drafted the application forms and necessary information to apply for the determination letter. Ms. Murtha, TFFR legal counsel with the Attorney General's Office, has completed her review of the forms and determination letter process. The IRS application forms and $2,500 fee will be submitted to the IRS on January 25, 2016. It could take 1-2 years before the determination is received.

ADMINISTRATIVE RULES UPDATE:
Mrs. Kopp reported the public hearing to solicit comments for the proposed amendments, additions and deletions to Title 82 of the ND Administrative Code was held November 19, 2015. There were no members of the public in attendance. It was noted at the public hearing that two typographical errors appeared, so the rules were updated to reflect consideration and incorporation of those comments. On January 12, 2016, the Attorney General's Office approved the rules as to their legality.

MR. OLSON MOVED AND MRS. FRANZ SECONDED TO ADOPT THE PROPOSED ADMINISTRATIVE RULES AND AUTHORIZE STAFF TO SUBMIT TO LEGISLATIVE COUNCIL FOR FINAL PROMULGATION.

AYES: MRS. FRANZ, MR. BURTON, MR. LECH, SUPT. BAESLER, MR. OLSON, TREASURER SCHMIDT, AND PRESIDENT GESSNER.
NAYS: NONE
MOTION CARRIED.

The rules will be submitted by February 1, 2016, to the Legislative Council and will go into effect April 1, 2016.

2015 GASB 68 REPORT:
Mrs. Schumacher provided an overview of the GASB 67 and 68 Report developed by TFFR's actuary, Segal Company, and audited by the plan's auditor, CliftonLarsonAllen. The net pension liability increased from about $1 billion to $1.3 billion primarily due to the assumption changes that were implemented to lower the investment return assumption and to reflect mortality improvements. A disclosure template containing most of the information school districts will need to put in their financial disclosure notes will be provided to them.

TREASURER SCHMIDT MOVED AND MR. OLSON SECONDED TO ACCEPT THE JUNE 30, 2015, GASB 68 REPORT.

AYES: MR. OLSON, MR. LECH, SUPT. BAESLER, MRS. FRANZ, TREASURER SCHMIDT, MR. BURTON AND PRESIDENT GESSNER.
NAYS: NONE
MOTION CARRIED.

The report will be posted to the TFFR website for use in the June 30, 2016, employer financial statements.

There was discussion regarding additional ways to communicate information to employers, school boards, members, and the general public that would help them better understand different aspects of TFFR.

2017 LEGISLATIVE PLANNING:
Mrs. Kopp reviewed the timeline and planning process for the 2017 Legislative session. The deadline to submit bill drafts to the interim legislative committee is April 1, 2016. Mrs. Kopp highlighted 2015 actuarial valuation results and funding projections. The Board discussed whether additional contribution, benefit, retiree benefit increase, or other plan changes should be made. Mrs. Kopp indicated that she recently met with various active and retired member interest group representatives, and there were no TFFR related issues presented which would require legislative changes. After discussion, the board concurred that no legislative changes to TFFR statutes are necessary at this time, so no bill drafts will be submitted to the Legislative Employee Benefits Programs Committee for study during the 2016 interim.

ELIGIBLE SALARY DISCUSSION:
Mrs. Kopp reviewed an issue that has come up as a result of a number of internal audits and reviews of Career and Technology Education (CTE) Centers. It involves certain payments that have been made to various licensed employees for equipment maintenance and repair duties. Mrs. Kopp and Mrs. Schumacher will meet with a small working group of CTE directors on January 22, 2016, in Valley City. This is in the information gathering stage at this time and will be brought to the March 17, 2016, meeting for board action.

ANNUAL TFFR ENDS AND STATISTICS REPORT:
Mrs. Schumacher presented the annual retirement ends and statistics report for the year ended June 30, 2015. She provided information on members and employers, cyber-attack in 2014-15, collections and payments, member and employer participation in outreach programs, service purchases, tier membership, service retirement, disability retirements, re-employed retirees and employer payment plan models. She noted the Pre-retirement Seminars will now be called Retirement Education Workshops and will also be marketed to younger teachers. This year group counseling sessions were held in three locations and were very well received. They replaced individual sessions and were able to involve 30-40 members rather than just 10-12 members at each site. After discussion,

MR. BURTON MOVED AND MR. LECH SECONDED TO ACCEPT THE ANNUAL TFFR RETIREMENT ENDS AND STATISTICS REPORT.

AYES: MR. BURTON, MRS. FRANZ, MR. OLSON, TREASURER SCHMIDT, MR. LECH, SUPT. BAESLER AND PRESIDENT GESSNER.
NAYS: NONE

MOTION CARRIED.

ANNUAL RETIREMENT TRENDS REPORT:

Mrs. Schumacher presented the annual retirement trends and projections report. Of the 10,870 active members, 1,152 members are currently eligible to retire. On average, 390 teachers actually retired each year for a total of over 3,900 for the 2006-2015 10 year period. After discussion,

MRS. FRANZ MOVED AND MR. OLSON SECONDED TO ACCEPT THE ANNUAL RETIREMENT TRENDS REPORT.

AYES: MRS. FRANZ, MR. LECH, TREASURER SCHMIDT, SUPT. BAESLER, MR. BURTON, MR. OLSON AND PRESIDENT GESSNER.
NAYS: NONE
MOTION CARRIED.

QUARTERLY AUDIT SERVICES UPDATE:
Ms. Miller-Bowley presented the quarterly audit activities report for July 1, 2015 – September 30, 2015. As of today, 15 employer audits have been completed. Eight audits are currently in progress. All employers remaining in the third audit cycle currently have an audit underway. The third audit cycle will conclude once the eight audits are completed. The TFFR file maintenance audit, benefits payments audit, SIB satisfaction survey, and GASB 68 audits were also completed.

2015 CAFR AND PPCC AWARDS:
Mrs. Kopp reported that the Government Finance Officers Association (GFOA) has awarded a Certificate of Achievement for Excellence in Financial Reporting to RIO for 17 years.

TFFR received the 2015 Public Pension Standards Award for Funding and Administration from the Public Pension Coordinating Council (PPCC).

CONSENT AGENDA:

TREASURER SCHMIDT MOVED AND MR. LECH SECONDED TO APPROVE THE CONSENT AGENDA WHICH CONSISTED OF DISABILITY APPLICATION # 2016-1D.

AYES: SUPT. BAESLER, MR. BURTON, MRS. FRANZ, MR. OLSON, TREASURER SCHMIDT, MR. LECH, AND PRESIDENT GESSNER.
NAYS: NONE
MOTION CARRIED.

OTHER BUSINESS:
Mrs. Kopp shared a new handout called "Fast Facts" which will be used to educate members, legislators, and the public about TFFR.

The next regular board meeting will be held March 17, 2016, in the Peace Garden Room at the State Capitol.

All presentations and reports from this meeting are on file at RIO.

ADJOURNMENT:
With no further business to come before the Board, President Gessner adjourned the meeting at 4:40 p.m.

Respectfully Submitted:

_____
Mr. Mike Gessner, President
Teachers' Fund for Retirement Board

_____
Darlene Roppel
Reporting Secretary

Actuarial Audit Services for the North Dakota Teachers' Fund for Retirement

March 17, 2016

Ryan Falls, FSA, EA, MAAA
Joe Newton, FSA, EA, MAAA

GRS
Gabriel Roeder Smith & Company
Consultants & Actuaries
www.gabrielroeder.com

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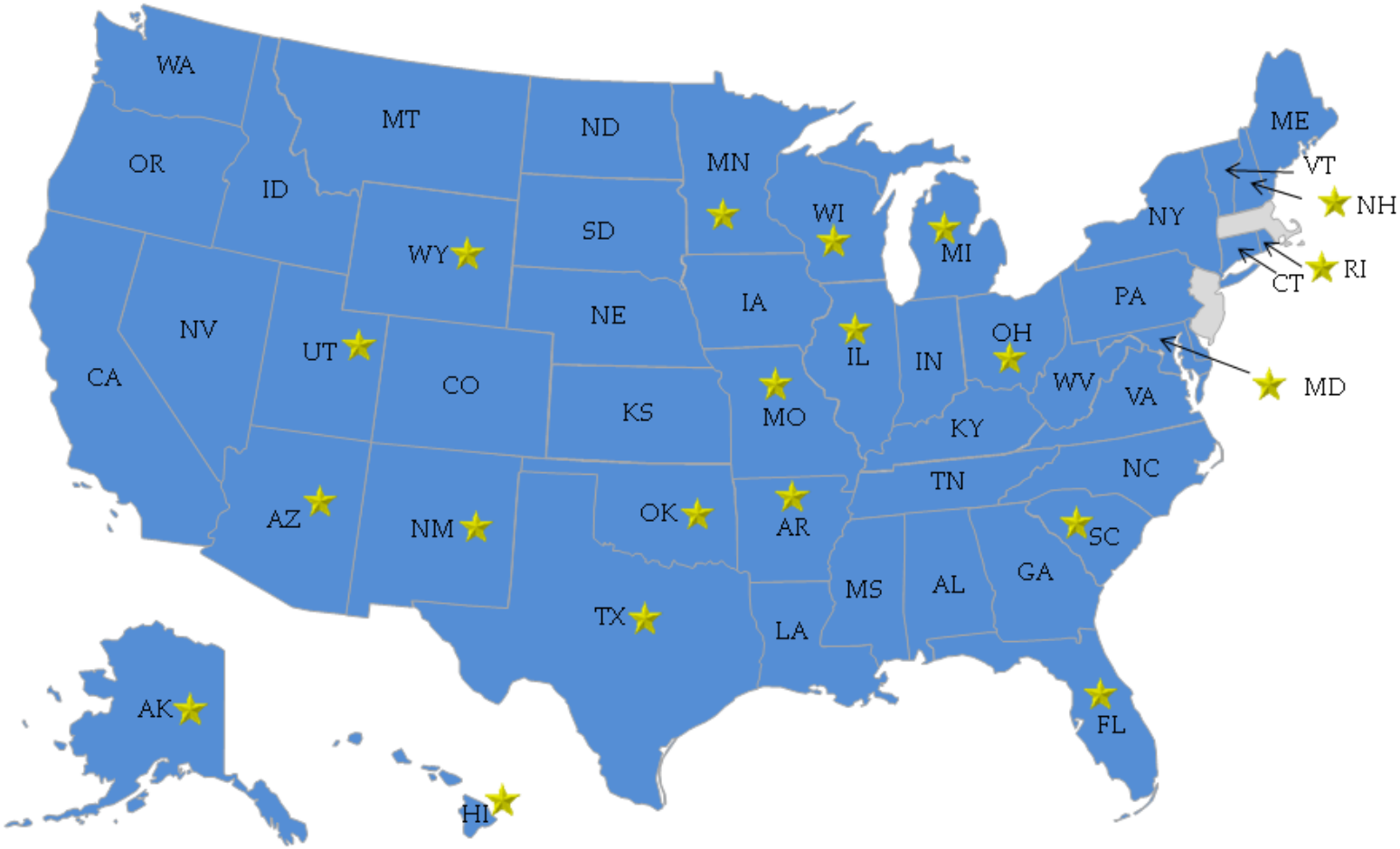
Our Strengths, Your Benefits

- Depth of Experience
  - Experienced and forward looking consulting team
  - Research and data supported approach to developing client solutions
  - Your Lead Actuaries work with statewide retirement systems across the country, including six covering Teachers
- Approach to Work
  - Understand the importance of paying attention to the big picture of the system as well as the calculation details
  - Team approach with a cohesive consulting
- Communication
  - Emphasize *education*, not just *information*
  - Will bring accountability and transparency to the actuarial process

An Innovative and National Perspective for Your Retirement System

GRS

A Firm with a National Perspective



States where GRS currently provides retained consulting services to statewide systems

States where GRS has provided actuarial and benefits consulting services

GRS

A Firm with a National Perspective

- Provide actuarial and consulting services to 35 statewide retirement systems
  - 13 statewide teacher retirement systems
    - Texas, Arkansas, Oklahoma, New Mexico, Michigan, Hawaii, Rhode Island, South Carolina, Wyoming, Utah, Wisconsin
- Performed 10 actuarial audits for statewide retirement systems over the last five years
- Because we are the nation's largest provider of actuarial services to the public sector, we are often also the actuary being audited
  - Consulting team familiar with the auditing process and understands what is required to perform a thorough review

Experienced Consulting Team

- Lead Actuaries provide actuarial and consulting services to 10 statewide retirement systems
  - Includes 6 statewide teacher retirement systems
- Ryan has performed 11 actuarial audits for over the last five years, including
  - Montana Teachers' Retirement System
  - Arizona State Retirement System
  - Virginia Retirement Systems
- Audited Segal on two separate occasions

GRS

The Co-Lead Approach to Actuarial Services

- We have had tremendous success with, and believe our clients have received added value from, a co-lead approach to the client service team
- Allows for a stronger position to provide proactive, responsive service
- Allows for our consultants to have a broader experience while keeping an appropriate client base
- Allows for more flexibility around presentations, meetings, and other needs
- Allows for stronger relationships

Understanding of Project

- Full scope actuarial audit
  - Full replication of valuation results
    - Funding valuation and GASB disclosures
    - Includes review of data used
  - Evaluation of actuarial assumptions and methods
  - Assess reasonableness of funding projections
  - Confirm actuary's reports are accurate and comprehensive
- Timeline
  - Kickoff April 1
  - Periodic status calls with staff
  - Draft report by June 23
  - Final report by July 12
  - Presentation of results on July 21

GRS

Approach to Project

- Our intent is to identify and suggest improvements to the process and procedures utilized by NDTFFR's retained actuary
- Focus our attention on
  - Accuracy of the calculations
  - Completeness and reliability of reporting, and
  - Compliance with the Actuarial Standards of Practice
- Should not focus on finding differences in actuarial processes and procedures utilized by different actuaries
  - Limit our discussions regarding opinion differences

Approach to Project

- Reasonable vs. Correct vs. Material
- Because the valuations deal with events occurring in the future, reasonableness is often tested more than correctness
  - Reasonableness is based on Actuarial Standards and generally accepted methods
  - Unreasonable implies incorrect; reasonable does not necessarily imply correct
- Incorrect could be something that was done that was not intended (such as the use of the old assumptions)
  - Incorrect does not necessarily imply unreasonable and does not imply materiality
  - Typically, findings of issues that need to be corrected are generally those issues where the retained actuary did something that they did not intend
- Materiality will be tested by way of establishing tolerances

GRS

Approach to Project

- GRS Tolerances for Valuation Results

Category	Individual Tolerance	Aggregate Tolerance
Present Value of Benefits by Category	2.0%	0.5% of Total Present Value of Benefits
Accrued Liability by Category	5.0%	5.0% of Total Accrued Liability
Normal Cost	5.0%	n/a
Computed Contribution	5.0%	5.0% of Total Contribution

An item passes the Tolerance test if it passes either the Individual test or the Aggregate test.

For purposes of an actuarial audit, the auditing actuary does not necessarily need to have the same level of precision as the (retained) Actuary.

GRS

Approach to Project

- Sample actuarial audit client

	Retained Actuary		Gabriel, Roeder, Smith & Company		Tolerance Test	
	Liabilities	**Count**	**Liabilities**	**Count**	**Individual**	**Total**
1. Present Value of Benefits						
a. Actives	45,208	187,114	44,417	187,114	-1.75%	-0.95%
b. Inactives	845	16,353	864	16,353	2.22%	0.02%
c. Terminated Vested	625	8,880	638	8,880	2.02%	0.02%
d. Retirees	35,013	137,987	34,809	137,987	-0.58%	-0.25%
e. Loads	239		239		0.00%	0.00%
f. VSF	1,022		1,022		0.00%	0.00%
g. Total	82,953	350,334	81,989	350,334	-1.16%	-1.16%
2. Present Value of Future Salary	115,207		115,069		-0.12%	-0.12%
3. PV of Future Employee Contribution	2,826		2,824		-0.08%	-0.08%

GRS

Education, not just Information

- The Board and the staff are the decision makers, GRS is the advisor
- GRS' communications will focus much more on strategic initiatives and enhancing the Board and staff's level of understanding on important issues, and much less on a myriad of numbers
- Will look at results in three dimensions (value, time, and risk)
- Typical Actuarial Communication:
  - Unfunded Liability
  - Funded Ratio
  - Cost
  - Counts, Data, Etc
- With emphasis on education and understanding:
  - Graphical illustrations of major concepts
  - How we got here?
  - Where are we going?
  - What could go wrong?
  - Strategic consulting
- GRS will ensure that the Board and staff understand "Why" recommendations are made

GRS

GRS – *What Differentiates Us?*

- Exceptional Communication
  - Emphasizing education and accountability
- Thorough and client-specific solutions
- We are the only firm in the industry whose valuation software and tools are specifically designed for public sector plans
- Experienced Consulting Team
  - Focused on large public retirement systems
- Collaboration and Unity
  - Your consulting team is based in the same office and regularly work together

We will be a valued advisor to the North Dakota Teachers' Fund for Retirement

GRS

Thank you

We would be delighted to bring our resources and experiences to the actuarial audit for the North Dakota Teachers' Fund for Retirement.

GRS

GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

STATE OF NORTH DAKOTA
ND TEACHERS'FUND FOR RETIREMENT
ND RETIREMENT AND INVESTMENT OFFICE
REQUEST FOR PROPOSAL – ACTUARIAL AUDIT SERVICES
RFP NUMBER: 190-16-01
DATE DUE: FEBRUARY 16, 2016 – 2:00 P.M. CST

Gabriel, Roeder, Smith & Company ♦ 5605 North MacArthur Blvd. Suite 870♦ Irving, TX 75038
Contact: R. Ryan Falls, Senior Consultant
Phone Number: 469-524-1802 ♦ Fax: 469-524-0003♦E-mail: ryan.falls@gabrielroeder.com

TABLE OF CONTENTS

Table of Contents

		PAGE #
	TRANSMITTAL LETTER	
TECHNICAL PROPOSAL		
SECTION A	INTRODUCTION	2
SECTION B	UNDERSTANDING OF THE PROJECT	5
SECTION C	METHODOLOGY USED FOR THE PROJECT	12
SECTION D	MANAGEMENT PLAN FOR THE PROJECT	18
SECTION E	EXPERIENCE AND QUALIFICATIONS	23
COST PROPOSAL	COST PROPOSAL (UNDER A SEPARATE COVER)	
APPENDIX A	TEAM BIOS	
APPENDIX B	REGISTRATION TO DO BUSINESS	
APPENDIX C	GRS TECHNOLOGY TOOLS	
APPENDIX D	SAMPLE REPORT	
APPENDIX E	LETTER OF REFERENCE	

TRANSMITTAL LETTER

GRS
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5605 N. MacArthur Blvd.
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www.gabrielroeder.com

February 12, 2016

Ms. Fay Kopp
Chief Retirement Officer
Deputy Executive Director
ND Teachers' Fund for Retirement – ND Retirement and Investment Office
1930 Burnt Boat Drive, P.O. Box 7100
Bismarck, ND 58507-7100

Re: Request for Proposal: Actuarial Audit Services
RFP Number: 190-16-01

Dear Ms. Kopp:

Gabriel, Roeder, Smith & Company ("GRS") is pleased to have the opportunity to submit a proposal for Actuarial Audit Services for the ND Retirement and Investment Office (NDRIO), on behalf of the ND Teachers' Fund for Retirement (NDTFFR). The attached proposal sets forth our understanding of the work to be performed and the qualifications and capabilities of the consultants and resources of GRS.

GRS offers NDTFFR an actuarial and benefits consulting firm that specializes in public sector retirement systems, has a nationally recognized reputation, and a clear understanding of the national and state political and legislative environments. GRS has been specializing in providing services to public sector clients for over 75 years.

GRS is the leading provider of actuarial and consulting services to the public sector community in the country. We serve more than 1,000 public sector retirement systems and healthcare programs in 42 states, including 38 statewide public pension retirement systems, 24 of which have 50,000 or more members. The location of our clients ranges from Rhode Island to Hawaii and from Minnesota to Texas.

Our proposed actuarial audit team will be led by Ryan Falls, FSA, EA, MAAA. Ryan is located in our Dallas Office and meets all of the professional requirements. Ryan's contact information is as follows:

Ryan Falls, Senior Consultant
Gabriel, Roeder, Smith & Company
5605 N. MacArthur Blvd, Suite 870
Irving, Texas 75038-2631
469-524-1802 (office direct line)
214-289-7869 (mobile)
ryan.falls@gabrielroeder.com

GRS has completed similar assignments for other systems. In some cases our work directly impacted the system's financial soundness and resulted in modifications for an improved work product. We, like you, want to ensure that the actuarial conditions of the NDTFFR's retirement plans are measured as accurately as possible. We are confident that we will complete this assignment within an agreeable timeframe for NDTFFR and GRS.

GRS has an exceptional reputation for quality work and commitment to the public sector community. We also have a long-standing reputation for unbiased presentation of facts. Our role is to present impartial information and consulting advice so that governments and boards can make informed decisions.

Current Licenses

We are registered to do business in the State of North Dakota and maintain the necessary licenses/registrations to provide the services you have requested. Our System ID number is 24618600. Our business certification is enclosed in Appendix B of our proposal.

Federal tax ID No.

Our federal tax identification number is 38-1691268.

This proposal remains valid for a period of ninety (90) calendar days from the date of submission.

We would like to thank the NDTFFR for the invitation to bid on the actuarial audit services and look forward to creating a partnership that will be mutually beneficial and satisfying.

We hereby certify that Mark R. Randall, Chief Executive Officer, is authorized to bind the firm and has authority to answer questions regarding this proposal. His contact information has been provided below:

Mark R. Randall, Chief Executive Officer	(469) 524-1803 (Direct dial)
Gabriel, Roeder, Smith & Company	(469) 524-0003 (Fax)
5605 N. MacArthur Blvd, Suite 870	(214) 636-0756 (Mobile)
Irving, TX 75038	mark.randall@gabrielroeder.com (E-mail)

Ryan Falls, Senior Consultant, will be your single point of contact responsible and responsive to supporting all aspects of this engagement. If you have any questions or need additional information, please feel free to contact him at (469) 524-1802 (ryan.falls@gabrielroeder.com).

Respectfully submitted,

Mark R. Randall

Mark R. Randall, EA, FCA, MAAA
Chief Executive Officer
Gabriel, Roeder, Smith & Company

SECTION A

INTRODUCTION

INTRODUCTION

Proposals must include the complete name and address of offeror's firm and the name, mailing address, and telephone number of the person the State should contact regarding the proposal.

GRS Response

Dallas – Primary Location Responsible for Servicing NDTFFR
Ryan Falls, Senior Consultant
Gabriel, Roeder, Smith & Company
5605 N. MacArthur Blvd, Suite 870
Irving, Texas 75038-2631
469-524-1802 (office direct line)
214-289-7869 (mobile)
ryan.falls@gabrielroeder.com

Please contact Ryan if you have any questions or need any additional or clarifying information.

Detroit – Corporate Headquarters
One Towne Square, Suite 800
Southfield, Michigan 48076-3723
Phone: (248) 799-9000
Facsimile: (248) 799-9020

Proposals must confirm that the offeror will comply with all provisions in this RFP. The proposal must disclose any instances where the firm or any individuals working on the contract has a possible conflict of interest and, if so, the nature of that conflict (e.g. employed by the State of North Dakota).

GRS Response

We understand and will comply with all terms and conditions in the RFP.

GRS is providing written assurance that no conflict of interest currently exists between our relationship with the ND Teachers' Fund for Retirement's Board, management, staff or relationships with other clients. Also, we do not anticipate any conflicts of interest to emerge.

Proposals must be signed by a company officer empowered to bind the company. An offeror's failure to include these items in the proposals may cause the proposal to be determined to be non-responsive and the proposal may be rejected.

GRS Response

Authorization to Sign

Mark Randall is the Chief Executive Officer of GRS and is authorized to represent GRS in this proposal process and to legally bind the firm.

Mark R. Randall, Chief Executive Officer
Gabriel, Roeder, Smith & Company
5605 N. MacArthur Blvd, Suite 870
Irving, Texas 75038-2631
469-524-1803 (office direct line)
mark.randall@gabrielroeder.com

SECTION B

UNDERSTANDING OF THE PROJECT

UNDERSTANDING OF THE PROJECT

Offerors must provide comprehensive narrative statements that illustrate their understanding of the requirements of the project, deliverables, project schedule, and contract terms and conditions. Offerors must also identify any pertinent issues and potential problems related to the project.

GRS Response

Gabriel, Roeder, Smith & Company (GRS) is pleased to have the opportunity to submit a proposal to provide actuarial audit services to the North Dakota Teachers' Fund for Retirement (NDTFFR). An actuarial audit reveals whether procedures are technically sound and if plan objectives are being met. Equally important, these types of reviews create a sense of security among those concerned with the viability of the retirement system. Our proposal sets forth our understanding of the work to be performed and the overall qualifications and capabilities of the GRS actuarial and consulting team.

We believe there are three key areas that differentiate GRS from other consulting firms with regard to this project.

- **DEPTH OF EXPERIENCE –** We serve more public sector retirement systems than any other firm. We provide actuarial and consulting services to 35 statewide retirement systems and, as a firm, have performed 10 actuarial audits for statewide retirement systems over the last five years. Because we are the nation's largest provider of actuarial services to the public sector, we are often also the actuary being audited. As a result, NDTFFR will get a consulting team that is familiar with the auditing process and understands what is required to perform a thorough review.

- **APPROACH TO THE WORK –** We, like you, want to ensure that the actuarial condition of NDTFFR is being measured as accurately as possible. Over the years, we have performed audits for retirement systems that confirmed their current processes are accurate and sound. In other situations we have identified issues of concern and further investigation. We also understand the importance of paying attention to the big picture of the system as well as the calculation details.

- **COMMUNICATION –** From our experience performing audits as well as having our work audited, we understand that communication throughout the project is essential for success. Also, the dialog generated by the audit process usually has value in the sharing of ideas and experiences.

  Furthermore, we understand there are many stakeholders involved within NDTFFR. Constituents pay attention to the activities and decisions made within your organization. Therefore, you can be confident that our work will include clear explanations and

disclosures, in layperson terms. To the extent that terms common to the industry must be used, we provide concise explanations of these terms. To reinforce understanding of the results and the impact of policy options, our reports include graphic representations of the information, such as charts and tables. In presentations we use the same approach, and endeavor to explain technical concepts and to respond to questions in a clear and concise manner rather than presenting page after page of numbers.

The work plan below shows our proposed process and expected completion dates. The specific dates can be modified based on input from NDTFFR and their expectations of the actuarial audit. A description of each step in the process also follows.

PROPOSED PROJECT SCHEDULE

WORK PLAN FOR THE 2016 ACTUARIAL AUDIT OF ND TFFR

	TASK DESCRIPTION	RESPONSIBILITY			
		GRS	TFFR	Segal	DUE DATE
PROJECT PLANNING	**1 Project Planning with Client and Team**				
	a.) Implementation Conference with TFFR	X	X		04/01/2016
DATA	**2 Census Data, Financial Data, and Assumption Tables**				
	a.) Send information request to TFFR and Segal	X			04/01/2016
	b.) Kickoff conference to confirm data request and project understanding	X	X	X	04/04/2016
	c.) Provide GRS with the information requested of TFFR		X		04/15/2016
	d.) Provide GRS with the information requested of Segal			X	04/15/2016
	e.) Request test lives data	X			04/18/2016
	f.) Complete review of the valuation data files provided by TFFR	X			04/29/2016
ASSUMPTIONS AND METHODS	**3 Actuarial Assumptions and Methods**				
	a.) Complete review of the economic actuarial assumptions	X			05/06/2016
	b.) Complete review of the demographic actuarial assumptions	X			05/13/2016
	c.) Complete review of the actuarial valuation methods	X			05/20/2016
	c.) Complete review of the actuarial experience study	X			05/31/2016
	e.) Scheduled status call with GRS and TFFR	X	X		05/31/2016
ACTUARIAL LIABILITIES	**4 Actuarial Liabilities**				
	a.) Begin coding of valuation system to replicate actuarial valuation	X			04/04/2016
	b.) Receive requested test lives data from Segal for comparison			X	05/02/2016
	c.) Complete replication of actuarial valuation results	X		X	05/16/2016
	d.) Review appropriateness of funding projections and GASB results	X		X	05/23/2016
ACTUARIAL VALUATION AND REPORT	**5 Valuation Report**				
	a.) Review Segal's actuarial valuation reports - Review for content, clarity, and accuracy - Compliance with relevant Actuarial Standards of Practice (ASOPs) - Reasonableness and completeness of results	X			05/30/2016
REPORT AND BRIEFINGS	**6 Communication of Findings**				
	a.) Draft report provided to TFFR	X			06/23/2016
	b.) Receive comments from TFFR and/or Segal		X	X	07/08/2016
	c.) Final report provided to TFFR	X			07/12/2016
	d.) Presentation to NDTFFR Board of Trustees	X			07/21/2016

The expected completion dates are contingent upon timely receipt of the data and information from NDTFFR and the retained actuary. We do not expect delays in receiving the data or having to invest significant resources converting the data into useable format for our systems.

PROPOSED DETAILED WORK PLAN

The following work plan provides a detailed discussion of the tasks we will undertake to complete the services requested by NDTFFR. The scheduled completion dates for the tasks that are described assume that the contract for this actuarial audit assignment is targeted to be awarded approximately on April 1, 2016. We have established a work plan assuming demographic data files will be provided to us during the week of April 11, 2016. The scheduled completion date may be adjusted accordingly based upon when the assignment is actually awarded and when we receive the data files.

(1) Implementation Conference with NDTFFR

The kick-off discussion will provide an opportunity for introductions and an exploration of potential issues. Prior to the meeting, GRS will provide a draft request for data and information that will be needed in order to complete the actuarial audit. GRS will expect to receive the following in hard copy or electronic copy (or web links to electronic copies online):

The following items would normally be provided by NDTFFR:

- Original member data provided to retained actuary for actuarial valuations;
- Actuarial valuation reports;
- Most recent actuarial experience study reports;
- Most recent actuarial audit reports (if applicable);
- Current investment policy statements;
- Plan documents and/or applicable statutes;
- Member handbooks, if available; and
- Funding projections to be reviewed

The following items would normally be provided by the retained actuary:

- Final member data used to prepare the most recent actuarial valuations;
- Description of data elements provided on file;
- Description of adjustments made to the valuation data files as part of the annual valuation;
- Detail of liability calculation for selected test cases;
- Description of all assumptions that are not completely provided in the valuation report; and
- Description of methodology for actuarial factors.

Scheduled completion date: Week of April 4, 2016 for the kickoff discussion

(2) Review of Data

The actuarial analysts will load the data into our systems and review it using our internal processing procedures to validate the membership statistics in the retained actuary's most recent actuarial valuation report. We will also review the data for appropriateness, completeness, and any possible data anomalies. Our tools and processes are used for cases with less than 100 lives to cases with more than one million lives. We will not have a problem handling the size of the data files we receive.

Scheduled completion date: We expect to complete processing the data files by April 29, 2016.

(3) Assess Appropriateness of Assumptions and Methods

While the retained actuary is gathering the requested information, GRS and the Lead Actuaries will begin reviewing the plan documents and member handbooks to become fully acquainted with the plan provisions of the pension funds. Upon GRS' complete understanding, we will then review the most recent actuarial valuations and experience studies to ascertain our opinion on the following items:

- Appropriateness of the actuarial cost method used to calculate the normal cost and actuarial accrued liability;
- Appropriateness of the method used to develop the actuarial value of assets;
- Appropriateness of the assumptions used in the actuarial valuation;

Scheduled completion date: We expect to complete our assessment of the assumptions and methodology by May 31, 2016.

(4) Review Actuarial Liabilities and Funding Projections

For this purpose, we plan to review individual member liabilities calculated for the most recent actuarial valuations by the retained actuary. The Support Actuary will work with our actuarial valuation systems to calculate the liability for the selected participants and compare the results with the test cases information provided by retained actuary. Additionally, we will replicate the liability for the retirement plans as a whole. Where discrepancies appear, we will discuss the differences with the retained actuary on an as needed basis. This is the process where we quantify and qualify any differences.

Once we successfully replicate the liabilities from the actuarial valuation, we will be able to review the appropriateness of the funding projections provided to NDTFFR by the retained actuary. Appendix C includes a discussion of the projection tools that will be used to replicate the cost savings projections.

In this step, we will also review and evaluate the work performed by the retained actuary related to compliance with GASB Statements 67 and 68.

Scheduled completion date: May 23, 2016

(5) Valuation Report

We will comment on the format and content of the most recent actuarial valuation reports:

- Completeness of the valuation report and any additional items which the reviewing actuary believes should be included in future valuation reports; items which could be omitted from future reports;
- Whether the valuation meets all statutory requirements, the requirements of the Actuarial Standards Board Standards of Practice;
- Whether the signors are qualified to issue a statement of actuarial opinion as outlined by the American Academy of Actuaries;
- Whether the benefits modeled in the valuation reasonably represent the benefits actually being paid and are the benefits modeled in the valuation reasonably complete; and
- Whether the results of the valuation reasonable and complete.

We will make suggestions for changes to the report format for the purpose of better communication with both the lay reader and the trained actuary.

Scheduled completion date: May 30, 2016

(6) Communication of Our Findings

During this step, the Lead Actuaries will discuss its findings with NDTFFR and, if necessary, the retained actuary. Discussions will focus on those areas where GRS identifies concerns.

At the end of this phase, GRS will submit a draft report with recommendations and analysis. Recommendations will relate to all areas of operation, such as:

- Analysis of the contribution amounts, accrued liabilities, actuarial value of assets, reserving and contribution rate stabilization methods, etc.
- Economic assumptions (investment return, inflation, salary growth, etc.)
- Major decrement assumptions (mortality, retirement, turnover, etc.)
- Minor assumptions (marital percent, service purchases, AFC spiking, etc.)
- Report format and completeness

We propose to complete this process in the following communication stages:

- Prior to releasing a draft report, discuss any important issues with the NDTFFR and the retained actuary. This provides opportunity to avoid issues where there is merely a miscommunication.
- Provide a draft report to the NDTFFR and the retained actuary for comment.

- Take into account feedback received and prepare a final report to be delivered to the NDTFFR.
- Present the results of the actuarial audit to the Board of Trustees.

As we have mentioned throughout this proposal, we believe that communication is an essential component to a successful engagement. As such, the work plan includes periodic, informal conference calls during the project to communicate our progress and discuss any interesting observations we encounter.

Scheduled completion date: Draft report will be provided to NDTFFR on June 23, 2016. The final report will be provided to NDTFFR after receiving comments on the draft report from NDTFFR and/or the retained actuary. The final report will be submitted to NDTFFR on July 12, 2016. Finally, the results of the actuarial audit will be presented to the NDTFFR Board of Trustees on July 21, 2016.

PERTINENT ISSUES AND POTENTIAL PROBLEMS

Conducting regular actuarial audits is an important part of a Board of Trustees' governance over a retirement system. In the best case scenario, the actuarial audit will provide the Board with confidence that the results they are receiving from their retained actuary are appropriate while also possibly providing areas for improvement in the future. More importantly, if the actuarial audit uncovers more significant issues, it is important for the Board to consider the most appropriate way to assess and communicate the health of the retirement system.

We applaud NCTFFR for electing to have a full-replication actuarial audit because a full replication of the actuarial valuation results is the best way to assess the current actuary's procedures. Actuarial audits that only look at a sample of liability calculations can miss material issues if the right calculations are not selected.

SECTION C

METHODOLOGY USED FOR THE PROJECT

METHODOLOGY USED FOR THE PROJECT

Offerors must provide comprehensive narrative statements that set out the methodology it intends to employ. Offerors must illustrate how the methodology will serve to accomplish the work and provide the deliverables described in the scope of work within the State's project schedule.

GRS Response

Because we are the nation's largest provider of actuarial services to the public sector, we are often also the actuary being audited. As a result, NDTFFR will get a consulting team that is familiar with the actuarial auditing process and understands what is required to perform a thorough review.

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 governing board. 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 member in the plan and results in a set of expected future benefit payments for that member. Discounting those future payments for the likelihood of survival 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).

We believe that an actuarial audit should not focus on finding differences in actuarial processes and procedures utilized by the consulting actuary and the auditing actuary. Rather, our intent is to identify and suggest improvements to the process and procedures utilized by NDTFFR's retained actuary. In performing this actuarial audit, we attempt to limit our discussions regarding opinion differences and focus our attention on the accuracy of the calculations of the liability and costs, completeness and reliability of reporting, and compliance with the Actuarial Standards of Practice that apply to the work performed by NDTFFR's retained actuary

The following sections will detail our approach to setting and assessing actuarial assumptions.

APPROACH TO DEMOGRAPHIC ACTUARIAL ASSUMPTIONS

GRS places a high level of importance on assisting clients in selecting actuarial assumptions that will best match future experience. Appropriate assumptions result in more accurate understanding of the plan's true liability and cost. In addition, we understand the importance of the actuarial standards created by our profession regarding assumption selection and follow them diligently. Given our large public sector client base and our extensive experience and our advanced software, we offer a special advantage in this area.

A periodic review and selection of the actuarial assumptions is one of many important components of understanding and managing the financial aspects of a pension system. Use of outdated or inappropriate assumptions can result in understated costs which will lead to higher future contribution requirements or perhaps an inability to pay benefits when due; or, on the other hand, produce overstated costs which place an unnecessarily large burden on the current generation of members, employers, and taxpayers.

A single set of assumptions is typically not expected to be suitable forever. As the actual experience of the retirement changes, the assumptions should be reviewed and adjusted accordingly.

It is important to recognize that the impact from various outcomes and the ability to adjust from experience deviating from the assumption are not symmetric. Due to compounding economic forces, legal limitations, and moral obligations outcomes from underestimating future liabilities are much more difficult to manage than outcomes of overestimates, and that asymmetric risk should be considered when the assumption set, investment policy and funding policy are created. As such, the assumption set used in the valuation process needs to represent the best estimate of the future experience of the System and be at least as likely, if not more than likely, to overestimate the future liabilities versus underestimate them.

Using this strategic mindset, each assumption will be analyzed compared to the actual experience of NDTFFR and general experience of other large public employee retirement systems. Changes in certain assumptions and methods will be suggested upon this comparison to remove any bias that may exist and to perhaps add in a slight margin for future adverse experience where appropriate. Next, the assumption set as a whole will be analyzed for consistency and to ensure that the projection of liabilities was reasonable and consistent with historical trends.

At the end of the actuarial audit, NDTFFR will see a difference in the thoroughness of the analysis and the amount of thought that your consulting team carries out when providing consulting services. As a result of recent analysis for an existing client, we made a number of structural changes we have recommended to other clients, which have included:

- A mortality assumption that includes an explicit assumption to anticipate future improvement in life expectancy.

- A termination assumption that is a function of the number of years remaining before becoming retirement eligible.
- A new assumption to model future behavior regarding the purchase of additional service to become immediately eligible for retirement.
- Modification to the structure of the retirement assumption to reflect a member's years of service or replacement income.

After performing the analysis, GRS will present our assessment of each significant assumption and the corresponding effect on the unfunded liability and contribution rate. It will then be the pension fund's decision makers that will have the ultimate say regarding the actuarial assumptions.

APPROACH TO ECONOMIC ACTUARIAL ASSUMPTIONS

As no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The economic assumptions are much more subjective in nature than the demographic assumptions. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Recognizing that there is not one right answer, the current standard calls for the actuary to develop a best estimate for each economic assumption. Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period. This last point will be emphasized in the report, especially in relation to the inflation assumption, which impacts all of the other economic assumptions.

It is critical for the actuary to present the Board and staff information in a complete and unbiased manner so the policymakers can make a fully informed decision. The selection of economic assumptions, such the system's investment return assumption is covered under Actuarial Standard of Practice No. 27. Economic assumptions are required by this standard to be within the best estimate based on the actuary's anticipation.

We view the investment return assumption as having three components: the assumed rate of (price) inflation, the real return and an offset for certain expected expenses. This "building block" approach is one explicitly permitted under ASOP 27.

For example, for price inflation, we focus our analysis on forward-looking estimates developed by professional economist, recognized investment firms, surveys, financial markets, and other various sources. Several sources used to develop a reasonable range for the price inflation assumption which include:

- Price inflation, as measured by annual increases in the Consumer Price Index (CPI), will be reviewed for various time periods to determine recent historical trends.
- We will review the market for US Treasury and Treasury Inflation Protection Bonds (TIPS) to gather additional information about future inflation expectations.
- Inflation and capital market assumptions published by at least six investment consulting firms will be summarized, including input from NDTFFR's investment consultants, if available.
- We will review relevant surveys, such as those conducted by the Philadelphia Fund Reserve to determine current trends and ranges.

The allocation of assets within the universe of investment options will significantly impact the overall performance. Therefore, it is meaningful to identify the range of expected returns based on the fund's targeted allocation of investments and an overall set of capital market assumptions. Since GRS does not provide investment consulting services, your consulting team will perform an analysis using plan's investment allocation and the capital market assumptions from our database of expected returns from other investment consulting firms. Instead of a single range, we feel this approach creates a range of ranges, or a more consistent and defendable range of probabilities as any single set of assumptions are dependent on the individuals personal view or methodology. The consulting team can also include the system's investment consultant (Callan, in the case of NDTFFR).

Below is one of the tables we often utilize when communicating the results of our analysis in our discussion material. In this particular example, we utilized the return expectations from eight different investment consulting firms to identify the distribution of expected returns over the next 20 years as well as the probability that the plan will exceed their current investment return assumption, which in this example is 7.75%.

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding 7.75% *
	25th	50th	75th	
(1)	(2)	(3)	(4)	(5)
1	5.27%	6.76%	8.28%	33.0%
2	5.42%	6.99%	8.58%	37.3%
3	5.75%	7.15%	8.56%	38.7%
4	5.85%	7.28%	8.74%	41.4%
5	4.74%	7.00%	9.30%	41.2%
6	5.95%	7.56%	9.19%	46.8%
7	5.67%	7.56%	9.49%	47.4%
8	7.90%	9.26%	10.63%	77.3%
Average	**5.82%**	**7.44%**	**9.10%**	**45.4%**

We believe an important step in reviewing the investment return assumption with a client is to have an engaging dialog with the Board, staff, actuary, and investment consultant early in the process. Communicating early provides opportunity for each party to provide input and feedback into the process as well buy-in to the methodology for assessing the assumption.

We also find the process is significantly more successful when the results of the analysis are provided several weeks in advance to the staff and Board. This provides the decision makers an opportunity to review and understand the information in advance, permitting them to focus their conversation on high-level strategic topics during the Board meeting.

GRS would most likely recommend a change in the actuarial investment return assumption during an experience study based on factors such as:

- a change in the pension fund's current (or anticipated) asset allocation strategy,
- a change in the pension fund decision makers' tolerance for risk (i.e., what percentage of annual returns fall above and below the assumed actuarial interest rate assumption), or
- a change in the future expectation of investment performance verified by multiple sources.

Finally, we believe the pension fund's decision makers have the ultimate say regarding this assumption.

Peer Review

GRS has a very strict quality control process for actuarial audits. It is our standard practice that one or more people prepare the initial analysis and others verify each value. The Supporting Actuary will review everything as part of the actuarial audit process to ensure that results not only look reasonable, but are correct.

The Lead Actuaries will review all work completed by the other team members as another check. The lead actuary will provide a final assessment of major results before they are communicated to you.

Finally, the Chief Actuary for GRS will provide a final review of the report to ensure that all of the conclusions of the actuarial audit are reasonable and appropriately communicated.

SECTION D

MANAGEMENT PLAN FOR THE PROJECT

MANAGEMENT PLAN FOR THE PROJECT

Offerors must provide comprehensive narrative statements that set out the management plan it intends to follow and illustrate how the plan will serve to accomplish the work and furnish the deliverables described in the scope of work within the State's project schedule. Offerors must provide a narrative or organizational chart that describes the organization of the project team. The organizational chart must illustrate the lines of authority, designate the individual responsible and accountable for the completion of each component and deliverable of the RFP, and indicate where the work will be performed

GRS Response

CO-LEAD APPROACH TO ACTUARIAL SERVICES

The Co-Lead Actuary approach assigns two senior actuaries to the account, with both actuaries sharing in all of the responsibilities typically held by a single lead consulting actuary. Ryan Falls will be the main day-to-day contact. However, this approach allows NDTFFR to have more direct senior contact and receive a more seasoned and proactive consulting experience. This allows our actuaries to have a broader client base, while keeping an appropriate client load, allows for more flexibility around meetings and presentations, as well as for stronger relationships. In addition, the transition plan, if one is ever needed, is already in place.

By having two senior consultants intimately involved, the likelihood of reaching someone in person is much greater, and likewise the response time of returning a call will decrease. The Board and the members it represents will see value from having the strengths of both actuaries available to NDTFFR.

The Supporting Actuary, Brad Stewart, brings a third credentialed actuary to the team and a distinct set of advantages to the relationship. Brad is one of the strongest technical Consultants at GRS when it comes to coding valuation systems, performing analysis, manipulating data, and managing projects on a deadline.

The paragraphs below provide a high-level summary of the qualifications and experience of key members of the proposed consulting team. *Please also refer to Appendix A for the biography for each client team member.*

GRS has proposed a consulting team that we believe is unmatched in depth and experience. Our testament to this statement is evident in the satisfaction from clients that the team currently provides services too. GRS will be providing services to NDTFFR primarily from its Dallas, TX office which provides services to retained actuarial consulting services to fourteen (14) statewide retirement systems that range from Hawaii to Rhode Island.

The broad and experienced GRS team is the key aspect of our ability to complete each element outlined in the Scope of Work. Each component of the team will initially be able to focus on different aspects of the project, maximizing resources, preventing any bottlenecks, and allowing for overlapping deadlines in the Work Plan.

- Our Actuarial Analysts will combine their experience processing data for with large retirement systems with our robust system resources in order to get started immediately on reviewing the census data.
- The Support Actuary will apply their deep understanding of actuarial methods and modeling to the replication of actuarial valuation results of NDTFFR.
- The Lead Actuaries will draw on their broad experience with large statewide retirement systems across the country to focus actuarial assumptions and methods, including the experience study used to develop the assumptions.

Co-Lead Actuaries

R. Ryan Falls, FSA, EA, MAAA, will serve in the role of Co-Lead Actuary and primary contact for the actuarial audit of your pension fund. **Ryan will be responsible and accountable for the completion of each component and deliverable outlined in the Scope of Work.** Ryan is a Senior Consultant and Actuary with almost 20 years of professional actuarial and benefits consulting experience with major public employee retirement systems and private sector employers. His background includes many large plan design studies involving the impact on the plan costs as well as the impact on employee retention, administrative concerns, and applicable stakeholders. Ryan is currently the lead actuary for the Employees' Retirement System of Texas, the Oklahoma Teachers Retirement System, and the New Mexico Educational Retirement Board. Additionally, Ryan is the support actuary for the City of Austin Employees Retirement System and the DFW International Airport retirement plans. Prior to joining GRS, he was also the lead actuary for the Oklahoma Police Pension and Retirement System and the Dallas Police & Fire Pension System. During his career, he has also worked with organizations including ExxonMobil Corporation, Shell Oil Company, INTEGRIS *Health*, American Fidelity, and the City of Dallas.

Over the past five years, Ryan has completed actuarial audits of nine governmental pension plans including actuarial audits for the Arizona State Retirement System, the Virginia Retirement Systems, the Teachers Retirement System of Montana, the City of Austin and the City of San Antonio.

Joe Newton, FSA, EA, MAAA will also serve in the role of Co-Lead Actuary and will lend his experience and national perspective to the team. Joe is a Senior Consultant and Actuary with almost 20 years of professional actuarial and consulting experience with statewide and municipal public retirement systems.

He is the Primary Actuary for the Teacher Retirement System of Texas, the Colorado Fire and Police Pension Association, the South Carolina Employees' Retirement System, the Employees'

Retirement System of Rhode Island, and the Employees' Retirement System of Hawaii. Joe is also the Pension Team Leader for the Southwest Region of GRS.

Support Actuary

Working closely with Ryan and Joe will be the Support Actuary **Brad Stewart**, **ASA, EA, MAAA**. Brad will manage the actuarial audit for timeliness and thoroughness, and coordinate efforts within your GRS team. Brad has more than 10 years of actuarial and benefits consulting experience with major public employee retirement systems and private sector employers. His background includes many large plan design studies involving the impact on the plan costs as well as the impact on employee retention, administrative concerns, and applicable stakeholders. He is currently the secondary actuary for the Oklahoma Teachers' Retirement System and the Employees' Retirement System of Rhode Island.

Analyst Team

Thomas Lyle is a Senior Analyst in the Denver, CO office of GRS. Thomas will lead the team of GRS Analysts and be responsible for processing and reviewing the data provided as part of the actuarial audit and perform an initial review of the valuation details received from NDTFFR's current retained actuary.

Thomas is an actuarial "convert" from the Civil Engineering field. He has shown great aptitude and intuition for actuarial work. Thomas participated in the test life process for the Alaska actuarial audit work this year and created a more efficient and intuitive spreadsheet for the process.

Chief Actuary & Resource Actuary

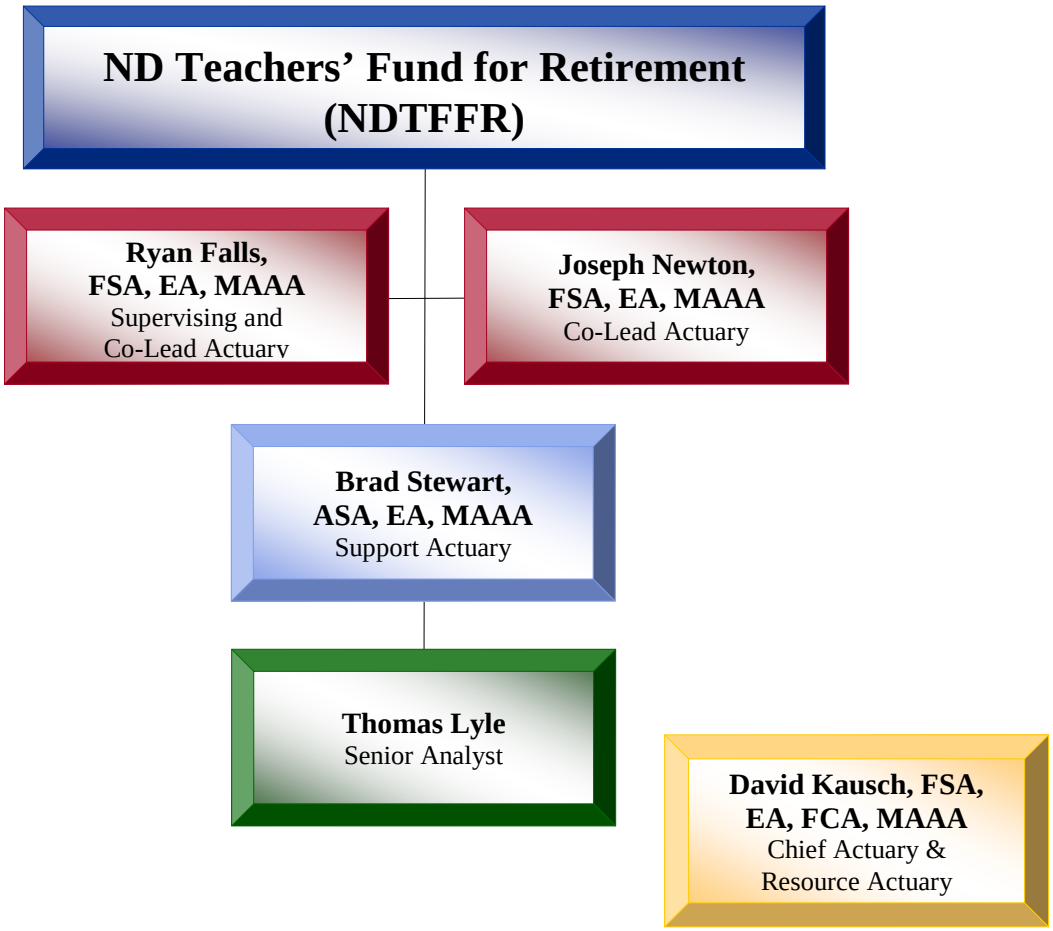
David Kausch, FSA, FCA, EA, MAAA, is the Chief Actuary of GRS in the Southfield, MI office and will serve in the role of Resource Actuary for NDTFFR. As Chief Actuary, it is David's responsibility to set the quality control procedures as well as acceptable standards of practice for our consultants, which at GRS are typically more stringent than the industry version of the same.

David is a final level of review to ensure all calculations and communications with NDTFFR meet a high expectation for excellence that GRS clients are accustomed to receiving.

ORGANIZATIONAL CHART

The NDTFFR will be serviced out of our Dallas office which is made up of twenty-five professionals. The following individuals are responsible for delivering services outlined in our proposal. Your proposed GRS team biographies of key professionals are provided in Appendix A.

Supervising & Co-Lead Actuary:	Ryan Falls, FSA, EA, MAAA
Co-Lead Actuary:	Joe Newton, FSA, EA, MAAA
Support Actuary:	Brad Stewart, ASA, EA, MAAA
Senior Analyst:	Thomas Lyle
Chief Actuary & Resource Actuary:	David Kausch, FSA, EA, FCA, MAAA



SECTION E

EXPERIENCE AND QUALIFICATIONS

EXPERIENCE AND QUALIFICATIONS

Offerors must describe the experience of their firm in completing similar projects. Additionally, offerors must provide information specific to the personnel assigned to accomplish the work called for in this RFP. Offerors must provide a narrative description of the organization of the project team and a personnel roster that identifies each person who will actually work on the contract and provide the following information about each person listed:

(a) title;
(b) resume;
(c) description of the type of work the individual will perform; and
(d) the number of estimated hours for each individual named above.

Offerors must provide three (3) reference names and contact information for similar projects the offeror's firm has completed. The State reserves the right to contact any references provided by the offeror. Offerors are invited to provide letters of reference from previous clients. Offerors must provide a sample actuarial audit report.

GRS Response

GRS EXPERIENCE AS THE RETAINED ACTUARY

GRS has over 70 years of experience working with statewide and municipal retirement systems. Most of our clients have multiple benefit structures and employer groups. Therefore, it is unlikely that there is any public sector benefit design or funding issue that GRS has not already helped another client manage or solve. Over the years, GRS' has made this accumulated wealth of knowledge available to all GRS consultants through internal communications and training provided by our internal subject matter experts.

GRS provides ongoing actuarial and retirement consulting services to more than 300 public-sector retirement systems across the country. Listed below is the name, the first year of our initial contract with the plan, and the most current asset and membership size for the statewide public pension plan clients.

Client Name	Year Retained	Assets (in billions)	Actives	Retired
Alaska Railroad Retirement System	2009	0.1	603	144
Arizona Public Safety Personnel Retirement System	2009	5.6	18,000	10,000
Arkansas Judicial Retirement System	1982	0.2	140	120
Arkansas Local Police and Fire Retirement System	1981	1.1	6,100	2,800
Arkansas Public Employees Retirement System	1962	7.5	46,000	32,000
Arkansas State Highway Retirement System	2001	1.2	3,600	3,000
Arkansas State Police Retirement System	1962	0.2	540	640
Arkansas Teacher Retirement System	1956	12.8	75,000	34,000
Colorado Fire and Police Pension Association (FPPA)	2004	3.1	11,000	7,000
Employees' Retirement System of Rhode Island	2001	7.2	32,000	27,000
Illinois Municipal Retirement Fund	1992	33.0	173,000	107,000
Illinois State Employees Retirement System	2001	11.0	66,000	60,000
Maryland State Retirement and Pension Agency	2008	37.2	192,000	132,000
Michigan Public School Employees	2006	38.4	223,000	196,000
Michigan State Employee Retirement System	2006	9.4	18,000	56,000
Michigan State Police Retirement System	2006	1.0	1,500	2,900
Minnesota State Employees Retirement System	2012	13.2	53,000	34,000
Missouri Dept. of Transportation and Highway Patrol	1999	1.9	7,400	8,400
Missouri Local Government Employees Retirement System	1967	4.7	33,000	18,000
Missouri State Employees Retirement System	1987	8.6	51,000	41,000
New Hampshire Retirement System	2006	6.1	49,000	30,000
New Mexico Educational Retirement Board	2001	9.6	62,000	35,000
Ohio Public Employees Retirement System	1954	67.8	333,000	181,000
Ohio State Highway Patrol Retirement System	1964	0.7	1,500	1,400
Oklahoma Teachers' Retirement System	2001	11.8	89,000	55,000
Public Employees Retirement Association of Minnesota	2012	26.0	154,000	90,000
South Carolina Retirement System	2011	24.9	224,000	142,000
State of Hawaii Employees' Retirement System	2001	12.3	66,000	41,000
State Universities Retirement System of Illinois	1996	17.5	70,000	59,000
Texas Employees Retirement System	2013	24.0	142,000	101,000
Texas Municipal Retirement System	2008	19.7	102,000	47,000
Texas Teacher Retirement System	2001	117.0	831,000	336,000
Utah Retirement System	2001	21.3	102,000	52,000
Wisconsin Retirement System	1976	86.4	255,000	180,000
Wyoming Retirement System	2009	7.5	42,000	23,000

GRS also provides actuarial and retirement consulting services to almost 300 municipal, county and district public pension plan clients.

We encourage NDTFFR to contact the following retained/ongoing clients, or any of the clients listed above, to discuss their experience with GRS.

Teacher Retirement System of Texas
Mr. Brian Guthrie
Executive Director
1000 Red River Street
Austin, TX 78701-2698
(512) 542-6411
brian.guthrie@trs.state.tx.us

Texas Municipal Retirement System
Ms. Leslee S. Hardy
Decision Support Actuary - Director
Texas Municipal Retirement System
1200 N. IH 35
Austin, TX 78701
(512) 225-3760
lhardy@tmrs.com

Oklahoma Teacher Retirement System
Mr. Tom Spencer
Executive Director
P.O. Box 53524
Oklahoma City, OK 73152
(405) 521-2117
tom.spencer@trs.ok.gov

ACTUARIAL AUDIT EXPERIENCES

Actuarial audits provide an independent peer review of valuations. Periodic reviews nearly always lead to improved procedures. Our audit services range from providing basic reviews to ascertain the reasonableness of results to comprehensive full-replication audits. Since our substantial actuarial audit experience derives from years of conducting this work and having our own work audited, we are able to deliver reviews that consistently provide useful information and improvements.

The list of the statewide retirement systems where GRS has performed actuarial audits over the past five years includes:

Retirement System Name	Type	Year Completed
Alaska Retirement Management Board	Limited Scope	2013
California Public Employees Retirement System	Limited Scope	2011
Arizona State Retirement System*	Full Scope	2014
Florida Retirement System	Full Scope	2013
Iowa Public Employees Retirement System	Limited Scope	2015
Mississippi Public Employees Retirement System	Limited Scope	2011
Municipal Fire & Police Retirement System of Iowa	Full Scope	2015
Public Employee Retirement System of Idaho	Full Scope	2014
Teachers Retirement System of Montana*	Limited Scope	2015
Virginia Retirement Systems*	Limited Scope	2014

***** Assigned to Ryan Falls, the Supervising Actuary

ACTUARIAL AUDIT EXPERIENCE FOR SUPERVISING ACTUARY

Ryan, the Supervising and Co-Lead Actuary, has provided actuarial services as part of an actuarial audit to a diverse group of retirement systems, serviced by a diverse group of actuaries, over the past 10 years. Most notably, Ryan recently completed actuarial audits of the Arizona State Retirement System, the Virginia Retirement Systems, and the Teachers Retirement System of Montana.

Beginning in 2008, the State of Texas requires all public retirement systems with assets in excess of $100 million to have an independent actuarial audit completed every five years. Ryan has worked with retirement systems across the State of Texas since the implementation of the new requirements. In most cases, actuarial audits had never been conducted on most of the municipal retirement systems in Texas, so communication with the employers and Boards was vital as part of the actuarial audit process.

The following table details the actuarial audits conducted by Ryan over the past five years:

Retirement System Name	Actuary Audited	Final Report Submitted
Teachers Retirement System of Montana	Cavanaugh Macdonald Consulting	April 2015
Austin Fire Fighters Relief and Retirement Fund	Foster & Foster	August 2014
Austin Police Retirement System	Foster & Foster	August 2014
Arizona State Retirement System	Buck Consultants	June 2014
Virginia Retirement Systems	Cavanaugh Macdonald Consulting	June 2014
City of Corpus Christi Fire Fighters' Retirement System	Rudd & Wisdom	March 2014
Fire and Police Pension, San Antonio	Segal Consulting	November 2013
Irving Firemen's Relief & Retirement Fund	John Crider, Consulting Actuary	October 2013
City of Lubbock Fire Pension Fund	John Crider, Consulting Actuary	July 2013
Lower Colorado River Authority Retirement Plan	Rudd & Wisdom	June 2013
Port of Houston Authority Retirement Plan	Milliman	August 2012

Please see Appendix D for a sample actuarial audit report.

GRS has performed approximately 20 actuarial audits over the past five years. We have identified three recent actuarial audits that we considered pertinent to NDTFFR. If it would assist NDTFFR in in your decision making process, we can provide details of additional actuarial audits performed by GRS.

Arizona State Retirement System

In March 2014, GRS was retained to conduct an actuarial audit (including a full replication of the actuarial valuations) of the two pension plans and one LTD plan administered by the Arizona State Retirement System (ASRS). The final actuarial audit report was delivered to ASRS on June 13, 2014 and the results of the actuarial audit were presented to the Board on June 27, 2014. GRS reviewed Buck Consultants as part of the actuarial audit for ASRS.

The presentation of the actuarial audit to the Board involved an interesting and engaging discussion about the potential relationship between life expectancy, the size of an individual member's benefit, and the member's economic status.

We were not able to obtain a letter of reference from ASRS. However, Mr. Brian Crockett (contact information below) has indicated that he would be happy to provide a reference if NDTFFR would like to contact him directly.

Mr. Brian Crockett
Executive Consultant II
Strategic Planning and Analysis
Arizona State Retirement System
Phone: 602-240-5306
brianc@azasrs.gov

Montana Teachers' Retirement System

In December 2014, GRS was retained to conduct an actuarial audit of the most recent actuarial valuation (based on a detailed liability review of a sample of system members) and actuarial experience study for the Montana Teachers' Retirement System (MTRS). The scope of the actuarial audit also included a review of actuarial factors used for the plan administration and service purchases. The final actuarial audit report was delivered to MTRS on April 8, 2015 and the results of the actuarial audit were presented to the Board on May 15, 2015. GRS reviewed Cavanaugh Macdonald Consulting as part of the actuarial audit for MTRS.

The discussion about the actuarial audit with the staff and Board of MTRS prompted insightful conversations from all sides about the methodology for calculating the most appropriate service purchase cost and the potential for future mortality improvements.

A letter of reference from MTRS is included in Appendix E. NDTFFR is also welcome to contact MTRS for additional information on their experiences with the proposed actuarial audit team.

Mr. Shawn Graham
Executive Director
Montana Teachers' Retirement System
Phone: 406-444-3376
ShawnGraham@mt.gov

Virginia Joint Legislative Audit and Review Commission (JLARC)
GRS was engaged by JLARC to conduct the regularly scheduled quinquennial actuarial audit of the Virginia Retirement Systems in 2014. The presentation of the results of the actuarial audit included a discussion of actuarial cost methods and coordination of contribution timing.

We were not able to obtain a letter of reference from JLARC. However, Mr. Hal Greer (contact information below) has indicated that he would be happy to provide a reference if NDTFFR would like to contact him directly.

Mr. Hal E. Greer
Director
201 North 9th Street
General Assembly Building, Suite 1100
Richmond, VA 23219
804-786-1258
hgreer@jlarc.virginia.gov

CONSULTING TEAM

R. Ryan Falls, FSA, EA, MAAA, will serve in the role of Supervising and Co-Lead Actuary for the actuarial audit of your retirement system. Ryan is a Senior Consultant and Actuary with almost 20 years of professional actuarial and benefits consulting experience with major public employee retirement systems and private sector employers. His background includes many large plan design studies involving the impact on the plan costs as well as the impact on employee retention, administrative concerns, and applicable stakeholders. Ryan is currently the lead actuary for the Employees' Retirement System of Texas, the Oklahoma Teachers Retirement System, and the New Mexico Educational Retirement Board. Additionally, Ryan is the support actuary for the City of Austin Employees Retirement System, and the DFW International Airport retirement plans. Prior to joining GRS, he was also the lead actuary for the Oklahoma Police Pension and Retirement System and the Dallas Police & Fire Pension System. During his career, he has also worked with organizations including ExxonMobil Corporation, Shell Oil Company, INTEGRIS *Health*, American Fidelity, and the City of Dallas.

Ryan also serves on the Corporate Advisory Committee for the National Conference on Teacher Retirement (NCTR) where he provides advice and counsel to NCTR's governance process.

Forefront of GASB Education and Implementation

Since the GASB issued Statements 67 and 68 in 2012, Ryan has emerged as a leader within the actuarial community regarding the new accounting procedures for public pension plans. He he has met with state treasurers, state auditors, retirement boards, and independent auditors across the country to help educate practitioners on the new standards and prepare them for implementation. He has assisted a large statewide cost-sharing plan in their early implementation

of Statement 67 and he is currently working with multiple cost-sharing plans on an employer communication program for Statement 68. Additionally, Ryan has spoken at a number of cenferences, including the National Council on Teacher Retirement and the National Association of State Treasurers, on the on the impact of the upcoming implementaiton of Statement 68 for employers and the communication challenges.

Extensive Actuarial Audit Experience

Actuarial audits provide an independent peer review of valuations. Periodic reviews nearly always lead to improved procedures. Our audit services range from providing basic reviews to ascertain the reasonableness of results to comprehensive full-replication audits. Since our substantial actuarial audit experience derives from years of conducting this work and having our own work audited, we are able to deliver reviews that consistently provide useful information and improvements.

Over the past five years, Ryan has completed actuarial audits of 11 governmental pension plans including actuarial audits for the Arizona State Retirement System, the Virginia Retirement Systems, and the Montana Teachers' Retirement System. Some of Ryan's specific experiences will be discussed in later sections of this proposal.

Joseph P. Newton, FSA, EA, MAAA, a Senior Consultant and Actuary, will also serve in the role of Co-Lead Actuary for NDTFFR. Joe is the Pension Team Leader for the Southwest Region of GRS and has almost 20 years of actuarial experience and expertise representing large public sector clients. The Southwest Region Pension Team of GRS is the retained actuary for thirteen statewide retirement systems and the recurring auditing actuary for the State of Alaska. In addition, the team is the retained actuary for numerous municipal plans such as the cities of Dallas, Austin, and Houston.

Joe is the primary actuary for the Hawaii Employer-Union Health Benefits Trust Fund, Colorado Fire and Police Pension Association, Texas Teachers Retirement System, as well as the retiree medical actuary for Texas TRS-Care, and the Employees' Insurance Program of South Carolina. His other pension clients include the Texas Municipal Retirement System and the Employees' Retirement System of Rhode Island.

Joe stresses a top-down approach to pension plan consulting, which integrates the major goals of stakeholders, addresses human capital needs, and utilizes projection and valuation techniques that manage risk. He has been instrumental in GRS' internal development of several technical projects, including the development of GRS's Experience study and Gain/(Loss) software programs, which are unmatched in the industry. Joe is a leader in the development of production techniques and in designing applications that add value to GRS clients.

Joe has built an enviable reputation in the public sector actuarial community for his creative ability to communicate difficult and complex ideas to Boards and Stakeholders. Most

importantly, GRS believes it has helped NDTFFR increase its credibility with the legislative and executive branches of the state government. We believe our annual educational sessions for legislative leaders are of paramount importance in establishing and maintaining this credibility. Your GRS team has demonstrated and will continue to demonstrate an unmatched ability to communicate at all levels of our client service team.

Joe has also testified before legislatures and legislative subcommittees regularly in Texas, Colorado, Rhode Island, South Carolina, and Kentucky. In addition, Joe has given presentations to numerous retirement boards and national trustee conferences, including NCTR, NASRA, NCPERS, and GFOA.

Joe is a Fellow of the Society of Actuaries (FSA), a Fellow of the Conference of Consulting Actuaries (FCA), a Member of the American Academy of Actuaries (MAAA), and an Enrolled Actuary (EA) under ERISA.

Team Member	Title	Description of the type of work the individual will perform	Estimated Number of Hours
Ryan Falls	Co-Lead Actuary	Responsibility for completion of project on a timely basis, assessment of actuarial assumptions and method, final review of report	40
Joseph Newton	Co-Lead Actuary	Peer review of conclusions in the report, final review of report	25
Brad Stewart	Support Actuary	Initial review of actuarial valuation results and review of complete report	30
Thomas Lyle	Senior Analyst	Review of census data	20
Total	All staff		115

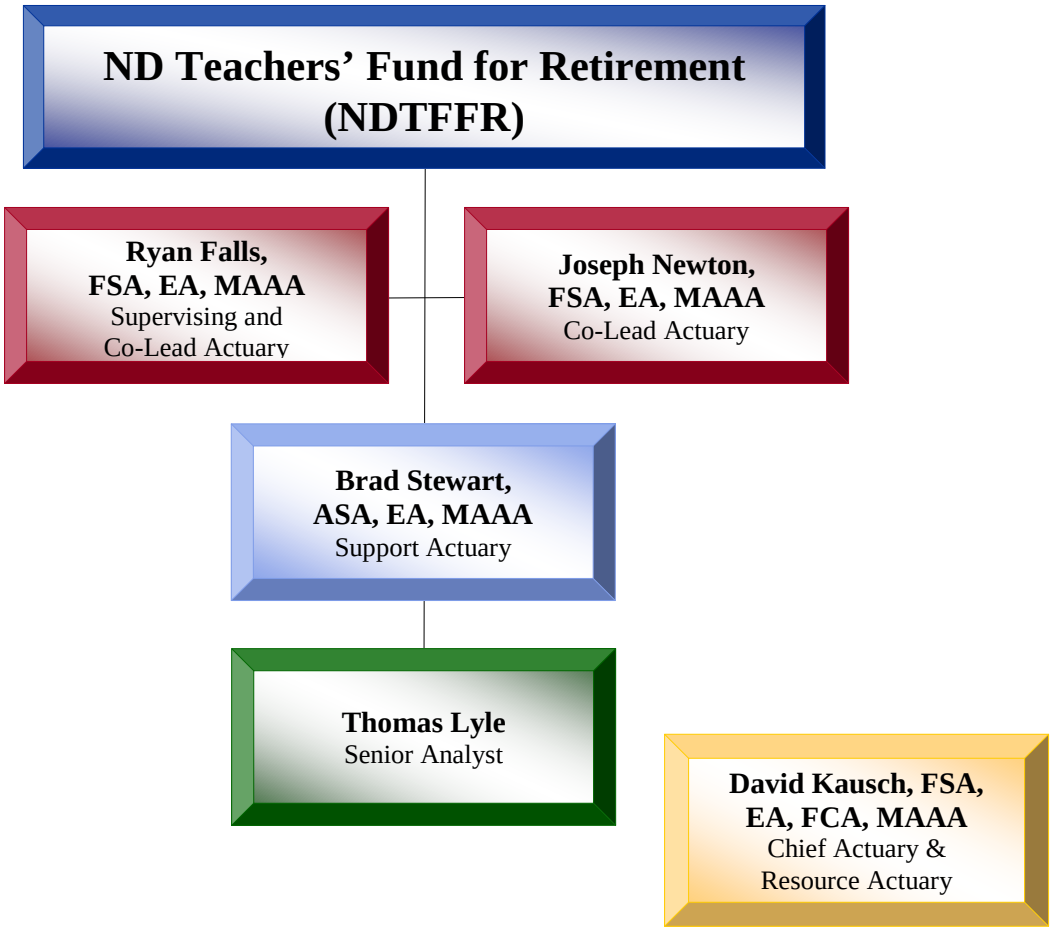
PART 2

COST PROPOSAL (UNDER SEPARATE COVER)

APPENDIX A

GRS TEAM'S ORGANIZATIONAL CHART AND TEAM BIOS

GRS Team's Organizational Chart And Team Bios



Ryan Falls, FSA, EA, MAAA

Senior Consultant

ryan.falls@gabrielroeder.com

Expertise

Ryan Falls is a Senior Consultant in GRS' Dallas, Texas office. He has almost 20 years of actuarial and benefits consulting experience with major public employee retirement systems and private sector employers. Throughout his career, Ryan has provided consulting services to statewide and municipal retirement systems across the country.

As an actuary and consultant, Ryan performs actuarial valuations for public pension plans, actuarial valuations for retiree health care plans, plan design analyses, including the design and implementation of cash balance and other hybrid plan designs, asset liability modeling, and actuarial audits.

Ryan is also an expert in conducting assumption reviews and consulting about benefit administration. His background includes many large plan design studies involving the impact on the plan cost as well as the impact on employee retention, administrative concerns, and applicable stakeholders. Ryan also has significant experience analyzing demographic and economic assumptions through actuarial experience studies and helping plan sponsors understand historical patterns and anticipate future trends. Ryan's experience with private sector employers included nondiscrimination and overall compliance of defined contribution and defined benefit retirement plans in accordance with ERISA and IRS regulations.

Since the GASB issued Statements 67 and 68 in 2012, Ryan has emerged as a leader within the actuarial community regarding the new accounting procedures for public pension plans. He has met with state treasurers, state auditors, retirement boards, and independent auditors across the country to help educate practitioners on the new standards and prepare them for implementation. He has assisted a large statewide cost-sharing plan in their early implementation of Statement 67 and he is currently working with multiple cost-sharing plans on an employer communication program for Statement 68. Additionally, Ryan has spoken at a number of conferences, including the National Council on Teacher Retirement and the National Association of State Treasurers, on the on the impact of the upcoming implementation of Statement 68 for employers and the communication challenges.

Ryan also recently appointed to the Corporate Advisory Committee for the National Conference on Teacher Retirement (NCTR) where he provides advice and counsel to NCTR's governance process.

Professional Designations

- Fellow, Society of Actuaries
- Enrolled Actuary
- Member, American Academy of Actuaries

Education

Bachelor of Science, Applied Mathematical Science, Texas A&M University

Joseph Newton, FSA, EA, MAAA

Senior Consultant and Team Leader

joe.newton@gabrielroeder.com

Expertise

Joe Newton is a nationally recognized public sector actuary who works with numerous statewide, regional, and local retirement systems and is located in GRS' Dallas, Texas office. He has more than 15 years of actuarial and benefit consulting experience. Joe's clients are located in Colorado, Hawaii, Rhode Island, South Carolina, Washington, Wyoming, and Texas.

Joe is a Senior Consultant and Team Leader for GRS' Southwest region. The Southwest region's pension team, which covers the Dallas and Denver offices, serves as the retained actuary to more than fourteen (14) statewide retirement systems and many large municipal retirement systems, and is the recurring auditing actuary for a statewide plan. This team also provides post-retirement health valuations and consulting through shared service arrangements with the North Central Texas Council of Governments and South Carolina Association of Counties.

As an actuary and consultant, Joe provides:

- Actuarial valuations
- Innovative funding solutions using cutting-edge projection technology
- Benefit and cost studies
- Experience analyses

Joe stresses a top-down approach to pension plan consulting, which integrates the major goals of stakeholders, addresses human capital needs, and utilizes projection and valuation techniques that manage risk. He has been instrumental in GRS' internal development of several technical projects, including the development of GRS's Experience study and Gain/(Loss) software programs, which are unmatched in the industry. Joe is a leader in the development of production techniques and in designing applications that add value to GRS clients.

Professional Designations

- Fellow, Society of Actuaries
- Enrolled Actuary
- Fellow, Conference of Consulting Actuaries
- Member, American Academy of Actuaries

Presentations

Joe has served as a speaker for the National Council on Teacher Retirement (NCTR) and International Foundation of Employee Benefit Plans (IFEBP).

Education

Bachelor of Arts, Mathematics, and Business Administration, Austin College (Sherman, Texas)

Brad Stewart, ASA, EA, MAAA

Consultant
brad.stewart@gabrielroeder.com

Expertise

Brad Stewart is a Consultant in GRS' Dallas, Texas office. He has more than 10 years of experience in the benefits industry, primarily focusing on services to public sector benefit plans. Brad's clients include statewide pension and health care clients in Oklahoma, Utah, Texas, and Rhode Island. He also serves several municipal clients located in Texas and Oklahoma.

Brad provides public pension retirement systems and OPEB plans with:

- Actuarial valuations
- Benefit proposal cost analyses
- Actuarial audits
- Benefit calculations

In addition to working with the public sector, Brad has provided consulting services to corporations and tax-exempt organizations. His benefit industry experience also includes the insurance provider market where he worked on insurance product pricing, rate development, and cash flow analysis. Brad's programming skills include Fortran and Visual Basic for Applications.

Professional Designations

- Associate, Society of Actuaries
- Enrolled Actuary, ERISA
- Member, American Academy of Actuaries

Education

Bachelor of Science, Mathematics, University of Texas, Austin
Master of Science, Mathematics, University of Texas, San Antonio

Thomas Lyle

Analyst

tom.lyle@gabrielroeder.com

Expertise

Thomas Lyle is an Analyst in GRS' Denver, Colorado office.

As an Analyst, Tom is responsible for:

- Data review, reconciliation and analysis
- Actuarial valuation preparation
- Report preparation
- Benefit certifications
- Preparation of power point presentations

Tom is a new and talented addition to the company. Prior to joining GRS, he worked as an engineer for six years. His work experience was with large governmental clients in transportation design and involved complex mathematical modeling, statistical analysis, and technical report preparation.

Professional Designations

- Passed Society of Actuaries Probability Exam (March 2013)

Education

Master's Degree, Civil Engineering, University of South Florida,
Bachelor's Degree, Civil and Environmental Engineering, University of South Florida, Cum Laude Honors

David T. Kausch, FSA, EA, FCA, MAAA, PhD

Chief Actuary & Senior Consultant

david.kausch@gabrielroeder.com

Expertise

David Kausch is GRS' Chief Actuary. Therefore, David serves each and every GRS actuarial client. In addition, he has provided direct actuarial and consulting services for many state and local public employee retirement systems in Michigan, Missouri, New Hampshire, and Rhode Island. David has more than 15 years of pension consulting experience and is located in GRS' Southfield, Michigan office.

As GRS' Chief Actuary, he:

- Monitors GRS' adherence to established actuarial standards
- Oversees and interprets GRS' actuarial methodologies
- Is GRS' spokesperson for the company's perspectives and positions on actuarial issues

David's consulting responsibilities include preparing and presenting actuarial valuations and consulting for public employee retirement funds, including project management and the preparation and presentation of actuarial valuations, experience studies, cash flow projections, and valuation of retiree health care plans.

Professional Designations

- Fellow, Society of Actuaries
- Enrolled Actuary, ERISA
- Fellow, Conference of Consulting Actuaries
- Member, American Academy of Actuaries

Presentations and Publications

David has spoken at various national and regional conferences such as the National Association of State Retirement Administrators (NASRA), the Michigan Association of Public Employees Retirement Systems (MAPERS), Pennsylvania Association of Public Employee Retirement System (PAPERS). He wrote an article for *Contingencies* (Jan/Feb 2008), "The Case for Stock in Pension Funds." He has also co-authored articles for MAPERS and PAPERS.

Education

Bachelor of Arts, Mathematics, Kalamazoo College
PhD, Mathematics, University of Michigan

APPENDIX B
REGISTRATION TO DO BUSINESS

North Dakota nd.gov Official Portal for North Dakota State Government

SECRETARY OF STATE
NORTH DAKOTA

Home | Business Records Search

GABRIEL, ROEDER, SMITH & COMPANY

Corporation Details

System ID: 24618600
Type: FOREIGN BUSINESS CORPORATION
Status: Active & Good Standing
Original File Date: 03/31/2008
State of Origin: Michigan

Phone: (800) 521-0498

Effective Date: 03/31/2008

Nature of Business

EMPLOYEE BENEFIT CONSULTING

Principal Office

1 TOWNE SQ STE 800 SOUTHFIELD, MI 48076-3723

Registered Agent

NATIONAL REGISTERED AGENTS, INC.
314 E THAYER AVE
BISMARCK, ND 58501-4018
Established Date: Aug 01, 2008

Generate an Annual Report To File

To Generate a Annual Report form to be filed with the Secretary of State, select the appropriate year of the report you intend to file. This report does not contain details of a report previously filed with the Secretary of State. The annual report years reflected are an indication of the various report forms available in this site and is not an indication that an entity needs to file reports for all years. Missing years indicate that the forms for the missing year have not yet been deployed to the website, or have already been removed, and can be obtained by contacting the Secretary of State.

2015 (generates a forms-fillable pdf in a new pop-up window)

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APPENDIX C
GRS TECHNOLOGY TOOLS

Description of GRS Valuation Software

Background

Gabriel, Roeder, Smith & Company's (GRS) core calculation software, which is used for the actuarial valuation of defined benefit and hybrid pension plans and other post-employment benefit (OPEB) plans, has evolved over 30 years of internal use, and is a very stable platform. Because our specialty is public sector benefit plans, this software is uniquely designed to handle those cases.

Software Development, Maintenance and Support

GRS has an Internal Software, Training, and Processes (ISTP) team that supports and updates our core calculation software. The client service team interacts directly with their retirement system client in the preparation of the valuation. The ISTP team supports the client service team to ensure the plan's benefit provisions are correctly modeled in GRS's software. The client's lead actuary is ultimately responsible for ensuring that GRS's work meets the client's needs.

Summary of Software Features

Handling of Assumptions & Methods:

Our software design guarantees that the assumptions and methods used in the DB/Hybrid valuation are fully compatible with those used in the retiree health valuation, which eliminates double handling of data.

Valuation Parameters:

GRS's software handles at least 500 valuation parameters and can be customized to handle others based on the unique features of the plan.

Gain/Loss:

Brian Murphy, FSA, GRS's President wrote the original version of the GRS Gain/Loss program in 1998. The current version of GRS's gain/loss program provides important data for input into the experience study tool.

Experience Studies:

The basic purpose of an experience study is to provide information on the differences between assumed and actual experience. We recently rewrote our experience study program to take into account the technology involved in our gain loss analysis program. This allows us to provide experience studies in a cost effective manner, particularly for those clients that have contracted with us for annual gain loss analysis services.

Reports:

GRS software can produce both standard and customized reports. To maximize efficiency, our program utilizes standard reporting formats for information that is required by all public plans. To address unique reporting needs, such as Board requests or state specific requirements, our program has flexible reporting capabilities that enable report customization. A sample standard and customized report is provided.

Reasons GRS Software is Superior to Other Valuation Systems

GRS valuation software is geared to develop the most level funding possible, a feature fundamental to public sector retirement systems. Based on our experience, we believe that our software does this better than any other company's actuarial valuation system.

Although at least five-hundred valuation parameters are used in an actuarial valuation, it has been our experience that most public sector benefit plans have some unique features that cannot be handled by standard valuation parameters. GRS software can model these unique features because we can customize our software for the plan.

Since our software is very flexible, we can correctly model other actuarial firms' valuation procedures and methods with great efficiency. This is important in transitioning to a new firm or for an actuarial audit–both cases where replication of another firm's work provides opportunities to improve the quality of the valuation.

GRS utilizes sophisticated actuarial gain/loss software to track any disconnect between the actual experience and the expected experience based on the actuarial assumptions. These annual gain/loss analyses will identify a recurring pattern and, therefore, by the time the experience study is performed there should be no surprises in the changes being recommended.

Our software package allows GRS actuaries to examine the annual reconciliation of data with unmatched efficiency and truly understand how the liabilities of an actuarial valuation are affected by the methodologies used to set the assumptions. Our package allows the actuary to examine the data for several parameters giving the actuary the ability to set the assumptions based on the most appropriate methodologies for the client, rather than basing assumptions on the project's budget.

A distinguishing feature of our system, which has been used to research termination and retirement assumptions for clients of all sizes, relates to the methodology of basing termination expectations on years of retirement eligibility instead of solely on age. The results of our research are being utilized in the valuations of GRS clients today.

Projection Tools

In our most recent efforts to enhance the products we are able to offer our clients, we have invested a significant amount of our resources to enhance our projection capabilities. Below are some examples of the different projection applications that we utilize for our clients.

The Magnitude Valuation© line of projection software includes three different software applications. The following is a short description of each application.

MagVal10:

This tool allows the user to project the results of the current and later valuations given the results of the current valuation, and assumptions (in blue) about future experience. This reduces the chance of surprises resulting from recent known and future possible experience.

GRS customizes this projection application for users by uploading the retirement system's most recent valuation results into the tool. Users can create alternate scenarios by entering economic data and valuation result inputs. Alternate scenario inputs can include investment return, payroll growth, contribution rates, amortization years, and asset corridors. The tool returns results in both graphical and chart formats.

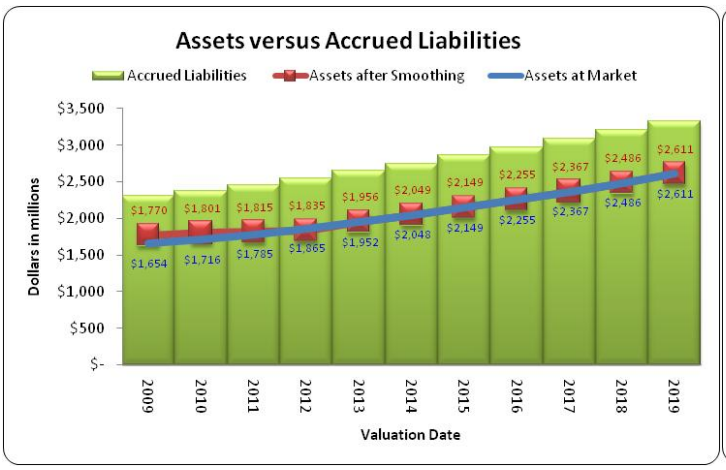
ABC Retirement System Contribution Rate Projection

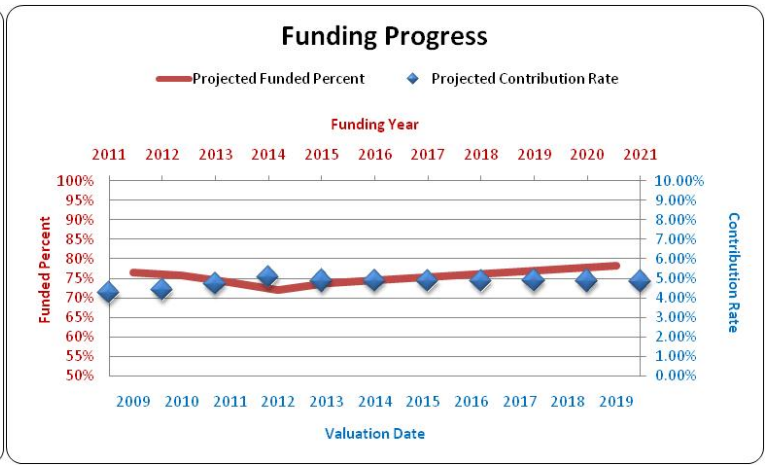
	Economic Data											
	Observed		Assumed									
Valuation Data	2003-2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Payroll Growth	6.93%	-0.25%	0.50%	1.00%	3.75%	3.75%	3.75%	3.75%	3.75%	3.75%	3.75%	3.75%
Liability Growth	4.94%	2.62%	2.86%	3.02%	3.91%	3.91%	3.91%	3.91%	3.91%	3.91%	3.91%	3.91%
Investment Return	4.08%	23.92%	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%
	Valuation Parameters											
	Observed		Assumed									
Fiscal Year Ending June 30	2003-2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Current Contribution Rate	3.30%	3.37%	3.20%	4.26%	4.41%	4.71%	5.03%	4.85%	4.86%	4.87%	4.86%	4.85%
Amortization Years	26	29	28	27	26	25	24	23	22	21	20	19
Asset Corridor	15%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
	Valuation Results in $ Millions											
	Observed		Projected									
Valuation Date: June 30/July 1	2003-2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Determines ARC for Fiscal Year		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Payroll	$ 1,102.5	$1,208.1	$1,214.1	$1,226.3	$1,272.3	$1,320.0	$1,369.5	$1,420.8	$1,474.1	$1,529.4	$1,586.7	$1,646.2
Assets after Smoothing	1,767.8	1,769.5	1,801.0	1,815.5	1,834.6	1,955.7	2,048.6	2,149.0	2,255.0	2,367.5	2,485.8	2,610.9
Assets at Market	1,733.5	1,654.4	1,715.6	1,784.8	1,864.9	1,951.8	2,047.5	2,149.3	2,255.3	2,367.4	2,485.8	2,610.9
Ratio	102%	107%	105%	102%	98%	100%	100%	100%	100%	100%	100%	100%
Accrued Liabilities	2,101.3	2,314.3	2,380.5	2,452.4	2,548.2	2,647.9	2,751.4	2,859.0	2,970.8	3,086.9	3,207.6	3,333.1
Funded Percent	84.1%	76.5%	75.7%	74.0%	72.0%	73.9%	74.5%	75.2%	75.9%	76.7%	77.5%	78.3%
Unfunded Accrued Liabilities	333.4	544.8	579.5	636.9	713.6	692.2	702.8	710.0	715.8	719.4	721.8	722.2
Contribution Rate	3.30%	4.26%	4.41%	4.71%	5.03%	4.85%	4.86%	4.87%	4.86%	4.85%	4.85%	4.84%

The above projections are based upon many assumptions about the future. Actual future valuation results will take all known future information into account and will differ from the projections -- perhaps materially. Projected results are very sensitive to the rates of payroll growth and liability growth that are assumed. In the long run, according to theory, both of those figures should approach 3.75%. The higher rates of growth that were seen in the 2003 to 2008 period are not likely to continue indefinitely.

RESET DEFAULTS

User inputs are in BLUE.





MagVal30:

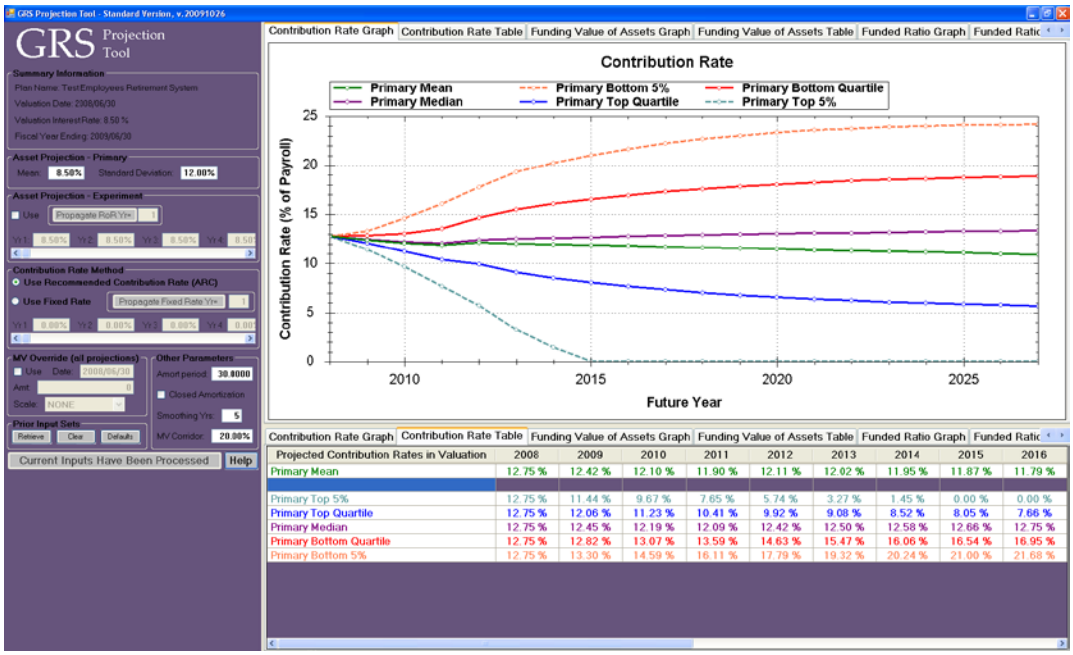
This tool provides information that helps decision makers analyze the impact of plan changes and respond to the economic pressures faced by the plan. Decision makers can use the results to forecast budget requirements and develop strategies to manage risk.

Users will find the GRS's Contribution Projection tool flexible and easy-to- use:

- Results are delivered in easy-to-analyze graphs and charts, as well as spreadsheet formats.
- Users perform what-if scenario modeling using a simple, field based data input screen.

Benefits of this Tool:

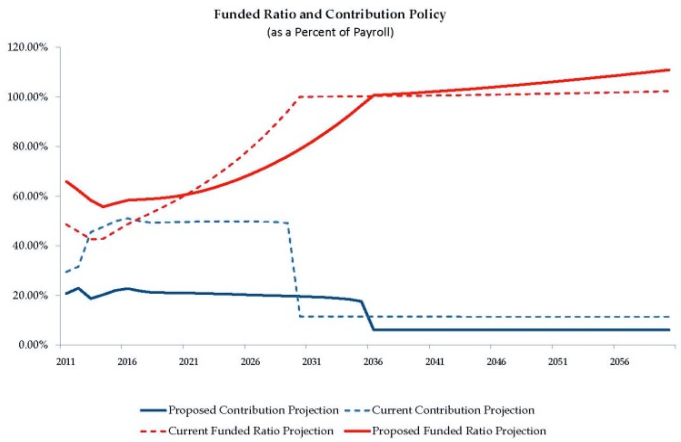
- This tool enables clients to examine long-range funding progress and contribution adequacy quickly and efficiently. This tool is specifically designed to model the adequacy of code-compliant contribution rates and can be customized to allow the System to study several key factors such as the impact of asset returns and funding policy decisions.
- The Projection Tool is a deterministic model that provides a range of results based on the system's asset allocation and investment policy. By using a deterministic approach, a broad range of outcomes can be illustrated almost instantly unlike a stochastic approach requiring hundreds or thousands of simulations.
- Output can be tailored specifically to the client's need. Moreover, clients may create asset return scenarios to estimate the impact of short-term market fluctuations.



Projected Contribution Rates in Valuation	2008	2009	2010	2011	2012	2013	2014	2015	2016
Primary Mean	12.75 %	12.42 %	12.10 %	11.90 %	12.11 %	12.02 %	11.95 %	11.87 %	11.79 %
Primary Top 5%	12.75 %	11.44 %	9.67 %	7.65 %	5.74 %	3.27 %	1.45 %	0.00 %	0.00 %
Primary Top Quartile	12.75 %	12.06 %	11.23 %	10.41 %	9.92 %	9.08 %	8.52 %	8.05 %	7.66 %
Primary Median	12.75 %	12.45 %	12.19 %	12.09 %	12.42 %	12.50 %	12.58 %	12.66 %	12.75 %
Primary Bottom Quartile	12.75 %	12.82 %	13.07 %	13.59 %	14.63 %	15.47 %	16.06 %	16.54 %	16.95 %
Primary Bottom 5%	12.75 %	13.30 %	14.59 %	16.11 %	17.79 %	19.32 %	20.24 %	21.00 %	21.68 %

MagValPlus Projection and Valuation Tool

The tool is useful in plan redesign projects and for risk modeling exercises. MagPlus can value benefit and assumption changes. The effect of the changes can be broken out by retirees, active members (near or far from retirement), and future new hires. GRS can customize MagPlus to best serve your needs.



Valuation Results as of June 30, 2010:

	Baseline	Proposed	Change
Unfunded Actuarial Accrued Liability ($ in millions)	$2,672.0	$1,302.4	-$1,369.6
Funded Ratio	48.7%	66.0%	17.4%
State Actuarial Contribution Rate for FY 2013	36.85%	18.78%	-18.07%
Long-Term Normal Cost (rate at which new entrants accrue benefits)	11.45%	6.12%	-5.33%

Contribution Strategies and Investment Returns

	Open/Closed	Phase Length	Initial Period	
Phase I Amortization	Closed	25	25	years
Phase II Amortization	Open		1	years

	Actual Market Returns	Actuarial ER Contribution	Actual ER Contribution	Amortization Period
FY2011	20.00%	20.78%	20.78%	25
FY2012	7.50%	22.98%	22.98%	24
FY2013	7.50%	18.78%	18.78%	23
FY2014	7.50%	20.31%	20.31%	22
FY2015	7.50%	22.05%	22.05%	21
FY2016	7.50%	22.80%	22.80%	20
FY2017	7.50%	21.89%	21.89%	19
FY2018	7.50%	21.24%	21.24%	18
FY2019	7.50%	21.19%	21.19%	17
FY2020 and beyond	7.50%		Actuarial	
Inputted returns apply to baseline?	yes	Reset actual to actuarial?	yes	

Member Group	Current COLA	Proposed COLA	Current Multiple	Proposed Multiple	Current NRA	Proposed NRA	Current FAC Period	Proposed FAC Period	Current Member Contribution	Proposed Member Contribution	Change in Relative Value
Current Retirees	3.00%	0.00%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-23%
Active Members Eligible to Retire	3.00%	0.00%	2.20%	1.30%	N/A	N/A	3	10	8.75%	0.00%	-26%
Vested Active Members Not Yet Eligible to Retire	1.75%	0.00%	1.84%	1.30%	62.5	67.0	5	10	8.75%	0.00%	-42%
Non-Vested Members	1.75%	0.00%	1.84%	1.30%	65.8	67.0	5	10	8.75%	0.00%	-42%
New Hires	1.75%	0.00%	1.84%	1.30%	65.8	67.0	5	10	8.75%	0.00%	-45%

Capital Market Assumption Modeler:

It is critical for GRS to present the retirement system with information in a complete and unbiased manner so the policymakers can make a fully informed decision. The selection of economic assumptions, such the retirement system's investment return assumption is covered under Actuarial Standard of Practice No. 27. Economic assumptions are required by this standard to be within a best-estimate range, which the actuary reasonably anticipates the actual results will fall.

GRS views the investment return assumption as having three components: the assumed rate of (price) inflation, the real return and an offset for expected investment and administrative expenses. This "building block" approach is one explicitly permitted under ASOP 27.

The allocation of assets within the universe of investment options will significantly impact the overall performance. Therefore, it is meaningful to identify the range of expected returns based on a retirement system's targeted allocation of investments and an overall set of capital market

assumptions. Since GRS does not provide investment consulting services, we evaluate the return assumption based on the capital market assumptions from our database of expected returns from independent investment consulting firms. Instead of a single range, we feel this approach creates a consistent and defendable range of probabilities as any single set of assumptions are dependent on the individual's personal view or methodology.

Below is one of the tables often utilized when communicating the results of the analysis in our discussion material. In this particular example, GRS utilized the return expectations from eight different investment consulting firms to identify the distribution of expected returns over the next 20 years as well as the probability that the plan will exceed their current investment return assumption, which in this example is 7.75%.

Investment Consultant	**Distribution of 20-Year Average Geometric Net Nominal Return**			**Probability of exceeding 7.75% ***
	25th	**50th**	**75th**	
(1)	(2)	(3)	(4)	(5)
1	5.27%	6.76%	8.28%	33.0%
2	5.42%	6.99%	8.58%	37.3%
3	5.75%	7.15%	8.56%	38.7%
4	5.85%	7.28%	8.74%	41.4%
5	4.74%	7.00%	9.30%	41.2%
6	5.95%	7.56%	9.19%	46.8%
7	5.67%	7.56%	9.49%	47.4%
8	7.90%	9.26%	10.63%	77.3%
Average	**5.82%**	**7.44%**	**9.10%**	**45.4%**

APPENDIX D
GRS SAMPLE REPORT

GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

STATE RETIREMENT SYSTEM

REPORT OF AN ACTUARIAL AUDIT

MM/DD/YY

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MM/DD/YY

Retirement Board
State Retirement System
3300 North Central Avenue
14th Floor
City, State 12345

Dear Retirement Board Members:

Gabriel, Roeder, Smith & Company (GRS) is pleased to present this report of an actuarial audit of the MM/DD/YY actuarial valuations of the State Retirement System (SRS) retirement programs. The scope of our actuarial audit included the SRS Plan (pension and health benefits), the SRS System (pension and health benefits), and the Long Term Disability Program (LTD). We are grateful to the SRS staff and Smart Consultants (Smart), 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 SRS, in the actuarial valuations of SRS as of MM/DD/YY, 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 the Board, in our professional opinion, the MM/DD/YY actuarial valuations prepared by the retained actuary provide fair and reasonable assessments of the financial position of SRS.

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

The Senior Consultant is an Enrolled Actuary, a Fellow of the Society of Actuaries, and a Member of the American Academy of Actuaries. He meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. Both the Senior Consultants are experienced in performing valuations for large public retirement systems.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

FSA, FCA, MAAA, EA
Senior Consultant

Consultant

Table of Contents

Section	Item	Page
I	Executive Summary	2
II	General Actuarial Audit Procedure	6
III	Actuarial Assumptions	10
IV	Actuarial Methods	25
V	Funding Policy and Financial Objectives	28
VI	Actuarial Valuation Results	34
VII	Content of Valuation Report	40
VIII	SRS Plan Design Features	44
IX	Final Remarks	48
Appendix		50

SECTION I

EXECUTIVE SUMMARY

Executive Summary

The State Retirement System (SRS) engaged Gabriel, Roeder, Smith & Company (GRS) for an actuarial audit of the recent actuarial valuations, studies and reports on the SRS Plan (pension and health benefits), the SRS System (pension and health benefits), and the Long Term Disability Program (LTD) performed by the retained actuary.

This scope of this actuarial audit includes the following:

- Review and analysis of the results of the actuarial valuations for the year ended MM/DD/YY including an evaluation of the data used, for reasonableness and consistency as well as a review of the mathematical calculations for completeness and accuracy, based on a full replication of the actuarial valuations.
- Evaluate the actuarial cost method and the actuarial asset valuation method in use and whether other methods may be more appropriate for SRS.
- Review 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, inflation, Health Benefit Supplement eligibility rates, and disability rates.
- Determine whether the financial objectives of the retirement programs are being met based on the current funding policies.
- Confirm that the actuarial valuations are performed by qualified actuaries and assess the adherence to Actuarial Standards of Practice (ASOPs) published by the Actuarial Standards Board.

The scope of our engagement also includes a validation of the cost savings projections presented in the SRS Cost Savings Initiatives matrix. The results of this validation will be communicated to the Board in a separate communication.

Summary of Findings

Based on our review of the census data, experience study documents, liability replication, liability calculations for a sample of members, and the actuarial valuation reports, we believe the MM/DD/YY actuarial valuations of the SRS retirement programs are reasonable, are based on appropriate assumptions and methods, and the reports generally comply with the Actuarial Standards of Practice.

We offer the following recommendations based on the valuation methods and assumptions used by the retained actuary in the MM/DD/YY actuarial valuations of the SRS Plan, the SRS System, and the LTD Program.

Actuarial Assumptions

1. In order to improve the overall completeness of the next actuarial experience study report, we recommend the following:
    a. The retained actuary should include more detail regarding the "actuals" and "exposures" underlying the assumptions reviewed, and
    b. The retained actuary should provide a thorough analysis of the underlying inflation assumption and separately identify price inflation from wage inflation.

2. We recommend that the retained actuary modify the simplifying assumption used for the actuarial valuations of active members to assume that the post-retirement mortality assumption will be the mortality assumption for annuitants with benefits greater than $14,400.

3. We recommend that in future experience studies the retained actuary considers the impact of retirement incentives on observed retirement rates, both during the year of the retirement incentive as well as the year (or years) following the retirement incentive.

4. We recommend that in future experience studies the retained actuary thoroughly considers the economic cycle during the period that the assumptions are being studied and apply the appropriate level of weighting to the experience during the assumption setting process if that economic cycle is not expected to continue.

Actuarial Methods

5. We believe that the actuarial methods are reasonable and appropriately applied. As a result, we have no recommendations regarding the application of the actuarial methods.

Funding Policy and Financial Objectives

6. We recommend that the SRS Board consider adopting a formal funding policy which would codify the decisions already made by the Board and the reasons behind the decisions. Additionally, the funding policy can document the steps taken to manage pension risks.

7. We recommend that the retained actuary discuss with the Board possible adjustments to the contribution calculation that will eliminate the current disconnects resulting from (1) the different contribution rates during the lag period, and (2) the calculation of the normal cost rate. The current approach to calculating the funding policy contribution will eventually incorporate these costs into the contribution. However, we believe that these adjustments will allocate the contributions to the most appropriate period of time and keep the contribution rates more stable.

Actuarial Valuation Results

8. In the next actuarial valuation, we recommend that the retained actuary incorporate actual pay history into their valuation of active participants and update the actuarial valuation of the Other-than-Plan retirees.

Content of Valuation Report

9. In order to improve the ability of the report to communicate the assumptions, methods and plan provisions incorporated into the actuarial valuations of the SRS retirement programs, we recommend that the retained actuary incorporate the noted enhancements to future actuarial valuation reports.

SECTION II

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 reports for the SRS Plan, the SRS System, and the Long Term Disability Program as of MM/DD/YY,
- Actuarial Experience Study for the five-year period ending MM/DD/YY,
- SRS Investment Policy Statement, most recently revised MM/DD/YY,
- SRS Strategic Asset Allocation Policy Schematic, approved by the Board on MM/DD/YY,
- A preliminary set of census data for plan participants and beneficiaries as of MM/DD/YY originally provided by SRS to the retained actuary for the actuarial valuations,
- A final set of census data for plan participants and beneficiaries as of MM/DD/YY used by the retained actuary for the actuarial valuations, and
- Detailed liability calculations from the retained actuary for a sampling of 25 participants in the various retirement programs as of MM/DD/YY.

In performing our review, we:

- Reviewed member handbooks and applicable statutes to understand the benefits provided by SRS,
- Reviewed the appropriateness of the actuarial assumptions and methods,
- Reviewed the actuarial valuation reports,
- Replicated the calculation of the actuarial accrued liabilities in our actuarial valuation software, and
- Reviewed the detailed liability calculation of the sample lives, to ensure that the calculations were consistent with the stated plan provisions, actuarial methods and assumptions.

The actuarial audit findings, which follow, are 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 governing board. 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 member in the plan and results in a set of expected future benefit payments for that member. Discounting those future payments for the likelihood of survival 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).

We believe that an actuarial audit should not focus on finding differences in actuarial processes and procedures utilized by the consulting actuary and the auditing actuary. Rather, our intent is to identify and suggest improvements to the process and procedures utilized by SRS's retained actuary. In performing this actuarial audit, we attempted to limit our discussions regarding opinion differences and focus our attention on the accuracy of the calculations of the liability and costs, completeness and reliability of reporting, and compliance with the Actuarial Standards of Practice that apply to the work performed by SRS's retained actuary

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

Actuarial Qualifications

The MM/DD/YY actuarial valuations of the SRS Plan, the SRS System, and the LTD Program were signed by Mr. Smart E. Actuary, FSA, EA, MAAA and Mr. Almost A. Smart, ASA, EA, MAAA. Both Mr. Actuary and Mr. Smart have attained the actuarial credentials noted on the signature line of the actuarial valuation reports and are compliant with Society of Actuaries Continuing Professional Development requirement.

The MM/DD/YY actuarial valuation of the LTD Program was also signed by Mr. OPEB Genius, FSA, MAAA. Mr. Genius has attained the actuarial credentials noted on the signature line of the actuarial valuation report and is compliant with Society of Actuaries Continuing Professional Development requirement.

In all cases, the actuarial valuation reports indicate that the signing actuaries meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in the actuarial valuation reports.

Actuarial Fees

As part of the actuarial audit, GRS was asked to express an opinion regarding whether or not the various fees paid by SRS to the retained actuary are reasonable. SRS provided GRS with the current fee schedule with their retained actuary as well as the actual invoices prepared by the retained actuary from MM/YY through MM/YY.

The fee schedule indicates that SRS pays the retained actuary a total of $109,000 for the annual actuarial valuations of all three retirement programs. Additionally, the fee schedule indicates that SRS pays the retained actuary a total of $73,500 for the experience studies, as needed. It should be noted that the retained actuary also provides a 10% to 20% volume discount depending on the amount of business that is conducted. These fixed fees for actuarial valuations and experience studies appear to be reasonable based on our experiences with similarly sized retirement systems. The hourly rates charged by the retained actuary for services outside of the fixed fee ($175 to $395 per hour) also appear to be reasonable based on our experiences with similarly sized retirement systems.

The total fees that SRS has paid to the retained actuary over the period from MM/YY through MM/YY have averaged approximately $80,500 per month (or close to $1 million per year). This total may be on the high-end of fees paid by similarly sized retirement systems. However, the total fees are highly

dependent on the number of requests, and the complexity of the requests, made by SRS of their retained actuary. The retained actuary does provide the total number of hours worked, by project, on the monthly invoice. This detail should allow SRS to monitor the number of hours worked, by project, and make sure that the number of hours charged are commensurate with the expectations of SRS and the results of the request.

Ultimately, if SRS is pleased with the work product of their retained actuary, then the various fees paid by SRS to their retained actuary are reasonable.

SECTION III

ACTUARIAL ASSUMPTIONS

Actuarial Assumptions

Overview

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 a retirement program. In any statistical projection, assumptions as to future events will drive the process. Actuarial valuations are no exception.

The actuarial valuation reports for all of the SRS retirement programs contain descriptions of the actuarial assumptions which were used in the actuarial valuations as of MM/DD/YY. Additionally, the retained actuary published an actuarial experience study report, dated MM/DD/YY. We conducted a thorough review of these documents in order to assess the reasonableness of the assumptions used in the actuarial valuations.

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 evaluated each individual assumption 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 members,
- retirement patterns among active members, 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 members,
- distribution of form of payment selection, and
- percent of active members who are married and the relationship of the ages of participants and spouses.

Because SRS also administers the 401(h) health care benefit as part of the SRS Plan and the LTD Program, there are additional assumptions that have importance that are not generally part of a standard pension plan valuation. These assumptions are:

- The number of retired members electing the 401(h) health care benefit which is dependent on the number of retired members electing the State health care plan,
- Offsets to benefits payable to members on LTD, and
- Incurred but not reported (IBNR) liability for LTD claims.

Demographic assumptions for retirement programs 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. The measurement of experience is normally affected by simply counting occurrences of an event. For example, in reviewing retirement patterns, an actuary might count the number of actual retirees among males aged 50 with 20 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.

- 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.

Actuarial Experience Study Report – Demographic Assumptions

We believe that the discussion section of the actuarial experience review report, dated MM/DD/YY, did an adequate job of describing each assumption, providing context for the basis of each assumption, and outlining the reason for the proposed assumption going forward.

The report did not contain any information concerning the actual number of members that left active service during the experience period (actuals) nor the number of members that were exposed to the forces that cause members to leave active service (exposures). The report does contain tables that show the percentages of members leaving active service (actual-to-expected ratios, or “A/E ratios”) for both the current assumptions and the proposed assumptions. Without the context of these numbers it is difficult to analyze some of the changes made to the assumptions. For example, when an A/E ratio changes from 160% to 105% (withdrawal assumption for males with 28 years of service as noted on page 78 of the experience study report), did the expected number of terminations increase by several dozen or by one or two?

We recommend that the retained actuary include more detail regarding the "actuals" and "exposures" underlying the assumptions reviewed as part of the next experience study.

We have additional comments related to the mortality rates and the retirement rates. These comments will be discussed in the following sections.

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.

Healthy Post-Retirement Mortality – The most important demographic assumption is post-retirement mortality because this assumption is a predictor of how long pension payments will be made. The current post-retirement mortality assumption is based on the 1994 Group Annuity Mortality (94GAM) table with mortality improvements projected to YY using projection scale BB. The mortality assumption is further adjusted based on the size of the member's benefit. Specifically, healthy retirees who are receiving annual retirement benefits from SRS of less than $6,000 are assumed to have a shorter life expectancy than the base assumption. Similarly, healthy retirees who are receiving annual retirement benefits from SRS of greater than $14,400 are assumed to have a longer life expectancy than the base assumption.

There is ample evidence that a retiree's economic status is a factor in their rates of mortality; therefore, the use of different rates of mortality based on benefit size is very justified. In addition, the retained actuary has selected rates of mortality that appear to provide reasonable margins in the rates of mortality to allow for future mortality improvement.

We believe that this assumption is reasonable and appropriately applied to the current annuitants receiving a benefit from SRS retirement programs.

However, we have some concerns about how this post-retirement mortality assumption is incorporated into the actuarial valuation of the current active members (future retirees). The retained actuary used a simplifying assumption that applies the healthy post-retirement mortality assumption "with no adjustments for small or large benefits" to all future termination and retirement annuity benefits. The result of this simplifying assumption is that the life expectancy for all current active members is based on the mortality table applicable to annuitants receiving a benefit between $6,000 and $14,400.

We understand it would be very complicated for the retained actuary to directly apply the stated post-retirement mortality assumption, as it is currently constructed, in the actuarial valuation of the active members. Most actuarial valuation systems would not allow the user to change the post-retirement mortality assumption at each projected retirement age for active members. As a result, we believe that the use of a simplifying assumption for post-retirement mortality, as it is currently constructed, is reasonable for the actuarial valuation of the active members.

As an illustration, the average active member in the SRS Plan as of MM/DD/YY was approximately 46 years old with 10 years of service and was earning $43,000 per year. Based on the MM/DD/YY actuarial assumptions, the average member's projected retirement benefits are summarized in the following table.

Age at Retirement	Projected Benefit	Benefit Category	Probability of Receipt
50	$7,200	Between $6,000 and $14,400	3.2%
51	8,800	Between $6,000 and $14,400	3.1%
52	10,600	Between $6,000 and $14,400	2.9%
53	12,700	Between $6,000 and $14,400	2.8%
54	14,900	Greater than $14,400	2.7%
55	17,500	Greater than $14,400	2.5%
56	22,300	Greater than $14,400	6.1%
57	27,700	Greater than $14,400	5.4%
58	31,300	Greater than $14,400	7.3%
59	34,200	Greater than $14,400	6.9%
60	36,800	Greater than $14,400	8.1%
61	39,900	Greater than $14,400	6.3%
62	43,300	Greater than $14,400	4.7%
63	46,300	Greater than $14,400	2.8%
64	49,400	Greater than $14,400	2.2%
65	52,700	Greater than $14,400	2.9%

As the table illustrates, it would be more appropriate to apply a simplifying assumption that this member will have the assumed mortality for annuitants with benefits greater than $14,400.

The final MM/DD/YY actuarial valuation data includes approximately 24,000 healthy retired members that have a retirement date after MM/DD/YY. The level of benefits for these new retirees can be summarized as follows:

Benefit Category	Number of Retirees	% of Retirees	Total Annual Benefits	% of Total Benefits
Less than $6,000	6,311	26%	$19,059,611	4%
Between $6,000 and $14,400	5,823	24%	57,222,725	12%
Greater than $14,400	11,826	50%	396,489,418	84%
Total	**23,960**		**$472,771,754**	

Approximately 50% of the new healthy retirements over the past three years are receiving annual benefits greater than $14,400. However, from the perspective of the percentage of annual benefits being paid, the new healthy retirees over the past three years that are receiving annual benefits greater than $14,400 are receiving 84% of the total annual payments to these new retirees. Conversely, the new healthy retirees with annual benefits less than $14,400 are only receiving 16% of the total annual payments to these new retirees.

The use of a simplifying assumption of using the unadjusted mortality rates (rates for members with annual benefits between $6,000 and $14,400) will result in actuarial losses each valuation cycle. That is because, within each new group of retiring members, the majority of these new retirees will ultimately be valued with the mortality for annuitants with benefits greater than $14,400. Additionally, since the $14,400 threshold is a static assumption, the ratio of future retirees exceeding this threshold will continue to increase over time due to inflationary forces.

We believe that the retained actuary should use a simplifying assumption that applies the healthy post-retirement mortality assumption for annuitants with annual retirement benefits greater than $14,400 (the assumption that assumes a longer life expectancy for a larger benefit).

This simplifying assumption would be conservative because there are definitely current active members with projected benefits that are less than $14,400. As a result, the use of this simplifying assumption will result in actuarial gains as each new group of retiring members commences their benefits. However, the magnitude of the actuarial gains will be significantly smaller in size than the actuarial losses resulting from the current simplifying assumption.

Our primary recommendation is that the retained actuary modify the simplifying assumption for the actuarial valuation of active members to assume that their post-retirement mortality assumption will be the mortality assumption for annuitants with benefits greater than $14,400. We estimate that this modification will increase the actuarial accrued liability for active members by approximately $300 million (which equates to approximately a 2% increase in the actuarial accrued liability for active members).

For the next experience study, we encourage the retained actuary to explore alternate methods of analyzing mortality experience (e.g., benefit weighted, liability weighted, etc.) that will result in a mortality assumption that can be more directly incorporated into their actuarial valuation software. As previously stated, there is evidence that a retiree's economic status is a factor in their rates of mortality and we support the general approach of reflecting these differences.

Disabled Mortality – The experience study report also included a recommendation that the mortality assumption for disabled lives be returned to the assumption that was in place prior to YY. This appears to be the elimination of a 10-year set forward in the disabled life mortality table. Based on the A/E ratios in the experience study report, the proposed assumptions do not fit the data particularly well. However, this is often the case when analyzing disabled mortality. The current assumption does appear to be a significant improvement over the prior assumption and does appear to be reasonable in aggregate.

Retirement – Members are eligible to retire with an unreduced benefit at age 65, at age 62 if they have at least 10 years of service, or Rule of 80 (for members hired after MM/DD/YY the Rule of 80 has been replaced with age 60 and 25 years of service or age 55 with 30 years of service). Members are eligible for a reduced benefit at age 50 with five years of service. The rates at which participants are assumed to retire are based on the member's service. The current assumption was developed to be consistent with a portion of the actual experience over the most recent experience study period. The retained actuary noted that they excluded from the study all members who retired as part of an early retirement incentive offer. In our experience, when an early retirement incentive impacts the analysis of retirement rates it not only impacts the year in which it was offered but also impacts the year (or years) following the incentive (depending upon how strong the incentive was). In other words, an increase in the number of retirements in the year of the incentive is followed by a dearth of retirements in the year (or years) that follow.

The following table shows a simple example. Assume that we have 20 employees who are eligible to retire and that, each year, two are expected to retire and two new employees will become eligible to retire. Columns 2 and 3 show the expected experience without a retirement incentive. Columns 4 and 5 show the impact of a retirement incentive in Year 3. The retirement incentive results in two additional retirements in Year 3. These employees were expected to retire in Year 4 and now they

don't because they are already retired. Also, note that the number of eligible retirements is less in Year 4, as well, because there are still only two new employees that become eligible to replace the four actual retirements.

Time Frame	Without Retirement Incentive		With Retirement Incentive	
	Eligible to Retire	Number of Retirements	Eligible to Retire	Number of Retirements
(1)	(2)	(3)	(4)	(5)
Year 1	20	2	20	2
Year 2	20	2	20	2
Year 3	20	2	20	4
Year 4	20	2	18	0
Year 5	20	2	20	2

If we include all 5 years of the study, the retirement rate is 10% per year without the retirement incentive and 9.8% per year with the retirement incentive. If members who retired as part of the retirement incentive are excluded (or exclude only Year 3 from the analysis) the resulting retirement rate from the analysis would be 7.5% (or, 6 divided by 80). Note, however, that if both the year with the incentive and the year following the incentive are excluded from the results then the retirement rate returns back to 10%.

Overall, we believe that the current retirement assumption is reasonable for the SRS retirement programs. Given the lack of "actuals" and "exposures" detail in the experience study report regarding the numbers of retirements, it is difficult for us to comment further on this assumption. In future experience studies, we recommend that the retained actuary consider the impact of retirement incentives on observed retirement rates, both during the retirement incentive as well as the year (or years) following the retirement incentive.

Turnover – The rates at which members are assumed to withdraw (or turnover) prior to eligibility for retirement are based on the member's service. The current assumption was developed to be consistent with the actual experience of the SRS retirement programs over the most recent experience study period. The prior assumption was based on both age and service. In our experience, most often turnover rates are more closely associated with service than with age and therefore, we agree with the retained actuary's decision to use service based rates. We believe that the turnover rate assumption is reasonable for the SRS retirement programs.

Pre-Retirement Mortality – The current pre-retirement mortality assumption for active members is based on the YY Group Annuity Mortality (94GAM) table. Specifically, the assumption that active members die prior to commencing their retirement benefit is 50% of the 94GAM tables projected to YY using projection scale BB. This pre-retirement mortality assumption is different than the post-retirement mortality assumption at the same ages.

It is often the case that the observed pre-retirement mortality of active members is notably different than post-retirement mortality at the ages where members are eligible to retire. This difference is most likely the result of members that are eligible to retire while in poor health, electing to retire, and then subsequently dying shortly thereafter. This results in proportionately fewer pre-retirement deaths in the active membership and proportionately more post-retirement deaths in the early years of retirement. This effect appears to be the case with the SRS retirement programs. Based on the information in the experience study it appears that the mortality assumption for the active employees is reasonable.

Disability Incidence – The current assumption for disability incidence is based on a member's age. The assumption was modified during the experience study to reflect lower rates of disability than were previously assumed. The current assumption appears to be reasonable.

Health Insurance Benefit (HIB) Elections – The current assumption is that 60% of future retirees will receive the HIB and that the proportion of those retirees who also get the dependent premium will be 40%. The assumption is extended into the first year of retirement with actual elections applying after the first year. The current assumption appears to be reasonable.

Load for Optional Form Selection – The current assumption is a load of 0.174% to retirement and termination benefits for the impact of the optional forms of payment not being actuarially equivalent to the single life annuity normal form of payment. There was no information contained in the experience study to support the assumption or to allow a third party to evaluate the assumption.

Alternate Contribution Rate – The retained actuary offsets the amortization payment for unfunded liabilities by an amount equal to the alternative contribution rate multiplied by the payroll for members on whom the alternative contribution rate is made (rehired retirees). In most systems that we work with that have this type of arrangement, the additional contributions received are used to reduce the unfunded liabilities in the year they are received and they are not counted on as a future source of funding. We would remind the retained actuary and SRS that by making this assumption the retained actuary is assuming that the payroll for this group of members will remain constant over the remaining amortization period. There is no documentation in the experience study report to support this assumption. However, that does not mean the assumption is unreasonable.

Adjustment for Contribution Timing – The retained actuary changed the assumption for the timing of when contributions are received from the beginning of the year to throughout the year. The current assumption is reasonable and appropriate.

LTD Rates of Termination of Claims due to Death or Recovery – The retained actuary assumes that members receiving LTD benefits may cease receiving benefits both due to death and recovery from disability. The experience study indicated that the A/E ratio was 132% for males and 163% for females over the experience period studied which indicates that a change in the assumption is warranted. The retained actuary recommended a significant increase (50%) over the prior assumption which resulted in an A/E ratio of 88% for males and 109% for females. It appears that the recent increase in the assumed rates may have "over corrected" for the males. To reduce the possibility of future actuarial losses, we recommend that in the next experience study the retained actuary consider modifications to the assumption in a manner that result in an A/E ratio for both males and females closer to, or in excess of, 100%.

Offsets for Disabled and Active Members – The current assumption is that 90% of members receiving LTD benefits will have an offset to their benefits within three years of becoming disabled. It is assumed that for members with offsets, their average offset will be equal to 45% of their benefit. This assumption appears to be reasonable.

IBNR Load Assumption – The current assumption is a 20% load to the liability for new LTD recipients. This load is to reflect the fact that members have become disabled, and therefore are no longer in the active population that is being valued, but they have not yet been approved for their LTD benefit. This assumption appears to be reasonable.

Post-Retirement Mortality for all SRS System Members – The current assumptions are the YY Group Annuity Mortality table with fully generational projections using Scale BB with adjustments for benefits over $14,400 and under $6,000. These are further adjusted by adding a one year age setback for males and a two year age setback for females. The experience study report indicates that there is insufficient data to make any analysis of these assumptions credible. Based on this assessment of credibility, we would expect that the same mortality assumption would be used for SRS Plan and SRS System retirees. If separate assumptions are to be used, then we recommend that the retained actuary include justification in their next experience study report of why the mortality assumption should be different for the SRS System. Ultimately, the mortality assumption for the SRS System is more conservative than the assumption for the SRS Plan so we believe that this assumption is reasonable.

Other Assumptions – The actuarial valuation also utilizes several other assumptions, some of which include: (1) percentage of active members who are married, (2) assumed difference in age of the member and spouse, and (3) the percent of terminating members electing a refund or deferred annuity. Each of these other assumptions is reasonable.

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.

Actuarial Experience Study Report – Economic Assumptions

The report did not have any discussion or analysis about core price inflation. Usually, the inflation assumption is the building block of the economic assumptions (see discussion below about consistency). Because it is such an important assumption, experience studies generally dedicate a significant portion of the report to analyzing this assumption. There is usually analysis regarding historical inflation and, often, there is analysis about the future outlook for inflation. As part of the salary scale analysis, the experience study report only stated the “wage” inflation assumption with no further analysis. We recommend that the retained actuary provide a thorough analysis of the underlying inflation assumption in future experience study reports.

We have additional comments related to the “wage” inflation and the salary scale assumption. These comments will be discussed in the following sections.

Inflation

Inflation refers to mean price inflation as measured by annual increases in the Consumer Price Index (CPI). This assumption underlies, and is the building block, for most of the other economic assumptions, including the investment return assumption and the assumed rate of salary increases. As such, it is fundamentally important that a consistent inflation assumption is used throughout the assumption review process.

Since YY, the Board has adopted three revisions to the salary increase assumption. As part of each of these assumption changes, there have been changes to the underlying inflation assumption; however, the details of the changes were not always clearly indicated in the documentation we reviewed. Based on the MM/DD/YY actuarial valuation reports, the retained actuary indicates that "wage" inflation is assumed to be 3.00%. It is unclear whether this "wage" inflation is intended to represent core (price) inflation or something larger than core inflation.

For purposes of our actuarial review, we have assumed that the stated "wage" inflation assumption of 3.00% also represents the assumption for core inflation.

Actual historical increases in CPI have averaged about 2.50% over the last 20 years. Average increases in inflation for the 20 years prior to the year 1990 have averaged much higher than the current assumption. However, since this is a forward-looking assumption, historical experience is not the best measure for predicting future increases in inflation. Rather, there are several sources that provide forward-looking inflation expectations. These sources include the bond market, investment consulting firms, surveys of professional forecasters conducted by the Philadelphia Federal Reserve, and assumptions used by the Chief Actuary at the Social Security Administration for projecting the long-term cost of benefits provided by the Social Security Administration.

These sources show similar inflation expectations. Namely, inflation during the next five years is expected to be lower than long-term inflation expectations. Also, each of these sources is consistent with their long-term inflation expectations, and project inflation for the next 10 to 20 years to range from 2.40% to 2.80% annually.

Taking this information into consideration, we believe the current 3.00% "wage" inflation assumption appears to be reasonable, although as stated above, it is unclear whether it represents price inflation or price inflation plus an additional wage or productivity component.

Investment Return

The investment return assumption is one of the principal assumptions in any actuarial valuation. It is used to discount future expected benefit payments to the valuation date 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 investment return assumption is 8.00%. We have analyzed the assumption assuming that the assumption is constructed from a 3.00% inflation assumption plus an annual real rate of return of 5.00%, net of investment fees and administrative expenses paid from the trust.

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 SRS Strategic Asset Allocation Policy Schematic, approved by the Board of Trustees on MM/DD/YY, SRS's current target asset allocation is:

Asset Class	Target
Large Cap U.S. Equities	23%
Mid Cap U.S. Equities	5%
Small Cap U.S. Equities	5%
Developed Large Cap Non-US Equities	14%
Developed Small Cap Non-US Equities	3%
Emerging Markets Non-US Equities	6%
Private Equity	7%
Core U.S. Fixed Income	13%
High Yield U.S. Fixed Income	5%
Emerging Market Debt	4%
Private Debt	3%
Commodities	4%
Real Estate	8%
Cash	0%
Total	100%

In addition to these allocations, the investment policy allows for a 10% Global Tactical Asset Allocation.

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

- JP Morgan
- NEPC
- PCA
- Mercer
- RV Kuhns
- Towers Watson
- BNY Mellon
- Hewitt EnnisKnupp

These investment consulting firms issue reports that describe their capital market assumptions, which include 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.

Given SRS's current strategic target asset allocation and the investment firms' capital market assumptions for YY, the development of the average nominal return, net of investment and administrative fees paid from the trust, is provided in the table below:

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Plan Incurred Expense Assumption	Expected Nominal Return Net of Expenses (6)-(7)		Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)
1	7.14%	3.00%	4.14%	3.00%	7.14%	0.34%	6.80%		12.50%
2	7.26%	2.40%	4.86%	3.00%	7.86%	0.34%	7.52%		10.70%
3	7.99%	3.00%	4.99%	3.00%	7.99%	0.34%	7.65%		13.10%
4	7.58%	2.50%	5.08%	3.00%	8.08%	0.34%	7.74%		14.70%
5	7.61%	2.50%	5.11%	3.00%	8.11%	0.34%	7.77%		14.20%
6	8.27%	2.51%	5.76%	3.00%	8.76%	0.34%	8.42%		14.70%
7	8.24%	2.30%	5.94%	3.00%	8.94%	0.34%	8.60%		15.10%
8	8.61%	2.50%	6.11%	3.00%	9.11%	0.34%	8.77%		14.40%
Average	**7.84%**	**2.59%**	**5.25%**	**3.00%**	**8.25%**	**0.34%**	**7.91%**		**13.68%**

We determined, for each firm, the expected nominal return rate based on SRS's target allocation and then subtracted that investment consulting firm's expected inflation to arrive at their expected real return in column (4). Then we added back SRS's current 3.00% inflation assumption and subtracted an estimated 0.34% for investment fess and administrative expenses (see discussion below) paid from the trust to arrive at an expected nominal return net of expenses. As the table shows, the resulting average arithmetic one-year return of the eight firms is 7.91%. It should be noted that the average administrative and investment expenses for the prior five fiscal years was 0.66%. However, we reduced the offset for the investment expenses related to active management. The reason for the reduced offset is the expectation that the managers will generate enough alpha to at least cover the cost of the active management. No additional alpha for active management is considered.

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 25th, 50th, and 75th percentiles of the 20-year geometric average of the expected nominal return, net of investment and administrative fees paid from the trust, as well as the probability of exceeding the current 8.00% assumption.

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return 25th	50th	75th	Probability of exceeding 8.00% *
(1)	(2)	(3)	(4)	(5)
1	4.21%	6.06%	7.94%	24.3%
2	5.40%	6.98%	8.59%	33.5%
3	4.91%	6.84%	8.82%	34.6%
4	4.55%	6.72%	8.94%	34.8%
5	4.75%	6.83%	8.96%	35.5%
6	5.25%	7.41%	9.62%	42.9%
7	5.32%	7.54%	9.80%	44.5%
8	5.67%	7.80%	9.97%	47.4%
Average	**5.01%**	**7.02%**	**9.08%**	**37.2%**

*Plan's current return assumption net of expenses.

As the analysis shows, there is a 50% likelihood that the 20-year average net nominal return will be between 5.01% and 9.08%. Under the current Actuarial Standards of Practice No. 27, Selection of Economic Assumptions for Measuring Pension Obligations, this is the best estimate range for a reasonable investment return assumption. Further, while the table above documents that the average probability of exceeding the current 8.00% investment return assumption is only 37.2%, it must be noted that the average duration for these return expectations is short-term in nature (7-10 years). If the capital market assumptions were based on a longer time horizon it would be reasonable to assume that the rate of return expectations would be greater.

As a point of reference, the National Association of State Retirement Administrators published a survey in MM/YY of 126 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 7.77%.

The current investment return assumption falls within our best-estimate range and we believe that the current 8.00% assumption is reasonable for this purpose.

In MM/YY, the Actuarial Standard Board adopted changes to ASOP No. 27 which significantly reduced the reasonable range for an acceptable investment return assumption. The effective date for this new standard is for measurement dates on or after MM/DD/YY. While this new standard does not apply to the actuarial valuation that is being audited, SRS may wish to discuss the possible impact of these changes with their retained actuary.

Earnings Progression

Generally, assumed rates of pay increase are usually constructed as the total of three main components:

- Price Inflation – currently 3.00% (see discussion below)
- Economic Productivity Increases (base pay increases above price inflation) – currently 0.00% (see discussion below)
- Merit, Promotion, and Longevity – This portion of the salary increase assumption reflects components such as promotional increases as well as "step" increases and longevity pay. This portion of the assumption is not related to inflation.

In the context of a typical employer pay scale, pay levels are set for various employment grades, or "steps". 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 members through the pay scale.

In the most recent experience study, the retained actuary proposed a base "wage" inflation of 3.00% plus a merit component that varied based on service. The retained actuary recommended changes to the merit component of the salary scale assumption which, when combined with the changes in the "wage" inflation, resulted in a 25% across the board reduction in the salary increase assumption. As most are aware, during the five year period covered by the experience study, the country suffered through what is generally referred to as the "Great Recession". The Great Recession caused severe financial hardship for many state and municipal governments which was passed onto employees in the form of very small pay increases, reductions in force, and furloughs. Given these financial hardships, it can be very difficult to use the observed salary increases during this period as a basis for setting an assumption for the future.

The retained actuary has experience with SRS and may have additional information regarding the appropriateness of the long-term expectation for salary increases above inflation. As a result, this comment is not intended to imply that the current assumption is unreasonable, but only that the retained actuary should thoroughly consider the economic cycle during the period being studied and make adjustments if that economic cycle is not expected to continue. We recommend that the retained actuary and the Board closely monitor the salary experience and update the assumption, accordingly, if it appears that salaries are consistently increasing by more than the current assumption anticipates.

Summary

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

We have the following recommendations regarding the actuarial assumptions:

- In order to improve the overall completeness of the next actuarial experience study report, we recommend the following:
    - The retained actuary should include more detail regarding the "actuals" and "exposures" underlying the assumptions reviewed, and
    - The retained actuary should provide a thorough analysis of the underlying inflation assumption and separately identify price inflation from wage inflation.

- We recommend that the retained actuary modify the simplifying assumption used for the actuarial valuations of active members to assume that the post-retirement mortality assumption will be the mortality assumption for annuitants with benefits greater than $14,400.

- We recommend that in future experience studies the retained actuary considers the impact of retirement incentives on observed retirement rates, both during the year of the retirement incentive as well as the year (or years) following the retirement incentive.

- We recommend that in future experience studies the retained actuary thoroughly considers the economic cycle during the period that the assumptions are being studied and apply the appropriate level of weighting to the experience during the assumption setting process if that economic cycle is not expected to continue.

SECTION IV

ACTUARIAL METHODS

Actuarial Methods

The ultimate cost of the retirement programs administered by SRS is equal to the benefits paid plus the expenses related to operating SRS. This cost is funded through contributions to the programs administered by SRS plus the investment return on accumulated contributions which are not immediately needed to pay benefits or expenses. The projected 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.

Actuarial Cost Methods

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 actuarial accrued liability (AAL). As prescribed by State statute, the retained actuary uses the Projected Unit Credit actuarial cost method (PUC method), where the TPV for an individual is allocated in proportion to accrued and future service at the valuation date. Essentially, the PUC method recognizes years of service when earned, but projects salary to retirement age. As such, the AAL for an individual member is generally equal to the TPV times the ratio of (i) the number of years of covered service on the date of the actuarial valuation, to (ii) the total expected covered service at retirement. There are varying methods that can be used to determine the proportion of the TPV that will be attributed to the AAL.

The normal cost is generally equal to the increase in the AAL due to one additional year of service in the numerator of the ratio described above. The normal cost under the PUC method increases as a percentage of pay for an individual member from the date of hire to the date of retirement. This differs from the behavior of the normal cost under the Entry Age Normal actuarial cost method (the most widely used actuarial cost method in the public sector) where the normal cost is expected to be level as a percentage of pay.

Although the Entry Age Normal actuarial cost method is the most widely used actuarial cost method in the public sector, the PUC method, used in the actuarial valuation of all three retirement programs administered by SRS, is still a commonly used method. The PUC method is one of the six currently accepted cost methods under GASB No. 25 and is a reasonable method for SRS.

The Governmental Accounting Standards Board (GASB) has adopted new accounting standards for Pension Plans (Statements 67 and 68) which will be effective for the MM/DD/YY financial statements of SRS. These new standards specify that the Entry Age Normal actuarial cost method is the only acceptable method for determining the required GASB disclosures. This requirement does not directly affect the actuarial cost method that is adopted by the Board and used to develop the funding requirements. However, the use of different actuarial cost methods will result in the disclosure of multiple actuarial liabilities (one for funding and one for accounting).

We have reviewed the retained actuary's application of the Projected Unit Credit actuarial cost method and we believe that the method is reasonable and appropriately applied.

Asset Valuation Method

The market value of assets can experience significant short-term swings, which can cause large fluctuations in the development of the actuarially determined contributions required to fund the retirement systems. Thus, many systems use an asset valuation method which dampens these short-term volatilities to achieve more stability in the employer contribution. A good asset valuation method places values on a retirement plan's assets which are related to the 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: (1) bear a reasonable relationship to the market value of assets (MVA), (2) recognize investment gains and losses over an appropriate time period, and (3) avoid systematic bias that would overstate or understate the AVA in comparison to MVA.

SRS Plan and LTD Program

The actuarial valuations of the SRS Plan and the LTD Program currently utilize a smoothed asset valuation method that immediately recognizes income equal to the expected return on market value of assets, based on the assumed valuation interest rate (8.00%). Differences between the assumed investment return and the actual market investment return are recognized over a ten-year period. The 10-year smoothing was implemented as of MM/DD/YY for the SRS Plan and as of MM/DD/YY for the LTD Program. The AVA is not constrained to be within a "corridor" around the MVA.

We believe that that the asset valuation method for the SRS Plan and the LTD Program comply with ASOP No. 44. Additionally, the method is reasonable and appropriately applied for the valuation.

SRS System

The Plan currently uses the MVA as the AVA in the annual valuation (i.e., no smoothing). An actuarial valuation based on the MVA has the advantage of using an asset value that is the same as the amount shown in financial reports. It also eliminates the need to explain the use of an asset value other than market value for making decisions regarding benefit enhancements.

Most importantly, the benefits payable by the SRS System are intended to change annually (theoretically "up" or "down") with the funded status of the plan. As a result, the use of MVA to determine the annual funded status of the SRS System is the most appropriate asset method.

We believe that that the asset valuation method for the SRS System complies with ASOP No. 44. Additionally, the method is reasonable and appropriately applied for the valuation.

Summary

We believe that the actuarial methods are reasonable and appropriately applied. As a result, we have no recommendations regarding the application of the actuarial methods.

SECTION V

FUNDING POLICY AND FINANCIAL OBJECTIVES

Funding Policy and Financial Objectives

In funding defined benefit pension plans, governments must satisfy a range of objectives. In addition to the fundamental objective of funding the long-term costs of promised benefits to plan participants, governments also work to: (1) keep employer's contributions relatively stable from year to year; (2) allocate pension costs to taxpayers on an equitable basis; and (3) manage pension risks.

The actual contribution rates to the SRS Plan and the LTD Program are actuarially determined contributions such that the actuarial accrued liability is expected to be fully funded at a future date. When contribution rates are actuarially determined, the resulting contribution rate is comprised of two components, a normal cost rate and an amortization percentage. The normal cost rate is the theoretical percentage of pay that would be required to fund the member's benefits that are expected to be earned over the subsequent year if the retirement program's experience exactly followed the actuarial assumptions. The normal cost of the plan is the weighted average cost of providing benefits to all the active members in the retirement program. For the SRS Plan, the normal cost is expected to gradually decrease in future years as the number of members hired on or after MM/DD/YY (and earning a less valuable benefit) grows.

The amortization amount is the cost of financing the difference between the actuarial accrued liability and the actuarial value of assets. The methods for determining the amortization amount, such as the amortization period, are dictated by the Board's funding policy.

The sum of these two cost components provides the total contribution rate to the SRS retirement programs. The rates applicable to the employer are the total rates less the member contribution rates.

The Board outlined their financial objectives for the retirement programs when the Board adopted new amortization periods at the MM/yy Board meeting. Specifically, the Board adopted a closed 30-year amortization period with level-dollar payments for the 401(a) portion of the SRS Plan. Similarly, the Board adopted a closed 15-year amortization period with level-dollar payments for the LTD Program and the 401(h) portion of the SRS Plan. SRS does not have formal written funding policies for these programs, but the amortization periods adopted by the Board are the first and most important step of funding the long-term costs of the promised benefits.

Adoption of Formal Written Funding Policy

Developing a written funding policy can help decision-makers understand the tradeoffs involved in reaching these goals and document the reasoning that underlies their decisions. By clarifying the funding policy, decision-makers can come to a better understanding of the principles and practices that produce sustainable benefits.

We recommend that SRS adopt a formal funding policy. This policy would codify the decisions already made by the Board and the reasons behind the decisions. Additionally, the funding policy can document the steps taken to manage pension risks. In an effort to keep the employer's pension contribution relatively stable from year to year, a funding policy should: (1) identify key risk areas that add to contribution volatility and (2) identify ways to manage each of those risks.

In YY, GRS published a Research Report titled "Developing a Pension Funding Policy for State and Local Governments." We have included this Report in the Appendix for your reference. This Report provides a framework for developing a robust funding policy.

Financial Objectives

The financial objectives for the SRS Plan (pension and health benefits) and the LTD Program are to (1) maintain reasonably stable contribution rates, and (2) achieve an ultimate funded status of 100%.

If the participating employers of SRS adhere to the current funding policy, then we expect the funded ratio to gradually improve and eventually attain a 100% funded ratio. We believe that the Board's funding policy is an appropriate balance of cost stability and maintaining intergenerational equity. This funding policy is also consistent with the principles and objectives recommended by the Government Finance Officers Association (GFOA) in a report they issued in YY regarding funding policies for defined benefit plans, as well as the Actuarial Funding Policies for Public Pension and OPEB Plans issued by the Conference of Consulting Actuaries Public Plans Committee in MM/YY

However, there are a few aspects of the current funding policy that should be noted.

Procedures for Calculating Actuarially Determined Contributions

As part of the most recent actuarial experience study, the Board adopted two modifications to the procedures for calculating the actuarially determined contributions.

First, the contribution rates are now calculated based on the assumption that the contributions are paid throughout the fiscal year (previously they were assumed to be paid at the beginning of the fiscal year). We believe that this is a very sound procedure for calculating the contribution rates.

Additionally, the actuarially determined contributions are now reduced by the expected Alternate Contribution for the upcoming year. We believe that this is a reasonable procedure, especially given the magnitude of the historical Alternate Contributions. This offset will be very sensitive to the number of return-to-work retirees and the provisions of the return-to-work program within SRS. It will be important for the Board and the retained actuary to always consider the possible impact of plan design and demographic changes on this contribution source when projecting future contribution rates.

Contribution Lag

There is a one-year lag between the valuation date and the effective date of the contribution rate. For instance, the actuarial valuation results as of MM/DD/YY are used to calculate the contribution rate necessary to meet the Board's funding policy. However, this contribution rate will not become effective until MM/DD/YY. This lag is a common occurrence when retirement programs are funded by actuarially determined contributions so that the retirement system and the employers have time to implement the contribution rate changes in advance of the effective date.

The current procedures produce a small disconnect between the funding policy and the calculation of the necessary contributions by the retained actuary. When the contribution rates are calculated as of MM/DD/YY, it is known for certain that the retirement program will receive a different rate of contribution during the lag period (between the valuation date and the effective date of the

contribution). For instance, the MM/DD/YY actuarial valuation indicates that the contribution rate necessary to meet the Board's funding policy must be 22.96% of pay for the SRS Plan. However, it is known that the contribution rate will only be 22.60% of pay during the lag period from MM/DD/YY through MM/DD/YY. As a result, the SRS plan will receive 0.36% of pay (approximately $31.5 million) less than it needs in order to meet the goals of the Board's funding policy for fiscal year YY. Even if all actuarial assumptions are met, the future contribution rates will have to increase in order to make up for the $31.5 million contribution shortfall during the lag period.

We believe that the calculated contribution rates would better achieve the Board's funding policy by incorporating the known contribution differences during the lag period. In most years, this proposed change should not have a material impact on the calculated contribution rates. If this updated procedure was adopted for the MM/DD/YY actuarial valuation, the increase in the necessary contributions effective for the fiscal year beginning MM/DD/YY would be approximately $3 million. However, this procedure could have a material impact on the contributions in years in which the retirement program realizes significant changes in the funded status (through actuarial gains/losses, assumption changes, etc).

Normal Cost for New Hires

As part of each actuarial valuation, the retained actuary calculates a normal cost rate that represents the normal cost for the upcoming year, stated as a percentage of pay. This normal cost rate is calculated for the MM/DD/YY actuarial valuations by taking the normal cost for the upcoming year for active members on the valuation date and dividing by the projected payroll for the upcoming year.

It is important to note that the projected payroll for the upcoming year includes the expected pay for the active members on the valuation date as well as the pay for new hires assumed to replace the current active members assumed to leave active service during the upcoming year. We believe that there is a disconnect between the members included in the normal cost calculation (the numerator or the normal cost rate calculation) and the members included in the projected payroll (the denominator).

We believe that this approach understates the normal cost rate.

When the actuarially determined contributions are based on the normal cost rate, as calculated by the retained actuary for the MM/DD/YY actuarial valuation, the contributions received by the retirement program will only be allocated to the normal cost associated with active members on the valuation date. None of the contributions received by the retirement program will be allocated to the normal cost for the new hires during the partial year that they are assumed to accrue benefits.

When no contributions received by the retirement program are allocated to the normal cost for members in their year of hire, then there will be an actuarial loss each year in the actuarial valuation due to new entrants. This new entrant loss can be seen, in part, on Page 31 of the MM/DD/YY actuarial valuation report for the SRS Plan. Specifically, the actuarial loss for "new entrants/rehires" was $97 million for the prior fiscal year and a total of $401 million for the past five years. It should be noted that, since this actuarial loss also includes the losses associated with rehires, losses strictly associated with new hires should be less. When this new entrant normal cost is incorporated into the actuarial valuation through an actuarial loss, the liability is added to the existing unfunded actuarial accrued liability and funded over the current amortization period (30 years as of MM/DD/YY for the 401(a) benefits).

It is important to note that the liability associated with the new entrant normal cost will ultimately be included in the actuarial valuation. However, we believe that the most appropriate approach would be to incorporate the new entrant normal cost into the calculation of the normal cost rate for the upcoming year. This approach allocates the cost of new hires to the period where they provided services to taxpayers, prevents the deferral of the costs, and keeps the contribution rates more stable.

The retained actuary could address this disconnect in a number of ways. A few examples are:

- The calculation of the normal cost rate would only include normal cost and projected pay for active members on the valuation date based on a modified projected payroll.
    - Normal Cost (numerator): same normal cost for active members on the valuation date
    - Modified Projected Payroll (denominator): retained actuary would calculate a modified projected payroll only for the active members on the valuation date, which would only include pay for the portion of the year that the active members are assumed to work.
- The calculation of the normal cost rate would include normal cost and projected pay for active members on the valuation date and new entrants based on a modified normal cost.
    - Modified Normal Cost (numerator): retained actuary would develop an estimate for the normal cost of new entrants during the year and add the estimate to the normal cost for the active members on the valuation date
    - Projected Payroll (denominator): same projected payroll for active members on the valuation date and expected new entrants
- The actuarial cost method could be modified such that each member's benefits are attributed over a period that begins with the first valuation that the member is included in the actuarial valuation. In other words, the application of the actuarial cost method would result in a zero accrued liability on the member's first valuation date and a zero normal cost in the first fractional year of a member's participation in the retirement program.

Each of these proposed solutions will increase the resulting normal cost rate, but they will all eliminate the actuarial losses that occur each year as a result of the new entrants.

Financial Objectives of the SRS System

According to the SRS System's MM/DD/YY actuarial valuation report, the State Attorney General issued an opinion letter on MM/DD/YY stating that System benefits cannot be "diminished or impaired" as defined under Article 29 of the State Constitution. It is our understanding that the Board has adopted the Attorney General's opinion letter.

Prior to the Attorney General's opinion letter, the provisions of the SRS System allowed the Board to modify the benefits (up or down) paid by the retirement program in order to maintain a funded status between 95% and 105%.

The only contributions to the SRS System now are the current 7% of pay contributions (by the employer and the member) for the few remaining active members. If all of the actuarial assumptions are met, the SRS System will run out of money before all of the benefits are paid. However, assets are being accumulated in the SRS Plan to guarantee the benefits of members who retired on or after MM/DD/YY from the SRS System.

As long as the State continues to guarantee the benefits payable to SRS System members who retired prior to MM/DD/YY, then the objective of paying all promised benefits of the SRS System is being met. As of MM/DD/YY, the benefits payable to SRS System members who retired prior to MM/DD/YY were underfunded by $68,234.

Summary

We believe that the funding policy is being reasonably applied and the financial objectives of the retirement programs are being met.

We recommend that SRS Board consider adopting a formal funding policy which would codify the decisions already made by the Board and the reasons behind the decisions. Additionally, the funding policy can document the steps taken to manage pension risks.

We also recommend that the retained actuary discuss with the Board possible adjustments to the contribution calculation that will eliminate the current disconnects resulting from (1) the different contribution rates during the lag period, and (2) the calculation of the normal cost rate. The current approach to calculating funding policy contributions will eventually incorporate these elements. However, we believe that these adjustments will allocate the contributions to the most appropriate period of time.

SECTION VI

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 workforce and financial 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 SRS through the Plan, the System and the LTD Program were reasonably incorporated in the actuarial valuations of these programs.

Data

As part of our actuarial audit, we received a preliminary set of census data for plan participants and beneficiaries as of MM/DD/YY originally provided by SRS to the retained actuary for the actuarial valuations. Additionally, we received a final set of census data for plan participants and beneficiaries as of MM/DD/YY used by the retained actuary for the actuarial valuations. Finally, we received a copy of the data questions from the retained actuary with SRS responses.

We used this data, along with the census summaries included the valuation reports, to review the valuation data process. In addition, we received the retained actuary's procedures for pay smoothing for active members and valuing the deferred vested members.

In total, we believe that the final valuation data used by the retained actuary is reasonable and valid for its purpose.

Actuarial Valuation Results

To verify the accuracy of the retained actuary's valuation results, GRS performed independent valuations, as of MM/DD/YY, of the following plans:

- SRS Plan (pension and health benefits)
- SRS System (pension and health benefits)
- Long Term Disability Program

The replication valuations were based on the final valuation data provided by the retained actuary. The replication uses the same methods and procedures that were used by the retained actuary. The results show that the retained actuary's numerical results are reproducible within acceptable tolerance ranges.

Generally accepted actuarial standards and practices provide actuaries with the basic mathematics and frameworks 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. Generally, differences in actuarial liabilities of 5% or less are considered within acceptable tolerance ranges.

As the following tables show, our replications of the retained actuary's valuation results are all less than 2%. As a result, we believe that the actuarial accrued liabilities presented in the retained actuary's valuation reports provide a reasonable representation of the actuarial accrued liability based on the stated assumptions, methods and procedures.

	GRS REPLICATION			FINAL JUNE 30, 2013 VALUATION		
	401(a) Account	401(h) Account	Total	401(a) Account	401(h) Account	Total
Total Present Value of Benefits						
Active Members	22,986,625,643	820,713,859	23,807,339,502	22,890,415,225	828,368,548	23,718,783,773
Inactive Members	1,562,656,891	47,029,537	1,609,686,428	1,613,619,133	47,018,704	1,660,637,837
Retired Members and Beneficiaries	22,417,092,986	702,297,782	23,119,390,768	22,398,414,156	694,187,656	23,092,601,812
Disabled Members*	872,528,460	38,906,473	911,434,933	871,779,172	38,925,197	910,704,369
Other-Than-Plan Members	1,578,432	5,224,216	6,802,648	1,650,427	5,618,364	7,268,791
Post-1981 System Members	412,704,278	0	412,704,278	412,582,843	0	412,582,843
TOTAL	48,253,186,690	1,614,171,867	49,867,358,557	48,188,460,956	1,614,118,469	49,802,579,425
Difference	*0.1%*	*0.0%*	*0.1%*			
Actuarial Accrued Liability						
Active Members	14,659,399,217	693,792,699	15,353,191,916	14,613,709,501	699,070,334	15,312,779,835
Inactive Members	1,562,656,891	47,029,537	1,609,686,428	1,613,619,133	47,018,704	1,660,637,837
Retired Members and Beneficiaries	22,417,092,986	702,297,782	23,119,390,768	22,398,414,156	694,187,656	23,092,601,812
Disabled Members*	872,528,460	38,906,473	911,434,933	871,779,172	38,925,197	910,704,369
Other-Than-Plan Members	1,578,432	5,224,216	6,802,648	1,650,427	5,618,364	7,268,791
Post-1981 System Members	412,704,278	0	412,704,278	412,582,843	0	412,582,843
TOTAL	39,925,960,264	1,487,250,707	41,413,210,971	39,911,755,232	1,484,820,255	41,396,575,487
Difference	*0.0%*	*0.2%*	*0.0%*			
Normal Cost (beginning of year)	1,104,383,373	32,172,038	1,136,555,411	1,099,143,459	32,745,588	1,131,889,047
Difference	*0.5%*	*-1.8%*	*0.4%*			

* Includes disabled members currently receiving of benefits from the Plan as well as disabled members currently receiving benefits from the LTD Program and eligible for deferred benefits from the Plan.

	GRS REPLICATION	FINAL JUNE 30, 2013 VALUATION
	System Valuation	
Actuarial Accrued Liability		
Active Members	17,413,339	17,413,339
Inactive Members	12,675,602	12,675,602
Non-Members	3,294,486	3,294,486
Retirees**	399,648,020	399,517,054
TOTAL	433,031,447	432,900,481
Difference	*0.0%*	
	LTD Program	
Actuarial Accrued Liability		
Active Members***	129,989,928	132,870,587
LTD Retirees	199,170,325	199,726,230
TOTAL	329,160,253	332,596,817
Difference	*-1.0%*	
Normal Cost (beginning of year)	15,256,352	15,312,600
Difference	*-0.4%*	

** Includes liability for benefits guaranteed by the State and by the Plan.
*** Includes liability for IBNR.

As part of our replication valuation, GRS requested sample participant 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. The requested sample participants included active and inactive members from the SRS Plan, SRS System and the LTD Program.

There are a few issues that were discovered during the replication process and subsequent review of the sample participants. These issues will be discussed below.

Active Members. At the onset of the review, we requested that the retained actuary provide sample liability calculations for active members in the SRS Plan, SRS System and the LTD Program. The retained actuary provided enough detail to show probabilities of decrement by age, estimated pay and benefits by age, and values of benefits or pay by age for each decrement in sufficient detail to verify the calculation of the present value of benefits, present value of pay, accrued liability and normal cost for the sample calculations requested.

We have previously noted our comments on the application of the actuarial cost method (Section IV) and the actuarial assumptions (Section III). We identified one additional element of the actuarial valuation of active members in the SRS Plan that the retained actuary should consider for future actuarial valuations.

> *Actual Pay History* – The retained actuary receives five years of historical salary from SRS each year as part of the actuarial valuation process. The retained actuary uses the prior two years of actual pay to calculate a "smoothed average pay" that is used to project a member's pay into the future. However, the retained actuary does not use the actual historical pay to calculate a member's current final average pay. The use of historical pay would only have an

impact on the projected benefits payable to members that are assumed to terminate with a vested benefit or retire over the first few years following the valuation date. In most cases, after the first few years following the valuation date, the member's actual historical pay would not factor in to the calculation of the member's projected benefits.

It is not uncommon to disregard the actual pay history when performing an actuarial valuation, but the use of actual pay history has become more notable since the recent recession and resulting flat salaries. We recommend that the retained actuary consider the use of actual pay history in the calculation of a member's final average salary.

We do not believe that this change will have a material impact on the actual valuation but we believe this approach would make better use of the data elements provided by SRS.

Based on our review of the other aspects of the actuarial valuation, the liability determination of active participants was reasonable and appropriately determined for the SRS Plan, the SRS System and the LTD Program.

Inactive Members. At the onset of the review, we requested that the retained actuary provide sample liability calculations for inactive members that are due a benefit from the SRS Plan and the SRS System. The retained actuary provided enough detail to verify the liability amount, benefit amount, form of benefit, age of participant, and age of beneficiary (where applicable) for the sample calculations requested.

Based on our review, the liability determination of inactive members in the SRS Plan and the SRS System 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 liability calculations for members currently receiving benefits in the SRS Plan, SRS System, and the LTD Program. The retained actuary provided enough detail to verify the liability amount, benefit amount, form of benefit, age of participant, and age of beneficiary (where applicable) for the sample calculations requested.

We identified a few elements of the actuarial valuation of annuitants in the SRS Plan that the retained should update for future actuarial valuations.

Pension Benefits Payable to Other-than-Plan Retirees – We reviewed one sample life where the liability of a 99-year-old retiree was being calculated based on a life annuity where the first three years were guaranteed (immediate 3-year certain-and-life payment form). The retained actuary confirmed that the annuitant should not have been valued with guaranteed payments since the member had been retired for more than three years. Additionally, the retained actuary reviewed their valuation for the remainder of this group and confirmed that updating the actuarial valuation for this entire group would result in a $77,210 decrease to the Other-than-Plan pension liabilities.

Health Benefits Payable to Other-than-Plan Retirees – We reviewed one sample life where the liability of an annuitant was calculated based on an actuarial valuation date of MM/DD/YY. The retained actuary confirmed that the annuitant was valued with an incorrect valuation date. Additionally, the retained actuary reviewed their valuation for the remainder of this group and

confirmed that updating the actuarial valuation for this entire group would result in a $193,529 decrease to the Other-than-Plan health benefit liabilities.

As indicated, the impact of these annuitant changes on the actuarial valuation is not significant but they should be corrected for future actuarial valuations. Based on our review of the other aspects of the actuarial valuation, the liability determination of annuitants was reasonable and appropriately determined for the SRS Plan, the SRS System and the LTD Program.

Summary

We believe that the actuarial valuation results were developed in a reasonable manner. In the next actuarial valuation, we recommend that the retained actuary incorporate actual pay history into their valuation of active participants and update the actuarial valuation of the Other-than-Plan retirees.

SECTION VII

CONTENT OF THE VALUATION REPORT

Content of the Valuation Report

ASOP No. 4, Measuring Pension Obligations and Determining Pension Plan Costs, provides guidance for performing actuarial valuations of pension plans, and ASOP No. 41, Actuarial Communications, provides guidance for communicating the results. These Standards of Practice 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 an actuarial valuation report on a pension plan should include:

- The name of the person 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, the 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.
- Cautions about any risk or uncertainty in the results of the actuarial valuation.

Our review of actuarial valuation reports includes the MM/DD/YY valuation report for the SRS Plan, the SRS System, and the LTD Program. The actuarial valuation reports complied with the applicable Actuarial Standards of Practice and thoroughly communicated the assumptions, methods and plan provisions incorporated into the MM/DD/YY actuarial valuations. The communication of the actuarial valuation results was well organized and provided stakeholders sufficient information to understand how the contribution rates were calculated.

We have noted a few modifications to the SRS Plan actuarial valuation report that would allow the report to better comply with ASOP Nos. 4 and 41 as well as to more clearly communicate the components of the actuarial valuation.

Actuarial Disclosures

ASOP No. 41 indicates that "the actuary should consider what cautions regarding possible uncertainty or risk in any results should be included in the actuarial report." The actuarial valuation reports for the SRS System and the LTD Program include the following statement:

> *Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for those measurements, and changes in plan provisions or applicable law. Due to the limited scope of this report, Smart performed no analysis on the potential range of such future measurements.*

We would recommend that the retained actuary incorporate a similar statement into the SRS Plan actuarial valuation report in order to address the risk and uncertainty and to better comply with ASOP No. 41.

References to Disabled Members throughout the Actuarial Valuation Report

There are two distinct groups of disabled members that participate in the SRS Plan. These two groups are:

- Disabled members that are currently receiving benefits from the LTD Program and are eligible for a deferred benefit from the SRS Plan, and
- Disabled members that are currently receiving an annuity from the SRS Plan.

The references to these groups (whether they are separate or combined) are not consistent throughout the actuarial valuation report. We recommend that the retained actuary review all of the references in the actuarial valuation report to either (or both) of these groups and ensure that the groups are referenced in a consistent manner throughout the report.

Section 8, GASB Disclosure and CAFR Information

On page 42, as part of the Actuarial Certification, the actuarial valuation report states: "The funding method is the projected unit-credit method as prescribed in State Revised Statutes Section 38.757A."

We believe that this statement would be more appropriate stated similar to the following: "The funding method is the projected unit-credit method as prescribed in State Revised Statutes Section 38-737."

Section 9, Summary of 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 the following suggestions to improve the overall communication of the valuation methods and assumptions.

Post-Retirement Mortality for Active Members – The healthy post-retirement mortality assumption is dependent on the amount of the annual benefit payable to the member. For active members, the retained actuary incorporates a simplifying assumption that applies the healthy post-retirement mortality assumption "with no adjustments for small or large benefits" to all future termination and retirement annuity benefits. It would improve the overall communication of mortality assumption in the actuarial valuation report if the retained actuary disclosed this simplifying assumption.

Post-Retirement Assumption for Other-than-Plan Retirees – Other-than-Plan Retirees are receiving historical COLA increases and health supplements from the SRS Plan while also receiving their primary benefit from the SRS System. The "benefit category" for post-retirement mortality purposes for this group is based on the sum of all pension benefits payable to these members from the SRS System and the SRS Plan. It would improve the overall communication of mortality assumption in the actuarial valuation report if the retained actuary clarified how the "benefit category" was determined for this group.

Actuarial Value of Assets – Since the SRS Plan guarantees a portion of SRS System benefits, a corresponding portion of the SRS System liabilities and assets are included in the actuarial valuation (and resulting contribution calculation) for the SRS Plan. The valuation reports for the SRS Plan and the SRS System both clearly indicate the market value of assets that are attributable to the SRS System benefits guaranteed by the SRS Plan. The actuarial valuation of the SRS Plan also includes a separate actuarial value of assets that is associated with these assets from the SRS System. However, the actuarial valuation report for the SRS System only provides the market value of assets. According to the retained actuary, the same 10-year smoothing method is applied to the assets in the SRS System and a corresponding portion of the resulting actuarial value of assets is included in the actuarial valuation for the SRS Plan. We recommend that the retained actuary include a description in the actuarial valuation report of the SRS Plan of how the actuarial value of assets attributable to the SRS System benefits guaranteed by the SRS Plan are determined. To be completely thorough, the retained actuary could also consider showing the derivation of the actuarial value of assets for the SRS System.

Section 11, Plan Provisions

The presentation of the major plan provisions is generally complete and understandable. We do have the following suggestion to improve the overall communication of the plan provisions.

Pre-Retirement Death Benefits – The plan provisions in the valuation report make it clear that the Board reduced the interest rate to be credited on the withdrawal of contributions from 8% to 4%, effective MM/DD/YY, and from 4% to 2%, effective MM/DD/YY. However, the description of the Pre-Retirement Death Benefits should indicate that the interest rate credited on the balances paid to the beneficiaries of a pre-retirement death remained at 8%.

Summary

In general, the actuarial valuation reports complied with the applicable Actuarial Standards of Practice and thoroughly communicated the assumptions, methods and plan provisions incorporated into the MM/DD/YY actuarial valuations. In order to improve the overall ability of the reports to communicate these items, we recommend that the retained actuary incorporate the noted enhancements into future actuarial valuation reports.

SECTION VIII

SRS PLAN DESIGN FEATURES

SRS Plan Design Features

In MM/YY, the results of the most recent Public Fund Survey were published. The Survey includes 126 of the nation's largest public retirement systems and is sponsored by the National Association of State Retirement Administrators and the National Council on Teacher Retirement.

We screened the survey data to identify retirement systems that were comparable to SRS. Through this screening, we identified 10 statewide retirement systems (including SRS) that cover general employees and teachers but do not cover public safety employees. These 10 retirement systems are scattered across the country, but three of the retirement systems (Colorado, Utah and Nevada) are in close proximity to State.

The following tables will summarize the survey data for these 10 retirement systems. The responses for these 10 retirement systems are based on the results of their actuarial valuations for fiscal years ending in YY.

Retirement Eligibility

Plan Name	Normal Retirement (age/svc)	Early Retirement (age/svc)
State SRS	65/any, 62/10, Rule of 80; Rule of 85 for new hires after MM/DD/YY	50/5
Colorado State	65/5; hired before M/D/Y: 50/30, Rule of 80 w/min age 55; hired MM/DD/YY: any/35, Rule of 80	60/5, 55/20, 50/25
Delaware State Employees	62/5, 60/15, any/30; 65/10, 60/20, any/30 for employees hired after MM/DD/YY	55/15, any/25
Kansas PERS	65/any, 62/10, Rule of 85; 65/5, 60/30 for those hired after 6/30/09	55/10
Mississippi PERS	60/4, any/25; 60/8 for those hired after M/D/Y; age 65/4, any/30 for employees hired after MM/DD/YY	60/4 for employees hired after MM/DD/YY
Nevada Regular Employees	65/5, 60/10, any/30; for new hires on or after M/D/Y: 65/5, 62/10, any/30	Participants may retire at any time once vested
Rhode Island ERS	Varies based on date of hire and retirement eligibility as of M/D/Y and M/D/Y, new EEs are SSNRA/5	55/20
South Carolina RS	65/5, any/28; 65/8, Rule of 90 for employees hired after MM/DD/YY	60/5, 55/25
Utah Noncontributory	any/30, 65/4; any/35 for new hires after M/D/Y	any/25, 60/20, 62/10
Virginia Retirement System	65/5, 50/30; Rule of 90 for employees hired after MM/DD/YY	50/10, 55/5; 60/5 for employees hired after MM/DD/YY

SRS has very similar Normal Retirement eligibility provisions to the entire comparison group. However, SRS does have one of the more permissive Early Retirement eligibility provisions of the comparison group. Early Retirement at age 50, with five years of service, is a reasonable plan design feature, but it does stand out within this comparison group.

It should be noted that Nevada allows a terminated vested member to commence their benefit at any age with a 4% reduction in their accrued benefit for every year the member commences prior to their unreduced retirement age.

Benefit Determination

Plan Name	Benefit Multiplier	Post-Retirement Increase Provisions	Social Security
State SRS	2.1% for first 20 years, 2.15% for 20 to 25 years, 2.2% for 25 to 30 years, and 2.3% for 30 or more years	Based on excess earnings above 8%, up to 4% annually	Yes
Colorado State	2.50%	Varies by date of retirement; automatic, generally, CPI up to 2%, compounded	No
Delaware State Employees	1.85%	Ad hoc as approved by the general assembly	Yes
Kansas PERS	1.75%	Ad hoc as approved by the legislature	Yes
Mississippi PERS	2.0% for the first 25 years and 2.5% for each year thereafter	Automatic 3%, simple, until age 55, then compounded thereafter. For new hires afterMM/YY, onset of compounding is delayed until age 60.	Yes
Nevada Regular Employees	2.5%, and 2.67% for svc earned after 7/1/01; for those hired on or after 1/1/10, 2.5%	After 3 years of receiving benefits, auto 2% annually, rising gradually to 5% annually, compounded, after 14 years of receiving benefits; COLA capped at 4% for employee hired on or after MM/DD/YY	No
Rhode Island ERS	Varies based on dates of hire and retirement eligibility. For unvested (10 yrs) participants as of 7/1/05: 1.6% for first 10 yrs, 1.8% for yrs 11-20, 2.25% for yrs 21-26, 2.5% for yrs 26-30. New hybrid, effective 7/1/12, includes DB multiplier of 1.0%	Effective MM/DD/YY, risk-adjusted COLA targeting 2% annually, compounded. 5-year smoothed investment return less 5.5% with a 0% floor and 4% cap	Yes
South Carolina RS	1.82%	Lesser of one percent or $500	Yes
Utah Noncontributory	2.00%; 1.75% for employees hired after MM/DD/YY	For those hired before MM/DD/YY, automatic based on CPI up to 4%, simple. For those hired after 6/30/11, based on CPI to to 2.5%, simple.	Yes
Virginia Retirement System	1.70%; 1.65% for members not vested as of MM/DD/YY	Automatic based on CPI up to 5%; 3% max for non-vested members as of MM/DD/YY	Yes

Amongst this comparison group, SRS has the third-highest benefit multiplier. However, it should be noted that the members in the two retirement systems with higher benefit multipliers (Colorado and Nevada) are not covered by Social Security.

It is important to be aware of the membership's Social Security coverage when plan design features of two different retirement systems are being compared. The benefits paid by retirement systems, where their membership is also covered by Social Security, are not generally impacted by the Social Security Benefits. However, Social Security coverage means that the member and the employer are each contributing an additional 6.2% of pay to the Social Security Administration. These members will receive additional benefits in retirement, beyond the benefits payable by the retirement systems.

Contribution Rates

Plan Name	Employee Contribution Rate	Employer Contribution Rate	For FY Ended
State SRS	10.74%	10.11%, plus 0.63% for the retiree health care benefit	MM/DD/YY
Colorado State	8.00%	15.65%	MM/DD/YY
Delaware State Employees	3.0% of earnings above $6,000; 5% of earnings above $6,000 for those hired after YY	7.84%	MM/DD/YY
Kansas PERS	4.0% or 7.0%, depending on employee election	8.77% for state and school; 7.34% for local governments	MM/DD/YY
Mississippi PERS	9.00%	12.93%	MM/DD/YY
Nevada Regular Employees	12.25%, paid by employers for most members as a pre-tax cost-sharing plan, in lieu of salary increases or by salary reduction as certified by employers.	12.25%, paid by employers for most members as a pre-tax cost-sharing plan, in lieu of salary increases or by salary reduction as certified by employers.	MM/DD/YY
Rhode Island ERS	8.75% for state employees, 9.5% for teachers	22.98% for state employees; 22.32% for teachers	MM/DD/YY
South Carolina RS	6.50%	10.73%	MM/DD/YY
Utah Noncontributory	Non-contributory; those hired after 6/30/11 must pay any required contribution above the employer's statutory maximum contribution rate of 10%	16.04% to 18.76%; 17.38% as a weighted average	MM/DD/YY
Virginia Retirement System	5.00%	Rates vary by employer, with a weighted average of approximately 7%. School divisions and political subdivisions may elect to pick up the 5.00% member contribution on behalf of their employees.	MM/DD/YY

Even though SRS has the third-highest benefit multiplier amongst this comparison group, the employer contribution rate and the total contribution rate are close to the middle of the comparison group. However, that member contribution rate is the second largest within this comparison group.

It should be noted that differences in actuarial assumptions, in addition to differences in plan design features, can impact the contribution rates.

Summary

Based on a comparison of 10 statewide public retirement systems with similar membership characteristics, SRS has one of the larger benefit multipliers but only an average employer contribution rate. When comparing plan design features, it is important to keep in mind that the members of SRS are also covered by Social Security.

SECTION IX

FINAL REMARKS

Final Remarks

The auditing actuarial firm, Gabriel, Roeder, Smith & Company (GRS), is independent of the 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. The retained actuary has access to information and a long history of retirement plans similar to SRS. We understand that the retained actuary may agree with some of our recommendations, while rejecting others. We ask that the retained actuary and SRS consider our recommendations carefully. We hope that the retained actuary and SRS find these suggestions useful.

APPENDIX

GRS RESEARCH REPORT

APPENDIX E
LETTER OF REFERENCE

TEACHERS' RETIREMENT SYSTEM

STEVE BULLOCK, GOVERNOR

www.trs.mt.gov

STATE OF MONTANA

1500 EAST SIXTH AVENUE
PO BOX 200139
HELENA, MONTANA 59620-0139

1-866-600-4045
406-444-3134

January 29, 2016

ND Teachers' Fund for Retirement – ND Retirement and Investment Office
Attn: Fay Kopp, Chief Retirement Officer – Deputy Executive Director
1930 Burnt Boat Drive, P.O. Box 7100
Bismarck, ND 58507-7100

RE: Letter of Reference for Gabriel Roeder Smith and Company (RFP Number: 190-16-01)

Proposal Review Committee and Board of Trustees of the Teachers' Fund for Retirement:

The purpose of this letter is to serve as a formal Letter of Reference for Gabriel, Roeder, Smith and Company (GRS).

GRS conducted an actuarial audit of the Montana Teachers' Retirement System (TRS) in January, 2015 and presented the final actuarial audit report to our Board of Trustees in May, 2015. Based on the scope of the actuarial audit, GRS was engaged to evaluate and express an opinion on the reasonableness of the actuarial methodologies employed, the reasonableness of the assumptions recommended, and the reasonableness of the actuarial reports and factors provided by our consulting actuary. The Dallas-based GRS team was led by Ryan Falls.

Overall, we feel that we received a thorough and beneficial actuarial audit. Most importantly, we received confirmation that the actuarial valuation prepared by our consulting actuary provides a fair and reasonable assessment of the financial position of TRS. Additionally, we received some thought-provoking considerations on how to possibly enhance our actuarial information in the future.

The actuarial audit was completed in compliance with the terms of the contract, on time, and within budget. GRS is not currently providing any services to TRS.

You are welcome to contact me directly if you would like to discuss our experiences with GRS further. I hope you have a successful actuarial audit.

Sincerely,

Shawn Graham
Executive Director
Montana Teachers' Retirement System
Email: shawngraham@mt.gov
Phone: 406-444-3134

GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

STATE OF NORTH DAKOTA
ND TEACHERS'FUND FOR RETIREMENT
ND RETIREMENT AND INVESTMENT OFFICE
COST PROPOSAL
REQUEST FOR PROPOSAL ACTUARIAL AUDIT SERVICES
RFP NUMBER: 190-16-01
DATE DUE: FEBRUARY 16, 2016 – 2:00 P.M. CST

Gabriel, Roeder, Smith & Company ♦ 5605 North MacArthur Blvd. Suite 870♦ Irving, TX 75038
Contact: Ryan Falls, Senior Consultant
Phone Number: 469-524-1802 ♦ Fax: 469-524-0003♦E-mail: ryan.falls@gabrielroeder.com

PART 2

COST PROPOSAL

ATTACHMENT 4

COST PROPOSAL FORMAT

Cost Proposal
2015 Actuarial Audit
ND Teachers' Fund for Retirement

	Estimated Total Hours	Total Fixed Fee*
Actuarial Audit	115 hours	$ 34,500

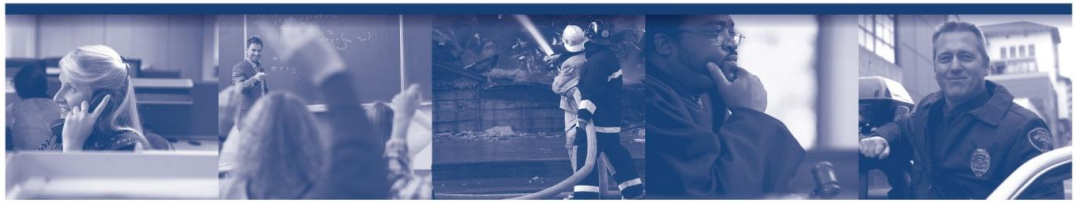
*Total Fixed Fee does not include travel expenses (including transportation, lodging, meals and other travel related expenses) and should not be included in your proposal. Travel expenses for the presentation to the TFFR Board of Trustees in July 2016 will be reimbursed if the Chief Retirement Officer has given prior approval for each individual to incur such expenses. NDTFFR is under no obligation to reimburse the consultant if no approval was given.

Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

North Dakota Teachers' Fund for Retirement

Finalist Interview - Actuarial Audit Services

Cavanaugh Macdonald
March 17, 2016



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Agenda

- Actuarial Audit Process
  - Understanding
  - Methodology
  - Management of project
- Experience and Qualifications
- Cost
- Why Select Cavanaugh Macdonald?

Purpose of an Audit

- Actuarial services
  - Very important services to the System
  - Highly technical, complex and very specialized
- Difficult for Board to evaluate retained actuary's work
- Yet as fiduciaries, Board is responsible for the accuracy and reliability of the actuarial work

Scope of Services

- Replication and evaluation of 2015 actuarial valuation results
  - Review data
  - Determine accuracy of calculations
  - Resolve material differences
  - Reconcile any material differences in key metrics
- Evaluate appropriateness of actuarial assumptions and methods recommended in 2015 experience study
  - Reasonable
  - Consistent with Actuarial Standards of Practice (ASOPs)
  - Appropriate for NDTFFR benefit structure and funding objectives

Scope of Services in RFP

- Assess the accuracy of actuarial information for GASB reporting
- Evaluate reasonableness of funding projections under alternative investment return scenarios
- Are reports accurate and comprehensive?
  - Conform to applicable Actuarial Standards of Practice
  - Effective communication of results
  - Look for improvements

Not the Purpose of Actuarial Audits

Audit Work

- Objective part of audit
  - Plan provisions coded correctly
  - Assumptions and methods applied correctly
  - Data used appropriately
  - Calculations accurate
  - Replication valuation directly addresses all of these issues
- Subjective part of audit
  - Selection and evaluation of assumptions and methods
- Both objective and subjective
  - Experience study report
  - Actuarial valuation report
  - Projection results

Our Approach to the Audit

- Maintain a constructive mindset
  - Improve the understanding of, or confidence in, the actuarial services provided
  - Avoid recommendations that are “nit picky” or simply personal preference
  - Improve the actuarial process and/or final work product

- Non-technical issues
  - Open channels of communication
    - Periodic updates
    - No surprises at end
  - Timeliness
  - Collegial atmosphere

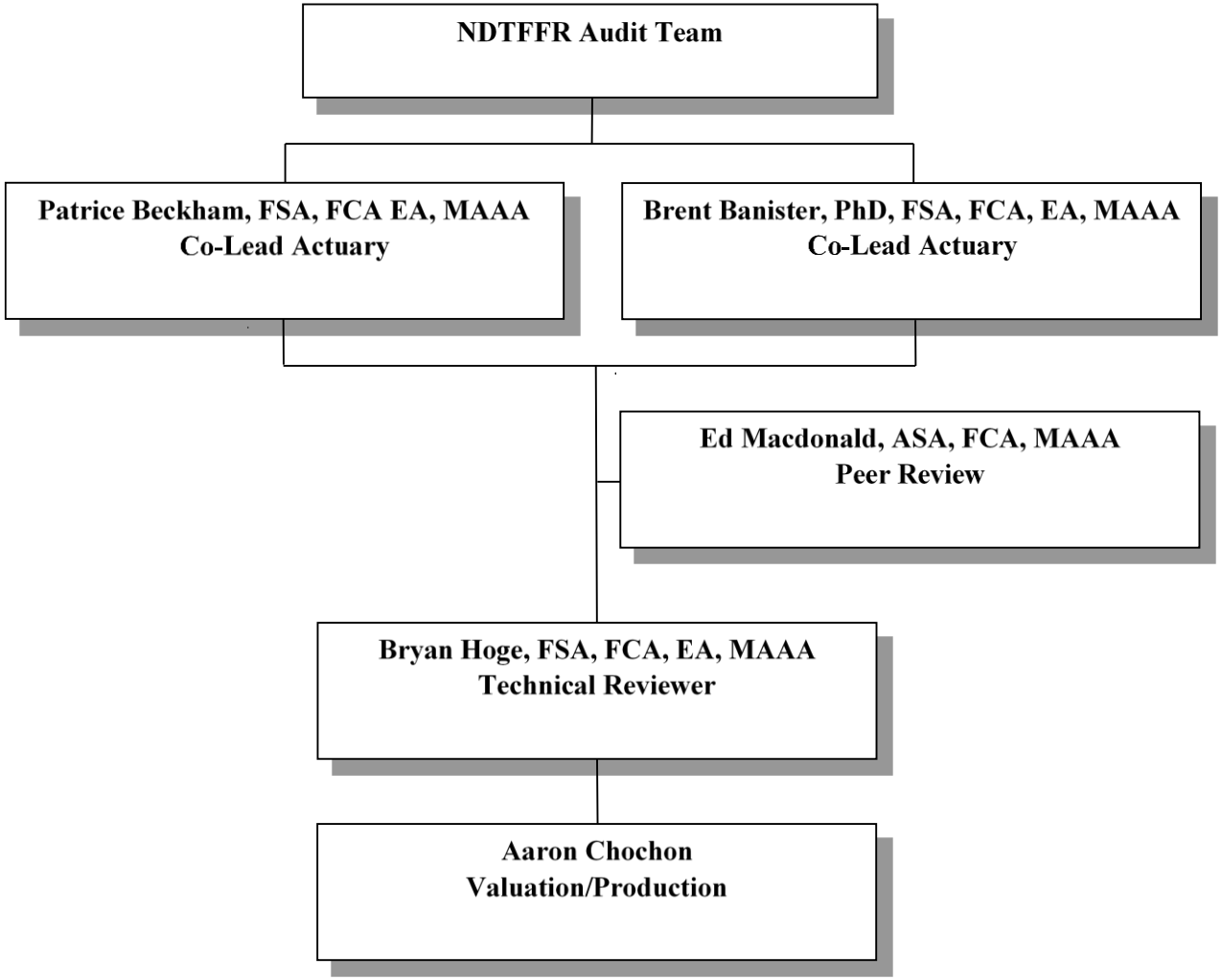
Our Methodology

- Data review
- Actuarial assumptions and methods
- Accuracy of valuation results
- Review of reports
- Review of actuarial projections

Management Plan

- Work Plan/Timeline set out in proposal
  - Understand the process and time needed for each task
  - Limited involvement by NDTFFR staff
  - Involvement of Segal is more variable
  - Available CMC staff to start immediately to ensure a positive “jump start”
  - Timeframe is comfortable
  - Focus first on replication of funding valuation, GASB results, and projections
  - Draft report provided ahead of deadline of June 23, 2016

NDTFFR Audit Team



Minimum Qualifications

- Firm:
  - Five (5) years of experience: CavMac has 11 years
  - Five (5) public pension clients: CavMac has 59 public pension clients including 21 statewide systems like NDTFFR

- Lead actuary
  - Fellow of Society of Actuaries and Enrolled Actuary
    - Three team members meet this requirement
    - Pat Beckham, Brent Banister and Bryan Hoge
  - Five (5) years of experience with public plans
    - Pat has 29 years and Brent has 22 years

Audit Experience

- Recent audit work
  - Public School and Education Employees Retirement System of Missouri
  - Texas Municipal Retirement System
  - Montana Public Employees Retirement Administration
  - Oklahoma Police Pension and Retirement System
  - Missouri State Employees' Retirement System
  - Utah Retirement System
  - Sioux Falls, South Dakota
- Takeovers (replication of last valuation)
  - 13 plans in last 3 years

Minimum Qualifications

Name	Highest Degree	Title	Years Experience
Patrice Beckham	BS, Math	Principal	39
Brent Banister	PhD Math	Chief Pension Actuary	22
Ed Macdonald	BS, Computer Science	President	30
Bryan Hoge	BS, Actuarial Science	Senior Actuary	11
Aaron Chochon	BA, Math	Senior Analyst	5

Costs

- Fixed fee: $37,500
- Will complete the audit in timely fashion and to your satisfaction as well as ours
- No additional costs to NDTFFR other than approved travel expenses

Why Cav Mac?

- Experience and qualifications
  - Specialize in public plans
  - Qualifications far exceed minimums (firm and actuaries)
  - Highly credentialed team – 3 FSAs
  - Significant audit and takeover experience
  - Client references including letters
- Provide perspective on materiality of differences
- Work cooperatively and collegially with Segal
  - We have experience on both sides of the table
  - Comfortable expressing our opinions, but respectful of those of others

Cavanaugh Macdonald
CONSULTING, LLC

The experience and dedication you deserve

North Dakota Teachers' Fund for Retirement

Request for Proposal for Actuarial Audit Services

RFP Number: 190-16-01

Due: February 16, 2016

Technical Proposal

Submitted by:
Patrice A. Beckham, FSA, FCA, EA, MAAA
Principal and Consulting Actuary

Brent A. Banister, PhD, FSA, FCA, EA, MAAA
Chief Pension Actuary

Cavanaugh Macdonald Consulting, LLC
3906 Raynor Parkway, Suite 106
Bellevue, NE 68123
405-902-4461 – Phone; 405-902-4464 – Fax

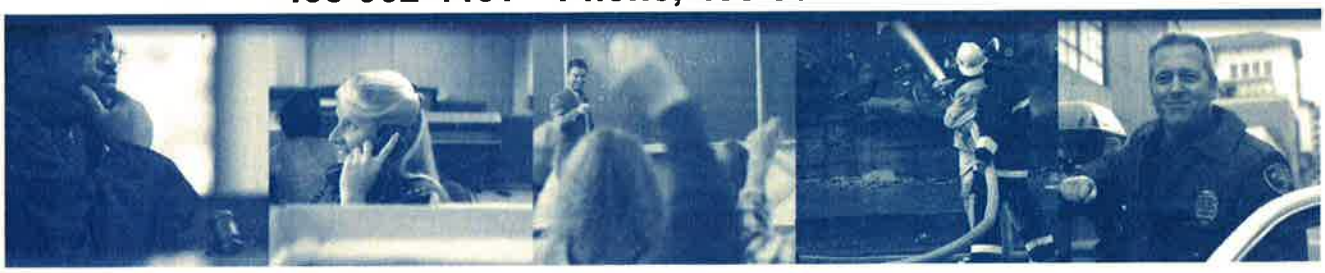


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TABLE OF CONTENTS

Transmittal Letter

6.01 Proposal Format and Content
1. Technical Proposal
2. Cost Proposal – Provided in a separately-sealed envelope

6.02 Introduction 1

6.03 Understanding of the Project 3

6.04 Methodology Used for the Project 8

6.05 Management Plan for the Project 11

6.06 Experience and Qualifications 14

6.07 Cost Proposal (Attachment 4) Provided in a separately-sealed and labeled envelope 27

6.08 Required Attachments 28

Appendix A – Reference Letters

Appendix B - Sample Actuarial Audit Report

Cavanaugh Macdonald
CONSULTING, LLC
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TRANSMITTAL LETTER

February 16, 2016

Ms. Fay Kopp
Chief Retirement Officer – Deputy Executive Director
ND Teachers' Fund for Retirement – ND Retirement and Investment Office
1930 Burnt Boat Drive
Bismarck, ND 58507

Re: RFP #190-16-01 For Actuarial Audit Services

Dear Ms. Kopp:

Cavanaugh Macdonald Consulting, LLC (CMC) is pleased to offer this proposal to the North Dakota Teachers' Fund for Retirement (NDTFFR) to provide actuarial audit services. We are particularly qualified for this assignment due to the following:

(1) Both the firm and the lead consultants exceed the minimum qualification requirements.
(2) We specialize in working with and for public retirement systems.
(3) Our consultants have a broad level of experience and expertise with public retirement systems.
(4) Our firm has significant experience in providing actuarial auditing services.

We will deliver a quality report to the Board in a timely and efficient manner for a reasonable cost. Please feel free to check with our references about our commitment to exceeding expectations.

We, the undersigned, hereby certify that we have read the RFP in its entirety and fully understand the requirements listed therein. We further certify that we are authorized agents of the respondent and are empowered to submit the response to the RFP and authorized to sign a contract with NDTFFR and that our proposal will be honored for at least 90 days.

We welcome this opportunity to work with NDTFFR and look forward to assisting you with this important project.

Sincerely,

Patrice A. Beckham, FSA, EA, FCA, MAAA
Principal and Consulting Actuary

Edward Macdonald, ASA, FCA, MAAA
President

3906 Raynor Pkwy, Suite 106, Bellevue, NE 68123
Phone (402) 905-4461 • Fax (402) 905-4464
www.CavMacConsulting.com
Offices in Englewood, CO • Kennesaw, GA • Bellevue, NE

6.02 INTRODUCTION

Proposals must include the complete name and address of offeror's firm and the name, mailing address, and telephone number of the person the State should contact regarding the proposal.

Cavanaugh Macdonald Consulting, LLC (CMC) was founded in 2005 to offer state and local governments the experience and dedication they deserve in retaining actuarial consulting services for their employee pension and benefit plans. Over the last ten years, CMC has grown to a firm of more than $10 million in revenue and has become a premier actuarial firm specializing in working for public plans. We provide actuarial consulting services solely to public sector plans so 100% of our revenue is derived from public sector actuarial consulting services.

The complete name and address of our firm is shown below:

Cavanaugh Macdonald Consulting, LLC
3550 Busbee Parkway, Suite 250
Kennesaw, GA 30144
Office: 678.388.1700
Fax: 678.388.1730

The name and contact information for the person the State should contact regarding this proposal is:

Patrice A. Beckham, FSA, FCA, EA, MAAA
Principal and Consulting Actuary
Cavanaugh Macdonald Consulting, LLC
3906 Raynor Parkway, Suite 106
Bellevue, NE 68123
402-905-4461 – Phone; 402-905-4464- Fax
PatB@CavMacConsulting.com

Proposals must confirm that the offeror will comply with all provisions in this RFP. The proposal must disclose any instances where the firm or any individuals working on the contract has a possible conflict of interest and, if so, the nature of that conflict (e.g. employed by the State of North Dakota.

We hereby certify that we have read the RFP in its entirety, fully understand the requirements listed therein, and intend to comply with all provisions other than certain concerns about insurance (see page 7).

We also certify that neither the firm nor any individuals working on the contract has a possible conflict of interest.

Proposals must be signed by a company officer empowered to bind the company. An offeror's failure to include these items in the proposals may cause the proposal to be determined to be non-responsive and the proposal may be rejected.

The President of Cavanaugh Macdonald Consulting, LLC, Mr. Ed Macdonald, has signed the cover letter of this proposal. He is empowered to bind the company.

6.03 UNDERSTANDING OF THE PROJECT

Offerors must provide comprehensive narrative statements that illustrate their understanding of the requirements of the project, deliverables, project schedule, and contract terms and conditions. Offerors must also identify any pertinent issues and potential problems related to the project.

Understanding of the Requirements of the Project

As part of its fiduciary duty, the Board of Trustees of NDTFFR must assure themselves that the actuary retained to perform annual valuations and periodic experience investigations is not only technically competent, but is painting an accurate picture of the financial condition of the systems in accordance with generally accepted actuarial standards. In addition, the Trustees must be sure that the retained actuary is making sound recommendations regarding the appropriate assumptions and methods used in developing that picture. Beyond that, NDTFFR is a large financial entity and the retained actuary's work has a direct and significant impact on all stakeholders. In addition to the implications of the funding valuation, the new GASB 68 accounting standard result in employers' financial statements being impacted by the actuary's work. To that end, the Fund is soliciting proposals for an actuarial audit of the retained actuary's June 30, 2015 valuation and the 2015 Experience Study.

The performance of these audit services requires a high level of skill and specialized training, along with detailed insight into key issues for public retirement systems. Cavanaugh Macdonald is a leading consulting firm in the public sector marketplace. We have conducted actuarial audits for the following systems:

- Arizona State Retirement System,
- Public Employees' Retirement System of Nevada,
- Utah Retirement System,
- Missouri State Employees' Retirement Systems,
- Montana Public Employees' Retirement System Defined Benefit Plan,
- Oklahoma Police Pension and Retirement System,
- Texas Municipal Retirement System, and
- Missouri Public School Retirement System and Public Education Employees Retirement System.

In addition, we have performed services very similar to actuarial review and auditing services in the transition of more than 15 new plans over the last five years. As a result, we are well qualified to provide these services to NDTFFR.

The basic purpose of an actuarial audit is to provide independent verification and analysis of the actuarial assumptions, procedures, and methods utilized by the system's retained actuary and the results produced by the retained actuary in performing the annual actuarial valuation of the system. Reviews generally fall into one of three categories: rule-of-thumb, sampling or peer review, and full replication. The first is not much more than a "smell test" and, while the least expensive,

usually will not provide the level of assurance that most systems require. Full replication, while more expensive, allows for an in-depth review of the actuarial valuation results, provides the System with the greatest degree of feedback on issues of concern, enables differences to be quantified, and generates the highest confidence level for the system in the appropriateness and accuracy of the end results of the valuation. A full replication audit is our preferred approach for the reasons listed above and we are pleased that NDTFFR has chosen this replication approach.

Scope of Audit

Pursuant to the RPF, we will review the valuation work performed for the funding valuation, as well as the GASB 67 and 68 reports for NDTFFR. Specific items included in the project include:

- Review of the data used including the appropriateness of the member census data and verification of the census data (with any adjustments used in the valuation);

- Evaluation of the accuracy of the key actuarial metrics including the present value of future benefits, actuarial accrued liability, normal cost, actuarial contribution rate, and funded ratio by ensuring the accuracy of the mathematical calculations and verifying that all appropriate benefits are valued and actuarial assumptions and methods are applied correctly;

- Review and evaluation of the demographic and economic actuarial assumptions and actuarial methods recommended in the 2015 Experience Study and used in the June 30, 2015 valuation including their consistency, reasonableness and compatibility;

- Review of funding projections under alternative investment return scenarios and evaluation of the reasonableness of the projection results;

- Effective communication of the actuarial valuation results of the NDTFFR June 30, 2015 actuarial valuation reports, as well as their accuracy, completeness, and compliance with applicable Actuarial Standards of Practice (ASOPs);

- Review of the actuarial information for reporting under GASB 67 and 68 with an evaluation of the accuracy and completeness of the information provided; and

- Provide an opinion on whether or not the valuations were performed by qualified actuaries and were performed in accordance with principles and practices prescribed by the Actuarial Standards Board.

We will be very thorough in our review of these items, but we do not feel it is constructive for non-material differences in actuarial opinions to be considered as key findings in the audit process. Therefore, we will attempt to ensure that our comments focus on items which will improve the valuation process, results, and reporting of the System. It is our recommended process that we first discuss all material findings with the System, then reconcile our findings with the retained

actuary, and then reflect those ultimate findings in our final report which is intended to improve the valuation and/or experience study process.

As stated previously, the basic purpose of an actuarial review is to provide independent verification and analysis of the assumptions, procedures, and methods utilized by the System's retained actuary and the results produced by the retained actuary.

We don't foresee any potential problems in providing the audit services listed in the RFP, but we would point out that the retained actuary's full cooperation will be necessary to resolve any key differences. While we don't have any reason to doubt that Segal will fully cooperate, we have been in situations where the retained actuary has not been particularly helpful in resolving differences so we mention it here so NDTFFR can ensure Segal's willingness to fully cooperate.

Deliverables

As described above, a significant amount of work will be performed during the actuarial audit. However, there is only one deliverable, a written report that will discuss the scope of the project, our methodology and findings. The content of the report will include the various bullets outlined on the prior page under "Scope of Project" including the accuracy of the June 30, 2015 funding valuation and projection results, the actuarial information prepared for GASB reporting, the evaluation of the actuarial assumptions and methods recommended in the 2015 Experience Study and used in the 2015 valuation report, and the accuracy and completeness of the actuary's reports. We will attend the Board meeting in July to present the findings in person.

Project Schedule

The RFP indicates that the contract will be issued around March 29, 2016 and the start date will be around April 1, 2016. The draft report is due to NDTFFR by June 23, 2016 with the final report due no later than July 12, 2016. These key dates effectively set the beginning and ending dates for the project. The remaining milestones of the audit process are shown in the following table. Based on our prior experience in conducting actuarial audits, it is advantageous to complete the replication of the valuation far in advance of the due date of the draft report in case there are differences to resolve between Segal and our valuation results. Our proposed timeline reflects the desire to permit sufficient time, if needed, to resolve differences or to gather additional information.

6.03 Understanding of the Project

Milestone	Estimated Completion Date	Responsible Party
Contract awarded	March 29, 2016	
Initial conference call with NDTFFR staff	April 1, 2016	CMC/NDTFFR
Formal request of information from NDTFFR	April 1, 2016	CMC
Request valuation data file and full set of assumptions used in 2015 valuations from Segal	April 4, 2016	CMC
Receipt of information from NDTFFR including member and financial data	April 6, 2016	NDTFFR
Begin programming of valuation software for replication valuation	April 6, 2016	CMC
Receipt of requested information from Segal	April 8, 2016	Segal
Begin review of most recent experience study report	April 25, 2016	CMC
Request to Segal for detailed test life output for selected members	May 6, 2016	CMC
Receive detailed test life output from Segal	May 13, 2016	Segal
Complete programming of CMC software and compare CMC valuation results to Segal results	May 18, 2016	CMC
Identify any material differences in valuation results that require resolution	May 20, 2016	CMC
Complete review of most recent experience study and document suggestions/comments/recommendations	May 25, 2016	CMC
Resolve any material differences in valuation results	June 3, 2016	CMC/Segal
Draft of audit report	June 10, 2016	CMC
Receive comments from System staff and retained actuary	June 24, 2016	NDTFFR/Segal
Final report to NDTFFR	July 6, 2016	CMC
Letter summarizing results for inclusion in NDTFFR's FY 2016 CAFR	July 9, 2016	CMC
Draft of Board presentation	July 10, 2016	CMC
Board Presentation	July 21, 2016	CMC

Contract Terms and Conditions

After a careful review of the contract terms and conditions identified in the RFP, we are happy to report that we can meet most of the requirements. There are, however, a few of the insurance requirements that we do not or cannot meet. We believe that our current insurance coverage is consistent with industry standards and that these differences can be resolved.

1. Item 1 specifies General Liability limits of $250,000 per person and $1,000,000 per occurrence. While we have the $1 million per occurrence coverage, we do not have the per person amount as part of our current coverage.
2. Item 2 specifies Automobile Liability limits of $250,000 per person and $1,000,000 per occurrence. While we have the $1 million per occurrence coverage, we do not have the per person amount as part of our current coverage.
3. Item 3 requires Workers Compensation for all states in which work is performed relative to this contract. We do not believe that the delivery of a report in North Dakota qualifies as "working" in North Dakota and so do not anticipate requesting coverage from the North Dakota Department of Workforce Safety and Insurance.
4. Item 4 requires a stop gap endorsement. Adding such a provision to our policies may require additional expense, so we would like to make this item a matter of negotiation if possible.
5. For the requirements of insurance policies on the second page of the appendix, item 4 requires that "the State shall have all the benefits, rights and coverages of an additional insured under these policies that shall not be limited to the minimum limits of insurance required by this agreement or by the contractual indemnity obligations of the Contractor." Our current General Liability policy is endorsed that it will only provide additional insured status for the minimum limits specified in the contract. Therefore, the additional insured status would not extend to the Umbrella Policy.
6. For the requirements of insurance policies on the second page of the appendix, item 5a, the Waiver of Subrogation clause does not indicate which coverage this clause applies to. We can provide the Waiver on General Liability and Workers Compensation, but not Automobile Liability.

6.04 METHODOLOGY USED FOR THE PROJECT

Offerors must provide comprehensive narrative statements that set out the methodology it intends to employ. Offerors must illustrate how the methodology will serve to accomplish the work and provide the deliverables described in the scope of work within the State's project schedule.

As we mentioned earlier, Cavanaugh Macdonald has successfully completed many actuarial audits in the past so we have a reliable methodology in place for the audit of NDTFFR. Our approach to meeting the objectives of this review, as listed in Scope of Services of the RFP, is set out below.

The first step is a conference call with NDTFFR staff to discuss and gather, if not readily available, all data relevant to the actuarial valuation – benefit provisions, actuarial valuation and experience study reports, financial information and census data – and to review the specific goals of the audit. In addition, we will provide an informational request letter to the retained actuary asking for a detailed listing and explanation of all assumptions, loads, and methods utilized in the valuation process, and for an electronic copy of the active and retired data files used in the last valuation.

a) Data Review

In this step, we will make a detailed comparison of the census data provided by NDTFFR and the demographic information supplied by the retained actuary, Segal, to ensure the System data is being appropriately processed. Data fields will be checked to ascertain whether all necessary data items are being submitted and then utilized properly, and whether total headcounts, payroll, benefits, and member contributions are the same on both data sets. This is an important step in the audit process.

It is very common for data from large systems to have some information missing or incorrect. Perhaps a few dates of birth or gender codes are not on some records or are not logical (e.g., birth date after 1/1/2012). Provided that only a small portion of the plan membership records are affected, the actuary can make assumptions to fix the records so that they can be included in the valuation. We will review the methodology used by the retained actuary to address missing or inconsistent data for reasonableness.

b) Actuarial Valuation Assumptions and Methods

An analysis of all demographic and economic assumptions utilized in the valuation will be conducted. As part of this task we will review the 2015 Experience Study performed by the retained actuary which formed the basis for the current set of actuarial assumptions, as well as the prior Study. On that basis, we will form an opinion as to whether the recommendations were appropriate and supported by the observed experience. We will also compare the major economic assumptions with those used by

other statewide public employee retirement systems for informational purposes, not as the evaluation tool of the retained actuary's assumptions.

We will provide an opinion on whether the retained actuary's actuarial methods, including the cost method, asset valuation method and the amortization method for the unfunded actuarial accrued liability, are reasonable, internally consistent, and in line with generally accepted actuarial standards (as set out by the Actuarial Standards Board). We will also comment on whether the methods and procedures are appropriate for the valuation of NDTFFR given their funding policy. If we believe that other methods might be more reasonable or appropriate, we will provide our input for the Board's consideration.

c) *Accuracy of the Actuarial Valuation Results*

As requested, the verification that all appropriate benefits have been valued correctly, actuarial assumptions have been applied correctly, and mathematical calculations are complete and accurate will be accomplished by a full replication of the June 30, 2015 valuation of NDTFFR. In addition, we will identify certain "test lives" requests for certain members in the data set. Each of the test lives is selected to satisfy specific demographic profiles we have identified based on the applicable benefit and eligibility provisions. We will request that the retained actuary provide the direct output of these individual calculations from their software.

In addition, we will ask the retained actuary to provide a spreadsheet showing detailed breakdowns of the actuarial measurements (present value of future benefits, actuarial accrued liability, and normal cost) developed in the 2015 valuation by decrement separately for active members. We will also ask for this information on the detailed test lives we request. This information, provided by the retained actuary for selected individuals, should allow us to determine if the methods and procedures employed by the retained actuary are reasonable and consistent with generally accepted actuarial standards and procedures; that the selected benefit provisions are included properly in the valuation results and that actuarial methods and assumptions pertaining to the calculations are accurately performed. We will verify all of the key metrics from the valuation including the present value of future benefits, actuarial accrued liability, unfunded actuarial accrued liability and amortization thereof, normal cost rate and actuarial contribution rate. During this process, we will review the application of the actuarial cost method, asset valuation method and the amortization method for reasonableness, appropriateness, and compliance with Actuarial Standards of Practice. Finally, we will form an opinion as to whether the valuation results fairly reflect the financial condition of the system.

As part of our review of the June 30, 2015 valuation, we will also review the information prepared by Segal for the Governmental Accounting Standards Board Statements 67 and 68 and provide an opinion on the reasonableness of the results.

d) *Review of Actuarial Reports and Other Actuarial Communications*

We will review the actuarial reports prepared for NDTFFR and provide our opinion as to the completeness of their contents, the reasonableness of the actuarial information and the effective communication of the reported findings. Our review will incorporate comments as to whether the reports and other actuarial communications meet the various requirements of applicable Actuarial Standards of Practice. Where we believe there is room for improvement, we will provide constructive remarks intended for the enhancement of the report. However, we recognize that the staff and Board are the main users of the reports so their preferences should ultimately drive the content and organization of the actuarial reports, as long as the reports are complete and meet applicable ASOPs.

e) *Review of Actuarial Projections*

Actuarial projections illustrating future funding results has become an integral part of the actuarial consulting services provided to public retirement systems. As part of the Scope of Services, we will review multiple projections using alternative investment return scenarios to ensure the reasonableness of the retained actuary's projections. While we will not replicate the projections, there are key actuarial measurements from the retained actuary's projections that will permit us to evaluate the projection results for reasonableness. We create and use a projection model for nearly all of our clients so we are aware of the challenges and limitations of projections and are confident we can thoroughly review Segal's projections and form an opinion regarding their reasonableness.

6.05 Management Plan for the Project

Offerors must provide comprehensive narrative statements that set out the management plan it intends to follow and illustrate how the plan will serve to accomplish the work and furnish the deliverables described in the scope of work within the State's project schedule.

Please see page 6 of this proposal for our proposed Work Plan/Timeline which also indicates the party responsible for each step in the Work Plan. This document will serve as our management plan and it clearly illustrates how the various aspects of the project will be accomplished. Additional detail on the specific responsibilities of each member of the NDTFFR team is set out in Section 6.06 of this proposal. This information should be sufficient to explain how the project will be managed and the plan to meet the deadlines and provide the deliverable (audit report).

As the proposed timeline indicates, we will need some time from NDTFFR staff at the beginning of the project to obtain the required data, reports, and guidance on the goals of the audit. We will also need some NDTFFR staff time near the end of the project to provide us with input on the draft report and presentation. We do not expect either amount of time to be significant in nature. In addition, if clarification of any of the plan provisions is needed while we are reviewing the test life output a phone call or two may be needed. Again, we expect the time involved to be minimal.

The involvement with the current NDTFFR actuary, Segal, is more unpredictable. Again, we will need support from Segal initially to provide us with the processed census data, full set of actuarial assumptions and procedures along with the detailed test life output. As we work to replicate the valuation results, we may or may not have technical questions about how Segal programmed certain benefit provisions. We have no reason to believe there will be difficulty getting this type of cooperation from Segal, but both NDTFFR and Segal should agree, in advance, on the level of support to be provided during the audit process.

6.05 Management Plan for the Project

Offerors must provide a narrative or organizational chart that describes the organization of the project team. The organizational chart must illustrate the lines of authority, designate the individual responsible and accountable for the completion of each component and deliverable of the RFP, and indicate where the work will be performed.

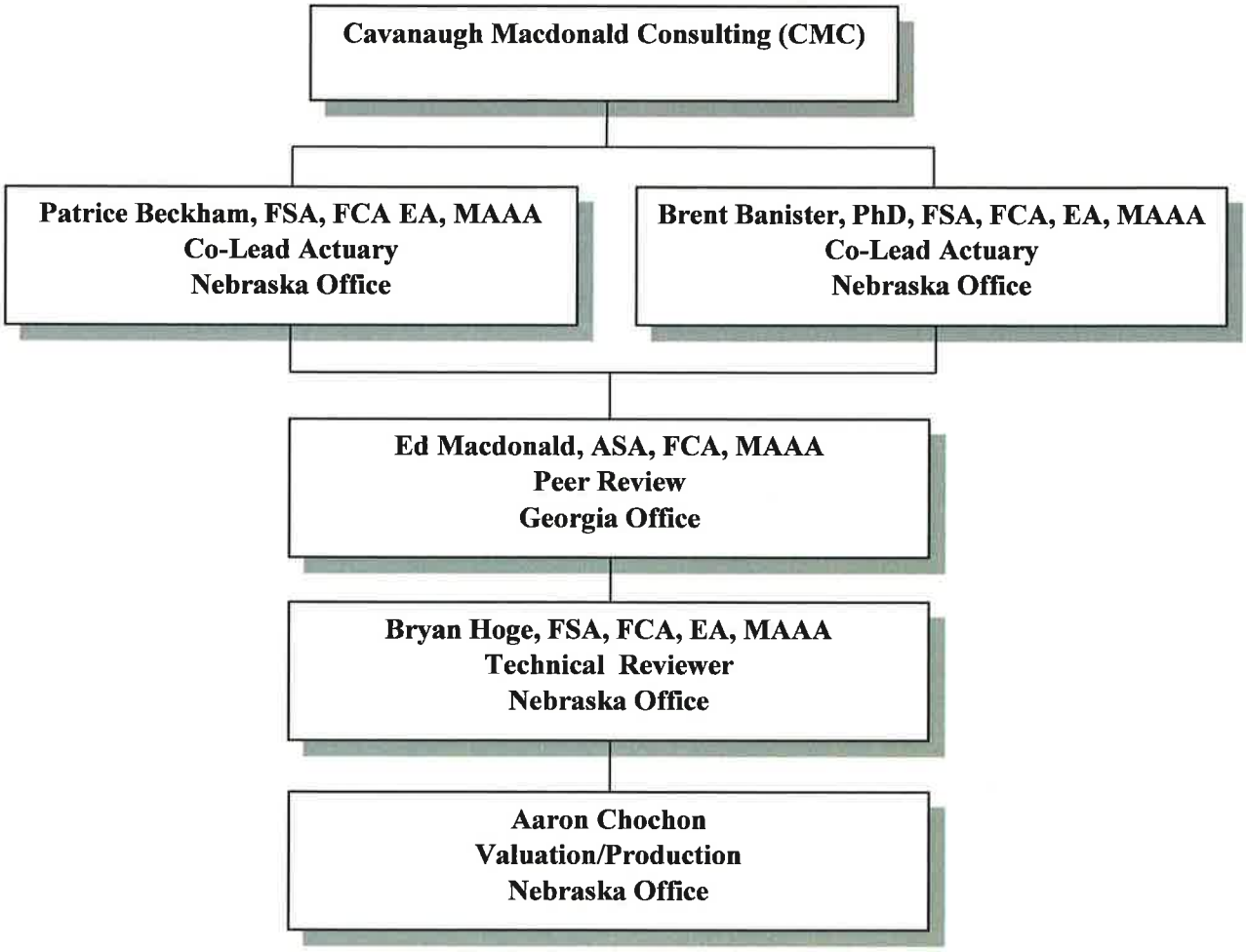
Our pension practice is organized into three teams with flexibility to assign team members from other teams to special projects if needed. The Nebraska office will perform the audit for NDTFFR with peer review of the project provided by the President of the company, Ed Macdonald. On all major assignments, including actuarial audits, we assign co-leads to the team to ensure that at least one lead consultant is available whenever needed. This is particularly important for audit assignments to keep the process moving and on schedule. Patrice and Brent have closely worked together for over 15 years and have a complementary style of consulting. The rest of the Nebraska team is very familiar with Patrice and Brent as they work closely together on all client work performed out of the office. Staff expectations are clearly known in advance and client deadlines are a high priority for our staff. Because of the close working relationship, our staff know the working "style" of both Patrice and Brent and effectively communicate with them on a regular basis as all of us are in the same office. Weekly staff meetings ensure projects stay on schedule and everyone involved is aware of the progress toward meeting the goals.

Aaron Chochon will perform the replication of the June 30, 2015 actuarial valuation with the final technical review by Bryan Hoge. As the Chief Pension Actuary, Brent Banister will review the audit findings related to the replication to ensure their accuracy. Bryan has prepared numerous GASB reports for our clients and has developed specialized expertise in the last few years. He will review the actuarial information prepared by Segal for GASB reporting to ensure its appropriateness. Brent specializes in working with projection models for our clients so he will review Segal's projections for reasonableness. Patrice will provide the critique on the actuarial assumption and methods used in the June 30, 2015 valuation by reviewing the 2015 Experience Study and the resulting set of actuarial assumptions and methods recommended. This will form the basis of Cavanaugh Macdonald's opinion on the appropriateness of the assumptions, given the observed experience, as well as compliance with applicable ASOPs. Brent will review Patrice's conclusions and offer any comments or suggestions that he feels should be included.

Once the draft report is complete, it will be peer reviewed by Ed Macdonald. This final step provides assurance that a third public plan actuary has had an opportunity to weigh in on the findings of the audit. Given Ed's extensive experience with public plans over the last 25 years, his insight is invaluable. Any feedback will be incorporated into the draft report sent to NDTFFR for their comment.

The organizational chart for this project is shown below:

6.05 Management Plan for the Project



6.06 Experience and Qualifications

Offerors must describe the experience of their firm in completing similar projects. Additionally, offerors must provide information specific to the personnel assigned to accomplish the work called for in this RFP. Offerors must provide a narrative description of the organization of the project team and a personnel roster that identifies each person who will actually work on the contract and provide the following information about each person listed.

a) Title;
b) Resume;
c) Description of the type of work the individual will perform; and
d) The number of estimated hours for each individual named above.

Please see Section 6.03 of this proposal for a discussion of our firm's experience in providing actuarial audits, similar to this project. The work to be performed on the contract by each person on the Cavanaugh Macdonald team is discussed in the previous section of this proposal, Section 6.06, and is summarized here:

Name	Highest Degree Held	Title	Years of Actuarial Experience	Type of Work Performed under Contract	Estimated Hours
Patrice Beckham	B.S. Math, Magna Cum Laude	Principal and Consulting Actuary	39	Consulting	20
Brent Banister	Ph.D. Mathematics	Chief Pension Actuary	22	Consulting and technical resource	25
Ed Macdonald	B.S. Computer Science	President	30	Peer Review of final work product	5
Bryan Hoge	B.S. Actuarial Science	Senior Actuary	11	Technical reviewer	25
Aaron Chochon	B.A. Mathematics	Senior Actuarial Analyst	5	Replication valuation production work	50

6.06 Experience and Qualifications

The co-lead actuaries who will be responsible for the NDTFFR audit, Patrice Beckham and Brent Banister, have more than 60 years of combined public plan actuarial experience. Patrice Beckham is one of the most experienced consultants in the firm and Brent Banister is the Chief Pension Actuary for Cavanaugh Macdonald, providing technical expertise to the consultants of the firm. Both are highly credentialed actuaries, including the following designations: Fellows of the Society of Actuaries (FSA), members of the American Academy of Actuaries (MAAA), Fellow of the Conference of Consulting Actuaries (FCA) and Enrolled Actuaries (EA) under ERISA. Both Patrice and Brent have extensive experience working with large statewide public retirement systems, including actuarial audit experience.

Other consultants in the firm also have extensive experience in completing similar projects.

Complete resumes for your team members are provided on the following pages.

Patrice A. Beckham, FSA, EA, FCA, MAAA
Principal and Consulting Actuary

- **Role;**

  Co-Lead Actuary

- **Years with the firm;**

  5 years

- **Current responsibilities;**

  Patrice has a broad range of experience in proposed legislation analysis and testimony, actuarial audits, experience studies, valuations, and the design, administration and funding of public retirement plans and postretirement health plans. Pat is responsible for the preparation of annual pension and other post-employment benefit (OPEB) valuations, proposed legislative pricing, experience studies, and modeling.

- **Relevant experience;**

  Patrice has been consulting to public pension systems since 1987. She has worked extensively with large statewide systems, including Iowa Public Employees Retirement System, Kansas Public Employees Retirement System, Nebraska Public Retirement System, Colorado Public Employee Retirement Association, Minnesota Teachers Retirement Association, and the Oklahoma Public Employees Retirement System, in preparing the annual valuation, developing projection models, and conducting legislative cost studies and experience studies. She also has a significant amount of experience performing actuarial audits and consulting with retirement systems for municipalities, including police and fire systems.

- **Education;**

  - BS in Mathematics from University of Nebraska – Lincoln (magna cum laude)

- **Professional designations and memberships; and**

  - Fellow of the Society of Actuaries
  - Enrolled Actuary under ERISA
  - Fellow of the Conference of Consulting Actuaries
  - Member of the American Academy of Actuaries

Patrice Beckham, FSA, EA, FCA, MAAA, *continued*

- **Relevant publications, studies, or presentations.**

Pat has presented at several public pension conferences including the following:

- "How Governments are Dealing with the Increasing Cost of Pension Plans" at the Midplains GFOA Conference, 2010
- "Actuarial Funding 101 and 201" at the Missouri Association of Public Employees Retirement System, 2009 and 2012
- "Actuarial Lessons" at the 2014 P2F2 Conference
- "Hybrid Plans – Valuation Considerations" at the 2015 Annual Meeting of the Conference of Consulting Actuaries

6.06 Experience and Qualifications

Brent A. Banister, PhD, FSA, EA, FCA, MAAA
Chief Pension Actuary

- **Role;**

  Co-Lead Actuary

- **Years with the firm;**

  5 years

- **Current responsibilities;**

  Brent has a broad range of experience in proposed legislation analysis and testimony, actuarial audits, experience studies, valuations, and the design, administration and funding of public retirement plans and postretirement health plans. Brent is responsible for the preparation of annual pension valuations, experience studies, open group projections, and modeling current and proposed plan designs. Brent also serves as the Chief Pension Actuary for Cavanaugh Macdonald providing guidance, insight and training on technical issues and new actuarial or GASB standards.

- **Relevant experience;**

  Brent has public sector consulting experience since 1994 providing services to large public clients. He has worked extensively with large statewide systems, including Iowa Public Employees Retirement System, Kansas Public Employees Retirement System, Minnesota Teachers Retirement Association, Nebraska Public Employees Retirement System, and Oklahoma Public Employees Retirement System, in preparing the annual valuation, developing projection models, and conducting cost and experience studies. With a prior employer, Brent performed a significant amount of review work for other consultants covering retirement and postemployment benefits on systems from municipalities through statewide systems all across the country.

- **Education;**

  - BS in Mathematics from Washington State University
  - PhD in Mathematics from Washington State University

- **Professional designations and memberships; and**

  - Fellow of the Society of Actuaries
  - Enrolled Actuary under ERISA
  - Fellow of the Conference of Consulting Actuaries
  - Member of the American Academy of Actuaries

Brent Banister, PhD, FSA, EA, FCA, MAAA, *continued*

➢ **Relevant publications, studies, or presentations.**

Brent has recently presented the following:

- "Current Actuarial Topics" at the Oklahoma Public Fund Trustee Conference, 2014
- "Issues Facing the Public Pension Industry" at the Nebraska Actuaries Club, 2010
- "An Introduction to GASB 45" to a group of Omaha area public sector accountants, 2007
- While at a previous employer, Brent was the editor and occasional contributor for the firm's public retirement plans newsletter

6.06 Experience and Qualifications

Edward A. Macdonald, ASA, FCA, MAAA
President

- **Role;**

  Peer Review

- **Years with the Firm;**

  10 years

- **Areas of expertise;**

  Ed has a broad range of experience in proposed legislation analysis and testimony, actuarial audits, experience studies, retiree medical valuations, and the design, administration and funding of public retirement plans and health plans.

- **Relevant experience;**

  Ed has public sector consulting experience since 1986. Ed is the lead actuary for many public systems including Alabama Teachers, Kentucky Teachers and Georgia Teachers.

  Education;

  - B.S. degree in Computer Science from New Jersey Institute of Technology

- **Professional designations and memberships; and**

  - Associate of the Society of Actuaries
  - Fellow of the Conference of Consulting Actuaries
  - Member of the American Academy of Actuaries

Edward A. Macdonald, ASA, FCA, MAAA (continued)

➢ **Relevant publications, studies or presentations.**

Ed has recently authored the following:

- "Financial Economics", October 2008, P2F2 Conference
- "Financial Economics", January 2008, Mid-Winter Conference on Large Public Employers
- "Understanding Actuarial Concepts", May 2006, National Council of Teachers Retirement
- "Reducing Contribution Volatility", January 2006, Mid-Winter Conference on Large Public Employers
- "Actuarial Valuation and Accounting Issues", March 2006, Alabama Government Finance Officers Association
- "The Actuarial Costs of Closing a Defined Benefit Plan by Offering A Mandatory Defined Contribution Plan", April 2005, Southern Conference on Teacher Retirement
- "Good Times/Bad Times", June 2005, National Council of Teachers Retirement – Directors Conference
- "GASB OPEB and Health Care Costs", June 2004, National Council of Teachers Retirement – Directors Conference

Bryan Hoge, FSA, EA, FCA, MAAA
Senior Actuary

- **Role;**

  Technical Reviewer

- **Years with the Firm;**

  2 years

- **Current responsibilities;**

  Bryan has a broad range of experience in data analysis, actuarial valuations, experience studies, and forecasting.

- **Relevant experience;**

  Bryan has pension and OPEB consulting experience since 2005. He has worked with a number of public clients including Iowa PERS, Kansas PERS, Oklahoma PERS, and the City of Omaha.

- **Education;**

  - B.S. in Actuarial Science from Drake University

- **Professional designations and memberships; and**

  - Fellow of the Society of Actuaries
  - Enrolled Actuary under ERISA
  - Fellow of the Conference of Consulting Actuaries
  - Member of the American Academy of Actuaries

Aaron Chochon
Senior Actuarial Analyst

- **Role;**

  Production

- **Years with the Firm;**

  5 years

- **Areas of expertise;**

  Aaron has a broad range of experience in data analysis, pension valuations, pension cost studies, and pension projections.

- **Relevant experience;**

  Aaron has provided analyst services since 2011 to many public clients, such as Kansas PERS, Nebraska PERS, Iowa PERS, Oklahoma PERS, and numerous local governmental clients.

- **Education;**

  - B.A. in Mathematics from Hastings College
  - Completed the Society of Actuaries exams P, FM, MFE, MLC, and C

6.06 Experience and Qualifications

Offerors must provide three (3) reference names and contact information for similar projects the offeror's firm has completed. The State reserves the right to contact any references provided by the offeror. Offerors are invited to provide letters of reference from previous clients. Offerors must provide a sample actuarial audit report.

Contact information is shown below for three references and letters of reference are provided in Appendix A.

A sample actuarial audit report is provided in Appendix B.

Public School and Education Employees Retirement Systems of Missouri
Ms. Anita Brand, Chief Financial Officer
3210 W. Truman Blvd.
Jefferson City, MO 65109
(573) 638-1022
abrand@psrsmo.org

Texas Municipal Retirement System
Ms. Leslee Hardy, Director of Actuarial Services
Texas Municipal Retirement System
1200 N. IH 35
Austin, TX 78701
512.225.3760
Lhardy@tmrs.com

Montana Public Employees Retirement Association
Mr. Dore Schwinden
Executive Director
Montana Public Employees' Retirement Administration
100 North Park Avenue, Suite 200
Helena, MT 59620
406-444-5459
DSchwinden@mt.gov

6.06 Experience and Qualifications

A list of all clients for whom an actuarial audit has been performed is included below:

System	Work Performed	Total # of Participants	Contact Information
1. Arizona State Retirement System	2008 Audit	550,000	Mr. Paul Matson Director Arizona State Retirement System 3300 North Central Avenue Phoenix, AZ 85012-0250 800.621.3778 paulm@azasrs.gov
2. Florida Retirement System	2002 Audit	940,000	Ms. Becky Vickers Staff Director The Florida Legislature 111 West Madison Street Room 312 Claude Pepper Building Tallahassee, FL 32399-1495 850.487.1316
3. Missouri State Employees' Retirement System	2013 Audit	105,000	Mr. Gary Findlay Executive Director Missouri State Employees' Retirement System 907 Wildwood Drive Jefferson City, MO 65109-5798 573.632.6100 garyfind@mosers.org
4. Public School and Education Employees Retirement Systems of Missouri	2015 Audit	200,000	Mr. M. Steve Yoakum Executive Director Public School Retirement System of Missouri 3210 W. Truman Boulevard Jefferson City, MO 65109 573.638.1099 syoakum@psrsmo.org
5. Missouri Department of Transportation and Patrol Employees' Retirement System	2005 Audit	17,000	Mr. Scott Simon Executive Director Missouri Department of Transportation and Patrol Employees' Retirement System 1913 William Street Jefferson City, MO 65102-1930 573.751.4640 ScottSimon@modot.mo.gov
6. Montana Public Employees' Retirement Administration	2015 Audit	58,801	Mr. Dore Schwinden Executive Director Montana Public Employees' Retirement Administration 100 North Park Avenue, Suite 200 Helena, MT 59620 406-444-5459 DSchwinden@mt.gov

6.06 Experience and Qualifications

System	Work Performed	Total # of Participants	Contact Information
7. Public Employees' Retirement System of Nevada	2009 Audit	160,000	Ms. Tina Leiss Executive Director Public Employees' Retirement System of Nevada 693 West Nye Lane Carson City, NV 89410 (775) 687-4200 tleiss@nvpers.org
8. Oklahoma Police Pension and Retirement System	2014 Audit	9,000	Mr. Steven Snyder Executive Director Oklahoma Police Pension and Retirement System 1001 N.W. 63rd Street, Suite 305 Jefferson City, MO 65102-1930 573.751.4640
9. Teachers' Retirement System of Oklahoma	2004 Audit	140,000	Mr. Tom Spencer Executive Director Teachers' Retirement System of Oklahoma 2500 N. Lincoln Boulevard, 5th Floor Oklahoma City, OK 73105 405.521.4745
10. Sioux Falls, SD Employees' Retirement System Firefighters Pension Fund	2012 Audit	1,744	Ms. Angie Uthe Compensation and Benefits Manager City of Sioux Falls 229 West Ninth Street Sioux Falls, SC 57117 authe@siouxfalls.org 605.367.8743
11. Texas Municipal Retirement System	2015 Audit	202,500	Ms. Leslee S. Hardy Director of Actuarial Services Texas Municipal Retirement System 1200 N. IH 35 Austin, TX 78701 512.225.3760 Lhardy@tmrs.com
12. Utah Retirement System	2012 Audit	140,000	Mr. Daniel D. Andersen Executive Director Utah Retirement Systems 540 East 200 South Salt Lake City, UT 84102-2099 301.366.7343 Dan.Andersen@urs.org

6.07 Cost Proposal

Offerors must complete cost proposal attached to this RFP or prepare a cost proposal following the same format. The cost proposal must be on a fixed-fee basis for all work involved. The cost proposal should be separate from the responses to the other sections of the RFP and clearly labeled "Cost Proposal."

The Cost Proposal is provided in a separately-sealed and labeled envelope.

6.08 Required Enclosures

Offerors must provide all information specifically required in this RFP.

The required enclosures are provided on the following pages.

ATTACHMENT 1

PROPOSAL EVALUATION FORM

All proposals will be reviewed by the Procurement Officer for responsiveness and then evaluated by the Proposal Review Committee using the criteria set out herein.

INSTRUCTIONS FOR EVALUATORS
Each evaluation criterion has been assigned a specific number of points. The questions under each evaluated area help you measure the quality of the offeror's response. Do not assign points to individual questions, instead, award a total score for each evaluation criterion.

RATING SCALE FOR ASSESSING VENDOR RESPONSES
This rating scale is intended to establish guidelines within that range to ensure members of the RFP evaluation committee perform their evaluation with consistency. You may assign any value for a given criteria from 0 to the maximum number of points. A zero value typically constitutes no response or an inability of the vendor to meet the criterion. In contrast, the maximum value should constitute a high standard of meeting the criterion. If a specific criterion would only yield a yes or no response (e.g., offeror can submit an electronic report in required format by noon Friday), the evaluator should award either the maximum points or a zero.

For Example: "Experience and Qualifications" is an evaluation criteria receiving a weighting of 40% of the total possible points. Using a 100 Point Scale, a maximum of 40 points can be awarded. The rating scale would be:

Rating Scale (**40 *POINT*** Maximum)	
Point Value	Explanation
0	None. Not addressed or response of no value
1-10	Fair. Limited applicability
11-20	Good. Some applicability
21-30	Very Good. Substantial applicability
31-40	Excellent. Total applicability

COST PROPOSAL

An NDRIO staff member who is not on the Proposal Review Committee will award points to each cost proposal separately from the technical proposal. After the technical proposals have been evaluated, the cost proposal points will be recorded on the evaluation summary sheets.

EVALUATION CRITERIA AND SCORING

Person or Firm Name Cavanaugh Macdonald Consulting, LLC

Proposal Evaluation Committee (PEC) Member Name _____

Date of Review _____

RFP Title/Number 190-16-01 for Actuarial Audit Services

I hereby certify that I do not have a conflict of interest with this offeror. I further certify that I have reviewed the Request for Proposal Evaluators Guide and that neither I nor my immediate family members have a conflict of interest with regard to this offeror who submitted a proposal in response to this Request for Proposal, in accordance with N.D.A.C. § 4-12-04-04.

Signature_____**Date**_____

THE TOTAL NUMBER OF POINTS USED TO SCORE THIS CONTRACT IS 100

6.03 Understanding of the Project

Weight ***10 Percent***. Maximum Point Value for this Section
100 Points x ***10 Percent*** = ***10 Points***

Rating Scale (***10 POINT*** Maximum)	
Point Value	Explanation
0	None. Not addressed or response of no value
1-2	Fair. Limited applicability
3-5	Good. Some applicability
6-8	Very Good. Substantial applicability
9-10	Excellent. Total applicability

Proposals will be evaluated against the questions set out below. Do not assign points to individual questions, instead, award a total score for each evaluation criterion.

[a] Has the offeror demonstrated a thorough understanding of the purpose and scope of the project?

EVALUATOR'S NOTES _____

_____

[b] How well has the offeror identified pertinent issues and potential problems related to the project?

EVALUATOR'S NOTES _____

_____

[c] Has the offeror demonstrated an understanding of the deliverables the State expects it to provide?

EVALUATOR'S NOTES _____

_____

[d] Has the offeror demonstrated an understanding of the State's time schedule and can meet it?

EVALUATOR'S NOTES _____

_____

[e] Is the proposal submitted responsive to all material requirements in the RFP?

EVALUATOR'S NOTES _____

_____

EVALUATOR'S POINT TOTAL FOR 6.03 _____

6.04 Methodology Used for the Project

Weight ***10 Percent***. Maximum Point Value for this Section
100 Points x ***10 Percent*** = ***10 Points***

Rating Scale (***10 POINT*** Maximum)	
Point Value	Explanation
0	None. Not addressed or response of no value
1-2	Fair. Limited applicability
3-5	Good. Some applicability
6-8	Very Good. Substantial applicability
9-10	Excellent. Total applicability

Proposals will be evaluated against the questions set out below. Do not assign points to individual questions, instead, award a total score for each evaluation criterion.

[a] Does the methodology depict a logical approach to fulfilling the requirements of the RFP?

EVALUATOR'S NOTES _____

_____

[b] Does the methodology match and achieve the objectives set out in the proposal?

EVALUATOR'S NOTES _____

_____

[c] Does the methodology interface with the time schedule in the proposal?

EVALUATOR'S NOTES _____

_____

[d] Does the methodology have provisions for quality assurance?

EVALUATOR'S NOTES _____

_____

EVALUATOR'S POINT TOTAL FOR 6.04 _____

6.05 Management Plan for the Project

Weight ***10 Percent***. Maximum Point Value for this Section
100 Points x ***10 Percent = 10 Points***

Rating Scale (***10 POINT*** Maximum)	
Point Value	Explanation
0	None. Not addressed or response of no value
1-2	Fair. Limited applicability
3-5	Good. Some applicability
6-8	Very Good. Substantial applicability
9-10	Excellent. Total applicability

Proposals will be evaluated against the questions set out below. Do not assign points to individual questions, instead, award a total score for each evaluation criterion.

[a] How well does the management plan support all of the project requirements and logically lead to the deliverables required in the RFP?

EVALUATOR'S NOTES _____

_____

[b] How well is accountability completely and clearly defined?

EVALUATOR'S NOTES _____

_____

[c] Is the organization of the project team clear?

EVALUATOR'S NOTES _____

_____

[d] How well does the management plan illustrate the lines of authority and communication?

EVALUATOR'S NOTES _____

_____

[e] To what extent does the offeror already have the hardware, software, equipment, and licenses necessary to perform the contract?

EVALUATOR'S NOTES _____

_____

[f] Does it appear that offeror can meet the schedule set out in the RFP?

EVALUATOR'S NOTES _____

_____

[g] Has the contractor gone beyond the minimum tasks necessary to meet the objectives of the RFP?

EVALUATOR'S NOTES _____

_____

[h] Is the proposal practical, feasible, and within budget?

EVALUATOR'S NOTES _____

_____

EVALUATOR'S POINT TOTAL FOR 6.05 _____

6.06 Experience and Qualifications

Weight ***40 Percent***. Maximum Point Value for this Section
100 Points x ***40 Percent = 40 Points***

Rating Scale (***40 POINT*** Maximum)	
Point Value	Explanation
0	None. Not addressed or response of no value
1-10	Fair. Limited applicability
11-20	Good. Some applicability
21-30	Very Good. Substantial applicability
31-40	Excellent. Total applicability

Proposals will be evaluated against the questions set out below. Do not assign points to individual questions, instead, award a total score for each evaluation criterion.

Questions regarding the personnel.

[a] Do the individuals assigned to the project have experience on similar projects?

EVALUATOR'S NOTES _____

_____

[b] Are resumes complete and do they demonstrate backgrounds that would be desirable for individuals engaged in the work the RFP requires?

EVALUATOR'S NOTES _____

_____

[c] How extensive is the applicable education and experience of the personnel designated to work on the project?

EVALUATOR'S NOTES _____

_____

Questions regarding the firm.

[d] Has the firm demonstrated experience in completing similar projects on time and within budget?

EVALUATOR'S NOTES _____

_____

[e] How successful is the general history of the firm regarding timely and successful completion of projects?

EVALUATOR'S NOTES _____

_____

[f] If references were required, did the references provide information to verify the satisfactory performance of the vendor?

EVALUATOR'S NOTES _____

_____

[g] Has the firm provided letters of reference from previous clients?

EVALUATOR'S NOTES _____

_____

EVALUATOR'S POINT TOTAL FOR 6.06 _____

6.07 Contract Cost

Weight ***30 Percent***. Maximum Point Value for this Section
100 Points x ***30 Percent = 30 Points***

Converting Cost to Points

The lowest cost proposal will receive the maximum number of points allocated to cost. The point allocations for cost on the other proposals will be determined as follows:

<u>Price of Lowest Cost Proposal</u>
Price of Proposal Being Rated X Total Points for Cost Available = Awarded Points

COST PROPOSAL EVALUATION

EVALUATOR'S POINT TOTAL FOR 6.07 _____

Request for Proposal
Evaluation Summary

Name of RFP: Actuarial Audit Services		
RFP Number 190-16-01		
Vendor Being Evaluated: Cavanaugh Macdonald Consulting, LLC		
Evaluator Name:		
Date:		
Technical Evaluation *(Maximum **70 Points**)*	Maximum Points by Category	Score
1. Understanding of the Project	***10***	
2. Methodology Used for the Project:	***10***	
3. Management Plan for the Project:	***10***	
4. Experience and Qualifications:	***40***	
Cost Evaluation (Maximum ***30 Points***) Calculated points awarded for price. Price of Lowest Cost Proposal Price of Proposal Being Rated X **30 points** = Awarded Points		
5. Cost	***30***	
Total		

Request for Proposal
Evaluation Totals

Name of RFP:	RFP # 190-16-01 for Actuarial Audit Services					
Name of Offeror:	Cavanaugh Macdonald Consulting					
Date:						
Technical Evaluation Criteria	***70 POINTS*** Maximum	Evaluator	Evaluator	Evaluator	Evaluator	Evaluator
1.Understanding of the Project	***10***					
2. Methodology Used for the Project:	***10***					
3. Management Plan for the Project:	***10***					
4. Experience and Qualifications:	***40***					
Evaluator Totals						
Grand Total		Note: Sum of all individual scores.				
Technical Proposal Score		Note: Total of individual points divided by the number of evaluators (***70 POINT MAXIMUM***).				
Cost Proposal Score		Note: (***30 POINT MAXIMUM***)				
TOTAL						

Request for Proposal
Summary of Evaluation Committee Totals

Name of RFP: RFP #190-16-01 for Actuarial Audit Services						
Date:						
Technical Evaluation Criteria	***70 POINTS*** Maximum	Vendor 1	Vendor 2	Vendor 3	Vendor 4	Vendor 5
1. Understanding of the Project	***10***					
2. Methodology Used for the Project:	***10***					
3. Management Plan for the Project:	***10***					
4. Experience and Qualifications:	***40***					
Technical Proposal Score						
Cost Proposal Score						
Grand Total						

ATTACHMENT 2

SERVICE CONTRACT

AGREEMENT FOR
ACTUARIAL AUDIT SERVICES

CONTRACTOR AND
North Dakota Teachers' Fund for Retirement

This Agreement for Actuarial Audit Services (hereinafter referred to as the "Agreement") is made and entered into by and between Contractor (hereinafter referred to as "Contractor"), and the State of North Dakota on behalf of the Teachers' Fund for Retirement through its Retirement and Investment Office (hereinafter referred to as "TFFR") that has responsibility for the management and administration of the retirement plan funded by contributing employers within North Dakota (hereinafter referred to as "TFFR") this _____, 2016, to provide actuarial audit services in accordance with this Agreement.

1. SCOPE OF WORK
   Contractor will provide the services as described under this Agreement, the proposal from Contractor dated _____, 2016, and the Request for Proposal issued _____, 2016 (hereinafter "Scope of Service Documents"). During the performance of such services by Contractor, TFFR will retain and exercise all decision-making authority with respect to the management and administration of the TFFR retirement plan and investments relating thereto.

2. TERMS OF AGREEMENT
   This Agreement shall be in effect beginning April 1, 2016, through July 30, 2016, or until the actuarial audit is completed and presented to the TFFR Board, whichever is earlier. This Agreement may, however, be extended for additional periods subject to the written approval of Contractor and TFFR. This Agreement constitutes the entire agreement between the parties hereto with respect to the subject matter hereof and supersedes all prior agreements, undertakings, negotiations and discussions, both written and oral.

3. CANCELLATION
   Contractor or TFFR may cancel this Agreement for convenience upon thirty (30) calendar days' written notice to the other party, or as mutually agreed to by the parties. Notice shall be deemed effective as of the date mailed if sent by certified mail to the parties as set forth in this Agreement.

   In addition, TFFR by written notice to Contractor, may terminate the whole or any part of this Agreement under any of the following conditions:

   1) If funding from federal, state, or other sources is not obtained and continued at levels sufficient to allow for purchase of the services or supplies in the indicated quantities or term.

2) If federal or state laws or rules are modified or interpreted in a way that the services are no longer allowable or appropriate for purchase under this Agreement or are no longer eligible for the funding proposed for payments authorized by this Agreement.
3) If any license, permit, or certificate required by law or rule, or by the terms of this Agreement, is for any reason denied, revoked, suspended, or not renewed.
Termination of this Agreement under this subsection is without prejudice to any obligations or liabilities of either party already accrued prior to termination.

4. FEES
Contractor's fees for performance of the work as referenced in the Scope of Service Documents is set forth in Contractor's Proposal.

5. TRAVEL AND EXPENSES
The fees detailed in Contractor's proposal do not cover travel-related expenses. TFFR shall reimburse Contractor for reasonable expenses related to such travel as agreed upon by the parties.

6. PAYMENTS
All fees are quoted on a cash basis. TFFR will be invoiced at the completion of the project. TFFR shall make cash payments within thirty (30) days following receipt of billing from Contractor.

7. APPLICABLE LAWS
The Agreement will be construed and interpreted under the laws of the State of North Dakota to the extent not preempted by applicable federal law.

8. CHANGES IN THE AGREEMENT
Any change to this Agreement shall be in writing in the form of an amendment mutually agreed upon and duly executed by both parties. Contractor's named representative shall be the point of contact with regard to contractual matters.

9. SEVERABILITY
If any portion of this Agreement is either held unenforceable for any reason or is modified pursuant to a subsequent written modification, the remaining terms of the Agreement shall remain in effect as set forth herein.

10. ASSIGNMENT
No assignment in whole or in part of this Agreement and no delegation of any part or all of the performance of its duties hereunder may be made by Contractor without the prior written consent of TFFR, and any attempted assignment or delegation without such consent will be void.

11. WAIVER
Failure of one party to perform any part of this Agreement does not constitute a waiver of this Agreement or any provision therein. Failure of one party to require performance of any part of this Agreement does not constitute a waiver of that party's right to enforce performance at any subsequent time.

12. INDEMNIFICATION

Contractor agrees to defend, indemnify, and hold harmless the state of North Dakota, its agencies, officers and employees (State), from and against claims based on the vicarious liability of the State or its agents, but not against claims based on the State's contributory negligence, comparative and/or contributory negligence or fault, sole negligence, or intentional misconduct. This obligation to defend, indemnify, and hold harmless does not extend to professional liability claims arising from professional errors and omissions. The legal defense provided by Contractor to the State under this provision must be free of any conflicts of interest, even if retention of separate legal counsel for the State is necessary. Any attorney appointed to represent the State must first qualify as and be appointed by the North Dakota Attorney General as a Special Assistant Attorney General as required under N.D.C.C. § 54-12-08. Contractor also agrees to defend, indemnify, and hold the State harmless for all costs, expenses and attorneys' fees incurred if the State prevails in an action against Contractor in establishing and litigating the indemnification coverage provided herein. This obligation shall continue after the termination of this agreement.

13. INSURANCE

Contractor shall secure and keep in force during the term of this agreement and Contractor shall require all subcontractors, prior to commencement of an agreement between Contractor and the subcontractor, to secure and keep in force during the term of this agreement, from insurance companies, government self-insurance pools or government self-retention funds, authorized to do business in North Dakota, the following insurance coverages:

1) Commercial general liability, including premises or operations, contractual, and products or completed operations coverages (if applicable), with minimum liability limits of $250,000 per person and $1,000,000 per occurrence.
2) Automobile liability, including Owned (if any), Hired, and Non-Owned automobiles, with minimum liability limits of $250,000 per person and $1,000,000 per occurrence.
3) Workers compensation coverage meeting all statutory requirements. The policy shall provide coverage for all states of operation that apply to the performance of this contract.
4) Employer's liability or "stop gap" insurance of not less than $1,000,000 as an endorsement on the workers compensation or commercial general liability insurance.
5) Professional errors and omissions with minimum limits of $1,000,000 per occurrence and in the aggregate, Contractor shall continuously maintain such coverage during the contact period and for three years thereafter. In the event of a change or cancellation of coverage, Contractor shall purchase an extended reporting period to meet the time periods required in this section.
The insurance coverages listed above must meet the following additional requirements:

1) Any deductible or self-insured retention amount or other similar obligation under the policies shall be the sole responsibility of the Contractor.
2) This insurance may be in policy or policies of insurance, primary and excess, including the so-called umbrella or catastrophe form and must be placed with insurers rated "A-" or better by A.M. Best Company, Inc., provided any excess policy follows form for coverage. Less than an "A-" rating must be approved by the State. The policies shall be in form and terms approved by the State.
3) The duty to defend, indemnify, and hold harmless the State under this agreement shall not be limited by the insurance required in this agreement.

4) The state of North Dakota and its agencies, officers, and employees (State) shall be endorsed on the commercial general liability policy, including any excess policies (to the extent applicable), as additional insured. The State shall have all the benefits, rights and coverages of an additional insured under these policies that shall not be limited to the minimum limits of insurance required by this agreement or by the contractual indemnity obligations of the Contractor.

5) The insurance required in this agreement, through a policy or endorsement, shall include:

a) "Waiver of Subrogation" waiving any right to recovery the insurance company may have against the State;

b) a provision that Contractor's insurance coverage shall be primary (i.e. pay first) as respects any insurance, self-insurance or self-retention maintained by the State and that any insurance, self-insurance or self-retention maintained by the State shall be in excess of the Contractor's insurance and shall not contribute with it;

c) Cross liability/severability of interest for all policies and endorsements;

d) The legal defense provided to the State under the policy and any endorsements must be free of any conflicts of interest, even if retention of separate legal counsel for the State is necessary;

e) The insolvency or bankruptcy of the insured Contractor shall not release the insurer from payment under the policy, even when such insolvency or bankruptcy prevents the insured Contractor from meeting the retention limit under the policy.

6) The Contractor shall furnish a certificate of insurance to the undersigned State representative prior to commencement of this agreement. All endorsements shall be provided as soon as practicable.

7) Failure to provide insurance as required in this agreement is a material breach of contract entitling the State to terminate this agreement immediately.

8) Contractor shall provide at least 30-day notice of any cancellation or material change to the policies or endorsements.

14. FORCE MAJEURE

Neither party shall be held responsible for delay or default caused by fire, riot, terrorism, acts of God or war if the event is beyond the party's reasonable control and the affected party gives notice to the other party immediately upon occurrence of the event causing the delay or default or that is reasonably expected to cause a delay or default.

15. WORK PRODUCT

All work product, equipment or materials created for TFFR or purchased by TFFR under this Agreement belongs to TFFR and must be immediately delivered to TFFR at TFFR's request upon termination of this Agreement.

16. NOTICE

All notices or other communications required under this Agreement must be given by registered or certified mail and are complete on the date mailed when addressed to the parties at the following addresses:

17. CONFIDENTIALITY & ACCESS TO RECORDS

The parties agree that all records relating to the benefits and participation of Teachers' Fund For Retirement members and their beneficiaries in programs administered by the Teachers' Fund For Retirement are confidential under North Dakota law. Contractor may request and the Teachers' Fund For Retirement shall provide directly to Contractor upon such request, confidential information necessary for Contractor to provide the services

described in the Scope of Service section. Contractor shall keep confidential all Teachers' Fund For Retirement member and beneficiary information obtained in the course of delivering services. Failure of Contractor to maintain the confidentiality of such information may be considered a material breach of the contract and may constitute the basis for additional civil and criminal penalties under North Dakota law. Contractor shall report to the State any use or disclosure of confidential information not provided for by this Agreement of which it becomes aware without unreasonable delay and in any case within thirty (30) days from the date of discovery. Contractor has exclusive control over the direction and guidance of the persons rendering services under this Agreement. Upon termination of this Agreement, for any reason, Contractor shall return or destroy all confidential information received from the Teachers' Fund For Retirement, or created or received by Contractor on behalf of the Teachers' Fund For Retirement. This provision applies to confidential information that may be in the possession of subcontractors or agents of Contractor. Contractor shall retain no copies of the confidential information. In the event that Contractor asserts that returning or destroying the confidential information is not feasible, Contractor shall provide to the Teachers' Fund For Retirement notification of the conditions that make return or destruction infeasible. Upon explicit written agreement of the Teachers' Fund For Retirement that return or destruction of confidential information is not feasible, Contractor shall extend the protections of this Agreement to that confidential information and limit further uses and disclosures of any such confidential information to those purposes that make the return or destruction infeasible, for so long as Contractor maintains the confidential information.

18. COMPLIANCE WITH PUBLIC RECORDS LAW

Contractor understands that, except for disclosures prohibited in this Agreement, TFFR must disclose to the public upon request any records it receives from Contractor. Contractor further understands that any records obtained or generated by Contractor under this Agreement, except for records that are confidential under this Agreement, may, under certain circumstances, be open to the public upon request under the North Dakota public records law. Contractor agrees to contact TFFR immediately upon receiving a request for information under the public records law and to comply with TFFR's instructions on how to respond to the request.

19. INDEPENDENT ENTITY

Contractor is an independent entity under this Agreement and is not a TFFR employee for any purpose, including the application of the Social Security Act, the Fair Labor Standards Act, the Federal Insurance Contribution Act, the North Dakota Unemployment Compensation Law and the North Dakota Workforce Safety and Insurance Act. Contractor retains sole and absolute discretion in the manner and means of carrying out Contractor's activities and responsibilities under this Agreement, except to the extent specified in this Agreement.

20. NONDISCRIMINATION AND COMPLIANCE WITH LAWS

Contractor agrees to comply with all laws, rules, and policies, including those relating to nondiscrimination, accessibility and civil rights. Contractor agrees to timely file all required reports, make required payroll deductions, and timely pay all taxes and premiums owed, including sales and use taxes and unemployment compensation and workers' compensation premiums. Contractor shall have and keep current at all times during the term of this Agreement all licenses and permits required by law.

21. ALTERNATIVE DISPUTE RESOLUTION - JURY TRIAL

TFFR does not agree to any form of binding arbitration, mediation, or other forms of mandatory alternative dispute resolution. The parties have the right to enforce their rights and remedies in judicial proceedings. TFFR does not waive any right to a jury trial.

22. STATE AUDIT

All records, regardless of physical form, and the accounting practices and procedures of Contractor relevant to this Agreement are subject to examination by the North Dakota State Auditor, the Auditor's designee, or federal auditors. Contractor shall maintain all of these records for at least three (3) years following completion of this Agreement and be able to provide them at any reasonable time. State, State Auditor, or Auditor's designee shall provide reasonable notice.

BY THE SIGNATURES affixed below, the above Agreement is hereby accepted as to all the terms and conditions.

ATTACHMENT 3

RISK MANAGEMENT APPENDIX

Indemnification

Contractor agrees to defend, indemnify, and hold harmless the state of North Dakota, its agencies, officers and employees (State), from and against claims based on the vicarious liability of the State or its agents, but not against claims based on the State's contributory negligence, comparative and/or contributory negligence or fault, sole negligence, or intentional misconduct. This obligation to defend, indemnify, and hold harmless does not extend to professional liability claims arising from professional errors and omissions. The legal defense provided by Contractor to the State under this provision must be free of any conflicts of interest, even if retention of separate legal counsel for the State is necessary. Any attorney appointed to represent the State must first qualify as and be appointed by the North Dakota Attorney General as a Special Assistant Attorney General as required under N.D.C.C. § 54-12-08. Contractor also agrees to defend, indemnify, and hold the State harmless for all costs, expenses and attorneys' fees incurred if the State prevails in an action against Contractor in establishing and litigating the indemnification coverage provided herein. This obligation shall continue after the termination of this agreement.

Insurance

Contractor shall secure and keep in force during the term of this agreement and Contractor shall require all subcontractors, prior to commencement of an agreement between Contractor and the subcontractor, to secure and keep in force during the term of this agreement, from insurance companies, government self-insurance pools or government self-retention funds, authorized to do business in North Dakota, the following insurance coverages:

1) Commercial general liability, including premises or operations, contractual, and products or completed operations coverages (if applicable), with minimum liability limits of $250,000 per person and $1,000,000 per occurrence.
2) Automobile liability, including Owned (if any), Hired, and Non-Owned automobiles, with minimum liability limits of $250,000 per person and $1,000,000 per occurrence.
3) Workers compensation coverage meeting all statutory requirements. The policy shall provide coverage for all states of operation that apply to the performance of this contract.
4) Employer's liability or "stop gap" insurance of not less than $1,000,000 as an endorsement on the workers compensation or commercial general liability insurance.
5) Professional errors and omissions with minimum limits of $1,000,000 per occurrence and in the aggregate, Contractor shall continuously maintain such coverage during the contact period and for three years thereafter. In the event of a change or cancellation of

coverage, Contractor shall purchase an extended reporting period to meet the time periods required in this section.

The insurance coverages listed above must meet the following additional requirements:

1) Any deductible or self-insured retention amount or other similar obligation under the policies shall be the sole responsibility of the Contractor.
2) This insurance may be in policy or policies of insurance, primary and excess, including the so-called umbrella or catastrophe form and must be placed with insurers rated "A-" or better by A.M. Best Company, Inc., provided any excess policy follows form for coverage. Less than an "A-" rating must be approved by the State. The policies shall be in form and terms approved by the State.
3) The duty to defend, indemnify, and hold harmless the State under this agreement shall not be limited by the insurance required in this agreement.
4) The state of North Dakota and its agencies, officers, and employees (State) shall be endorsed on the commercial general liability policy, including any excess policies (to the extent applicable), as additional insured. The State shall have all the benefits, rights and coverages of an additional insured under these policies that shall not be limited to the minimum limits of insurance required by this agreement or by the contractual indemnity obligations of the Contractor.
5) The insurance required in this agreement, through a policy or endorsement, shall include:
a) "Waiver of Subrogation" waiving any right to recovery the insurance company may have against the State;
b) a provision that Contractor's insurance coverage shall be primary (i.e. pay first) as respects any insurance, self-insurance or self-retention maintained by the State and that any insurance, self-insurance or self-retention maintained by the State shall be in excess of the Contractor's insurance and shall not contribute with it;
c) Cross liability/severability of interest for all policies and endorsements;
d) The legal defense provided to the State under the policy and any endorsements must be free of any conflicts of interest, even if retention of separate legal counsel for the State is necessary;
e) The insolvency or bankruptcy of the insured Contractor shall not release the insurer from payment under the policy, even when such insolvency or bankruptcy prevents the insured Contractor from meeting the retention limit under the policy.
6) The Contractor shall furnish a certificate of insurance to the undersigned State representative prior to commencement of this agreement. All endorsements shall be provided as soon as practicable.
7) Failure to provide insurance as required in this agreement is a material breach of contract entitling the State to terminate this agreement immediately.
8) Contractor shall provide at least 30 day notice of any cancellation or material change to the policies or endorsements.

ATTACHMENT 4

COST PROPOSAL FORMAT

Cost Proposal
2015 Actuarial Audit
ND Teachers' Fund for Retirement

Provided in a separately-sealed and labeled envelope

	Estimated Total Hours	Total Fixed Fee*
Actuarial Audit	_____	$_____

*Total Fixed Fee does not include travel expenses (including transportation, lodging, meals and other travel related expenses) and should not be included in your proposal. Travel expenses for the presentation to the TFFR Board of Trustees in July 2016 will be reimbursed if the Chief Retirement Officer has given prior approval for each individual to incur such expenses. NDTFFR is under no obligation to reimburse the consultant if no approval was given.

ATTACHMENT 5
CHECKLIST FOR OFFERORS

- ☒ Submit any questions, comments, or requests for clarification to the procurement officer by the deadline for submission of questions.
- ☒ Review Attachments 2 and 3. State any objections to any of the provisions in the Contract Form or Indemnification and Insurance Requirements prior to the deadline for submission of questions.
- ☒ Be sure an individual authorized to bind the offeror to the provisions of the RFP signs the proposal.
- ☒ Comply with the North Dakota Secretary of State and the North Dakota State Procurement Office Registration requirements prior to the deadline stated in the RFP.
- ☒ Comply with minimum requirements for experience for both firm and personnel.
- ☒ Comply with professional licensing requirements.
- ☒ Provide the information about the qualifications of the firm and individuals that will be working on the project.
- ☒ Identify all known federal requirements that apply to the proposal, the evaluation, or the contract.
- ☒ Provide the required references.
- ☒ Provide all documents or materials that must be submitted with the RFP.
- ☒ Identify and label and sections of the proposal you feel contain confidential information.

APPENDIX A – REFERENCE LETTERS

Reference letters from previous audit clients are provided on the following pages.

PSRS/PEERS

PUBLIC SCHOOL & EDUCATION EMPLOYEE
RETIREMENT SYSTEMS OF MISSOURI

February 10, 2016

To Whom It May Concern,

The Public School and Education Employee Retirement Systems of Missouri ("PSRS/PEERS") published a Request for Proposals for Actuarial Review Services ("RFP") in the Fall of 2015. We received multiple responses which were carefully assessed against the RFP criteria. PSRS/PEERS ultimately selected Cavanaugh Macdonald Consulting, LLC ("CMC") to perform our actuarial review services, which included a full replication of the most recent actuarial valuations. CMC's team was led by Patrice Beckham and Brent Banister.

PSRS/PEERS was pleased with the work product delivered by CMC as well as their overall procedures. CMC worked cooperatively with our retained actuary and our staff. We found them to be fair, constructive and thoughtful during the process. Our retained actuary indicated they shared our experiences with CMC.

The RFP included a very tight timeframe for delivery of a final report. CMC met the deadline without any issue and in accordance with the fixed fee quoted.

PSRS/PEERS would favorably recommend CMC's services to other public pension funds. If you would like additional information on our recent experiences please contact Anita Brand at 573-638-1022.

Sincerely,

M. Steve Yoakum
Executive Director

Anita Brand, CPA
Chief Financial Officer

Location 3210 W. Truman Blvd. / Jefferson City, MO 65109 **Mail** P.O. Box 268 / Jefferson City, MO 65102 **Phone** (573) 634-5290
Toll Free (800) 392-6848 **Email** psrspeers@psrspeers.org **Member Services FAX** (573) 634-7934 **Employer Services FAX** (573) 634-7911

TMRS
TEXAS MUNICIPAL RETIREMENT SYSTEM

January 26, 2016

Subject: Reference Letter for Cavanaugh Macdonald Consulting, LLC

To Whom It May Concern:

Cavanaugh Macdonald Consulting, LLC (CavMac) was chosen to perform the 2015 actuarial audit of the Texas Municipal Retirement System's (TMRS) consulting actuary. TMRS is a statewide agent multiple-employer pension plan with 860 individual participating municipalities. As a hybrid, defined benefit pension plan, TMRS members contribute at a designated rate toward their own retirement benefit. At retirement, the member's account balance with credited interest plus employer matching contributions, and possibly additional credits at the employer's discretion, is used to calculate the member's retirement benefit.

The 2015 actuarial audit consisted of a review of the December 31, 2014 actuarial valuation as well as the 2015 Experience Study. The audit was a limited replication audit wherein CavMac selected, reviewed and tested the valuation results using a mathematical model of plan activity for a sampling of 18 TMRS plans such that the sample plans constituted a complete representation of all TMRS plans.

The scope of work included, but what was not limited to, a review of the census data appropriateness; actuarial funding method and its application; actuarial asset valuation and its application; accuracy of valuation results; appropriateness of the application of the actuarial assumptions; accuracy of costing plan design changes; clarity of the actuarial reports; and whether the valuation and experience study were performed by qualified actuaries in accordance with actuarial standards of practice.

Throughout the engagement, CavMac exhibited a high level of professionalism as well as a collegial attitude in working with TMRS' consulting actuary. Overall, TMRS was satisfied with the level of expertise and the actuarial auditing services provided by CavMac, which were done on a timely basis and on budget.

Respectfully submitted,

Leslee S. Hardy

Leslee S. Hardy, ASA,EA,FCA,MAAA
Director of Actuarial Services
Texas Municipal Retirement System

TMRS
P.O. Box 149153
Austin, Texas 78714-9153

www.TMRS.com

512.476.7577
Toll-Free 800.924.8677
Fax 512.476.5576

MONTANA PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION

STEVE BULLOCK
GOVERNOR

DORE SCHWINDEN
EXECUTIVE DIRECTOR

STATE OF MONTANA

HELENA (406) 444-3154
TOLL FREE (877) 275-7372
FAX (406) 444-5428

100 N PARK, STE 200
PO BOX 200131
HELENA MT 59620-0131
mpera.mt.gov

January 14, 2016

Subject: Reference Letter for Cavanaugh Macdonald Consulting, LLC

To Whom It May Concern:

Cavanaugh Macdonald Consulting, LLC ("Cavanaugh Macdonald") was selected by the Montana Public Employee Retirement Administration ("MPERA") to provide an independent actuarial audit of the work performed by MPERA's principal actuary during the year 2014. The audit required Cavanaugh Macdonald to review the principal actuary's work in preparing the June 30, 2014 actuarial valuation for the Montana Public Employees' Retirement System Defined Benefit Plan (PERS-DB).

The scope of the requested audit required an in-depth review of individual calculations completed by the principal actuary. In addition, Cavanaugh Macdonald was tasked with reviewing the soundness of the actuarial procedures utilized and conformity with accepted practices; the validity of the census data used by the principal actuary for the valuation; the appropriateness of the actuarial assumptions and methods; the reasonableness of the actuarial cost method and actuarial asset valuation method; verification of the mathematical calculations, plan liabilities and plan assets; and the review of the method used to determine the actuarial factors used in administering the programs.

Throughout the course of this engagement, MPERA was highly satisfied with the level of expertise possessed by Cavanaugh Macdonald as well as the quality of work performed on behalf of MPERA by Cavanaugh Macdonald. Overall, MPERA has been completely satisfied with the performance of Cavanaugh Macdonald and I would definitely recommend them to you for your actuarial audit needs.

Sincerely,

Dore Schwinden
Executive Director
Montana Public Employee Retirement Administration

APPENDIX B – SAMPLE AUDIT REPORT

A sample Audit Report is provided on the following pages.

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CONSULTING, LLC

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ACTUARIAL REVIEW REPORT FOR

THE PUBLIC SCHOOL RETIREMENT SYSTEM OF MISSOURI AND THE PUBLIC EDUCATION EMPLOYEE RETIREMENT SYSTEM OF MISSOURI

Prepared December 9, 2015

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Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

December 9, 2015

Board of Trustees
Public School Retirement System of Missouri
Public Education Employees Retirement System of Missouri
3210 W. Truman Blvd.
Jefferson City, MO 65109

Dear Board of Trustees:

Cavanaugh Macdonald Consulting, LLC has performed an independent review of the June 30, 2014 actuarial valuations of the Public School Retirement System of Missouri and the Public Education Employee Retirement System of Missouri. As an independent reviewing or auditing actuary, we have been asked to express an opinion regarding the reasonableness and accuracy of the actuarial assumptions, actuarial cost methods, and valuation results.

Our analysis of the actuarial assumptions and methods was based largely on the most recent experience study prepared in 2011. Our opinion on the valuation results was based on a replication valuation of the June 30, 2014 actuarial valuations. The retained actuary for the System is PricewaterhouseCoopers (PwC). We would like to thank PwC for their cooperation and assistance in providing the required information to us. **We generally find the actuarial valuation results to be reasonable and accurate based on the assumptions used. As we explain in our report, we have serious concerns about the current mortality assumption which should be addressed in the 2016 Experience Study. The valuation was performed by qualified actuaries and was performed in accordance with the principles and practices prescribed by the Actuarial Standards Board.** This report documents the detailed results of our review.

If you need anything else, please do not hesitate to give us a call. The undersigned are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report.

Sincerely,

Brent A. Banister, FSA, FCA, MAAA, EA
Chief Pension Actuary

Patrice A. Beckham, FSA, FCA, MAAA, EA
Principal and Consulting Actuary

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TABLE OF CONTENTS

		Page
1.	Executive Summary	1
2.	Actuarial Assumptions	4
	Background on Actuarial Assumptions	4
	Economic Assumptions	6
	Demographic Assumptions	10
3.	Actuarial Methods	21
	Actuarial Cost Method	21
	Asset Valuation Method	23
	Amortization of Unfunded Actuarial Accrued Liability Method	26
4.	Data Review	27
5.	Actuarial Valuation Results Review	28
6.	Valuation Report Review	34
7.	Appendix	36

SAMPLE

1. EXECUTIVE SUMMARY

As an independent auditing 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 PricewaterhouseCoopers (PwC) for the Public School Retirement System of Missouri (PSRS) and the Public Education Employee Retirement System of Missouri (PEERS). The work to be reviewed includes both the June 30, 2014 valuations and the most recent experience study (dated June 13, 2011).

We requested full participant and financial data of the pertinent employee groups from PSRS/PEERS along with reports, plan descriptions and applicable statutes pertaining to the plans. We also requested from PwC participant data as reconciled for the 2014 valuations as well as complete descriptions of assumptions, methods and valuation procedures.

It is our belief that an audit should not focus on finding differences between actuarial processes and procedures utilized by two different actuaries, but rather to verify there are no material errors and to find improvements to the process and procedures utilized by the System's actuary. In performing this audit, we attempt to limit discussions concerning differing opinions and focus more on the accuracy of calculations, the completeness and reliability of reporting, and the compliance with generally acceptable actuarial practices and standards of practice in all of the work reviewed.

The Request for Proposal issued by PSRS/PEERS requested an audit of the June 30, 2014 actuarial valuations that produced the contribution rates to be considered for adoption by the Board of Trustees. Specifically, we were asked to provide:

1. Determination of whether the actuarial methods, considerations and analyses used by PWC in preparing the most recent actuarial valuation are reasonable and consistent with generally accepted actuarial standards and practices as promulgated by the Actuarial Standards Board; are appropriate for PSRS' and PEERS' structure and funding objectives; and are in compliance with Governmental Accounting Standards (GASB) reporting and disclosure requirements.

   This determination will include:

   a) An in depth review and analysis of the valuation results, including an evaluation of the data used for reasonableness and consistency as well as a review of mathematical calculations for completeness and accuracy.

   b) Verification that all appropriate benefits have been valued and valued accurately.

   c) Verification that the data provided by PSRS/PEERS is consistent with data used by PWC.

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d) Evaluation of the actuarial cost method and actuarial asset valuation method in use and whether other methods would be more reasonable.

e) Verification of the reasonableness of the calculation of the unfunded actuarial accrued liability and the amortization period.

f) A full replication of the June 30, 2014 actuarial valuations.

2. An opinion as to whether the PWC reports conform to appropriate Standards of Practice as promulgated by the Actuarial Standards Board and is comprehensive. Any recommendations for improvement in the report presentation should be included.

As described in our report, we have determined that the actuarial methods, assumptions, processes, and reports are consistent with the applicable Actuarial Standards of Practice and our understanding of GASB Statements 67 and 68. Throughout the report, we have noted some issues where we believe there are opportunities for improvement. Some of these suggestions have already been addressed by PwC in the 2015 valuations.

In Section 2 of our report, we analyze the set of actuarial assumptions used by PwC. The actuarial assumptions are a critical component of the valuation process and, thus, were reviewed as part of the audit. While we are in agreement with many of the assumptions, we have concerns with the development of the mortality assumption. Upon our request, PwC provided us with supplemental information including details on the number of actual and expected deaths by age. They also responded to several questions about the analysis and their decisions. Based on all of the additional information gathered, we believe that PwC's recommendation for the mortality assumption dramatically stripped out any margin for future mortality improvements and not only eliminated the conservatism that existed in the current table at that time, but likely moved to a table that overstates future mortality experience (deaths) and understates liabilities and costs. The dollar impact on liabilities and costs cannot be determined without the selection of a more appropriate mortality assumption which is outside the scope of this project. The 2016 experience study should provide further insight into the situation.

In Section 3 of our report, we review the actuarial methods that are used to develop the actuarial contribution rate. In our opinion, these methods are reasonable and appropriate for systematically funding the two systems.

In Section 4 of our report, we compare the data provided by PSRS and PEERS with the data used by PwC. We find that the data is consistent and appropriate. We understand that a new information system has been implemented and, therefore, the nature of the data available has likely improved. Consequently, we did not make any recommendations regarding how the data provided might be enhanced.

SAMPLE

1. Executive Summary

In Section 5 of our report, we independently calculated the liabilities of PSRS and PEERS. We identified a minor change for the retiree COLA calculation for PSRS (which has already been addressed by PwC in the 2015 valuation) and provided some suggestions for some possible refinements to the cost calculations. We reviewed the cost calculations and accounting calculations and found them to be appropriate.

In Section 6, we provide our analysis on the valuation reports produced by PwC. We found them to be substantially in compliance with the ASOPs, but we offered some suggestions for improvement.

Because of the complexity of actuarial work, we would not expect to match PwC's results exactly, nor would we necessarily expect our opinions regarding the selection of assumptions and methods to be the same as the opinions of PwC. Our differences of opinion are not material other than as related to the mortality assumption.

The remainder of this report provides the basis for our findings for each of the six tasks, including our recommendations.

SAMPLE

2. Actuarial Assumptions

Background on Actuarial Assumptions

The actuarial assumptions form the basis of any actuarial valuation or cost study. Since it is not possible to know in advance how each member's career will evolve in terms of salary growth, future service and cause of termination, the actuary must develop assumptions in an attempt to estimate future patterns. These assumptions enable the actuary to value the amount of benefits earned and to reasonably estimate when and how long these benefits will be paid. Similarly, the actuary must make an assumption about future investment earnings of the trust fund. In developing the assumptions, the actuary examines the past experience and considers future expectations to make the best estimate of the anticipated experience under the plan.

There are two general types of actuarial assumptions:

- Economic assumptions – these include the valuation interest rate (expected return on plan assets), assumed rates of salary increase, price inflation, wage inflation, and increases in total payroll. The selection of economic assumptions should conform to ASOP No. 27 *"Selection of Economic Assumptions for Measuring Pension Obligations"*.

- Demographic assumptions – these include the assumed rates of retirement, mortality, termination, and disability. The selection of demographic assumptions should conform to ASOP No. 35 *"Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations"*.

There was no mention of either ASOP 27 or ASOP 35 in the experience study report prepared by PwC. Although there is no requirement to include such discussion, it seems a natural part of any experience study where changes to the actuarial assumptions are being made since these standards provide professional guidance on our work as actuaries. There was also no indication of the individuals who prepared the report, or what actuarial credentials they might have. Again, this is not required, but we believe it would improve the credibility of the report. ***We recommend that PwC add this content to the next experience study report.***

Philosophy of Setting Assumptions

Different actuaries have different philosophies when it comes to evaluating the experience study data and recommending changes to assumptions. Based on the recommendations in the Experience Study report, it appears to us that PwC's approach is to heavily weight the credibility of the actual experience (often with weighting factors, described later, which assign more weight to the results in the last few years) and set the new, recommended assumption very close to the actual observed rates. Our philosophy is a bit different and is undoubtedly influenced by our experience in performing these type of studies over the last 30 years. When we see significant changes in experience, we consider them carefully and try to discern why the dramatic change occurred. If we believe the observed data is not an aberration and should be seriously considered, we typically recommend rates somewhere between the old rates and the new experience. If

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experience during the next experience study period shows the same result, we will likely recognize the trend at that point in time or at least move further in the direction of the observed experience. On the other hand, if experience returns closer to its prior level, we will not have overacted, possibly causing unnecessary volatility in the actuarial contribution rates. In our opinion, although the dataset for PSRS and PEERS is large enough to assign some credibility to it in setting assumption, it is not large enough to be fully credible, i.e. setting the recommended assumption based solely on, and closely matching, the actual observed experience in one study period. Therefore, we prefer our approach but we recognize that there is room for differences of opinion.

In addition, in the PwC experience study report there was no reference to the findings of the prior experience study and how/whether experience in the current study period was consistent with or different from the prior study. It can be very helpful to consider the experience in the prior study, in addition to the current study, to evaluate whether a change is a longer term trend or not. In response to our audit report, PwC indicated that they did consider the analysis and conclusions in the prior experience study. While such analysis may have taken place, there is no mention of it in the formal report. ***In the future, we recommend that PwC include some documentation in their report that they considered both the prior and current experience study results in evaluating whether or not to change assumptions.***

SAMPLE

2. Actuarial Assumptions

Economic Assumptions

Actuarial Standards of Practice (ASOPs) are issued by the Actuarial Standards Board to provide guidance to actuaries with respect to certain aspects of performing their work. As mentioned earlier, ASOP 27 is the standard that addresses the selection of or recommendations regarding economic assumptions for measuring pension obligations (liabilities) under defined benefit plans. A revision to this standard was issued after the last experience study report was issued (with an effective date for valuations prepared after December 31, 2013). Since the new standard was not in effect, our analysis is limited to the version of the standard that was applicable at the time the experience study was performed. It is worth noting that the new standard has a more restrictive definition of a "reasonable" assumption; therefore, it is possible that assumptions that were in the best estimate range under the old ASOP 27 standard may not be considered reasonable under the new ASOP 27 standard.

The current and recommended economic assumptions in the Experience Study report were:

	PwC Recommendation	Current Assumption
Price inflation	2.50%	3.25%
Real wage growth, including health care costs*	1.00%	1.75%
Total wage growth (PSRS)*	3.50%	5.00%
Price inflation	2.50%	3.25%
Real rate of return	5.50%	4.75%
Investment return	8.00%	8.00%
Cost of living adjustment	2.50%	3.25%

*PwC recommended real wage growth assumption for PEERS of 1.25% with resulting total wage growth of 3.75%.

Most of the economic assumptions are consistently used for both PSRS and PEERS, other than the payroll growth assumption. Each assumption is briefly discussed in the following narrative.

Price Inflation: Price inflation impacts both the assumptions for the rates of salary increase and the investment return assumption so the underlying price inflation component in both must be consistent in accordance with the guidance provided in ASOP 27. In addition, because the retirees have a cost-of-living-adjustment (COLA) linked to changes in the CPI-U, the inflation assumption also impacts the COLA assumption.

Historical patterns of inflation show a long-term average of around 3%. Inflation has varied significantly over time, with some notably high periods in the 1970's influencing the average. In recent years, inflation has been consistently below the long-term average of 3% and the financial markets' pricing of inflation (comparing Treasuries and TIPS) suggests that trend will continue

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for the next 30 years. However, these results may be partially driven by the recent actions of the Federal Reserve Bank and, therefore, may not be indicative of the long-term estimation that actuaries need for their work. For a longer time frame, actuaries often consider the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the May 2011 report (the latest report as of PwC's experience study), the ultimate projected annual increase in the CPI over the next 75 years was estimated to be 2.8%, under the intermediate cost assumptions. The lower cost assumption used a forecast of 1.8% and the high cost assumption was 3.8%. The 2015 report had an intermediate assumption of 2.7%, so there has not been much change in the last four years.

While there can be arguments made for assuming inflation will remain low for a very long period of time, we note that inflation can be significantly affected by monetary and fiscal policy, and those policies may change dramatically and rapidly. Consequently, these are also some strong arguments for assuming that inflation could increase at some point in the future.

PwC provides supporting documentation for their recommendation to lower the inflation assumption from 3.25% to 2.50%. We would simply note that this is a significant change to occur in one step. Our approach would likely have been to make a change to perhaps 3.00% or 2.75% and then reevaluate at the next experience study. However, it is clear throughout the experience study that PwC's approach is much different than ours as they often recommend rather dramatic changes in assumptions, heavily reflecting more recent experience. While we might not have arrived at the same recommendation, we do believe that an inflation assumption of 2.50% is reasonable.

Investment Return Assumption: The investment return assumption (also called the valuation interest rate) should represent the long-term rate of return expected on the plan assets, considering the asset allocation, the real rate of return on each asset class, and the underlying inflation rate, all net of expenses paid from the Trust.

The long term relationship between price inflation and investment return has long been recognized by economists. The basic principle is that the investor demands a more or less level "real return" – the excess of actual investment return over price inflation. If inflation rates are expected to be high, investment return rates are also expected to be high, while low inflation rates will result in lower expected investment returns, at least in the long run.

The period considered for pension funding represents a very long time horizon. In reviewing this assumption, the actuary should consider asset allocation policy, historical returns, and expectations of future returns. Frequently, asset advisors focus on no more than the next 5 to 10 years since they are most concerned with how to invest the funds currently to maximize returns. The longer term is less relevant to them, but it is, of course, paramount to actuaries who are projecting benefits to be paid for the next 50 to 100 years. This difference in perspective can significantly influence how investment advisors and actuaries derive an investment return assumption.

2. Actuarial Assumptions

In the experience study report, PwC provides analysis to support their recommendations for all of the economic assumptions other than the assumed rate of return. For that assumption, which is the single most important assumption used in the valuation, PwC states *"It is our understanding that your asset advisor, TowersWatson, will perform an asset/liability study and will independently provide their analysis concerning the expected return assumption. As such, we will defer to their expertise regarding the development of this assumption."* We understand that the timing was such that the experience study was performed prior to the asset/liability study (A/L Study) so the desire to wait until after the asset/liability study was finalized to evaluate and make a final recommendation makes sense. However, there was no correspondence from PwC after the A/L Study was completed to document their opinion that an 8.0% investment return assumption was reasonable. Based on our understanding of ASOP 27, the actuary who uses an assumption in the valuation takes responsibility for that assumption unless the actuary indicates that it was an assumption specified by another party. While the actuary may assign heavy weighting to the opinions or recommendations of experts, they ultimately must make a recommendation for the assumed investment return. While PwC did not make a specific recommendation about the investment return assumption in the experience study, they did use the 8.0% assumption in their valuation reports without qualification. Thus, it appears that PwC believes that the 8.0% assumed rate of return was reasonable and concurs with TowerWatson's analysis in the A/L Study. We would note that TowersWatson's A/L Study reported that 8.0% was reasonable, assuming 100 basis points of alpha. We would further note that 100 basis points is a significant additional return for alpha when related investment expenses are considered. While actuarial standards of practice do not prohibit an actuary from reflecting higher returns due to active investment management strategy, they should only be reflected if the actuary believes, **based on supporting data**, that such superior returns represent a reasonable expectation over the measurement period. The A/L Study indicated that a long-term alpha of 70 basis points had been observed, but it was not clear how the calculation of the alpha was determined. In our opinion, PwC should have provided some follow up after the A/L Study to indicate they had reviewed the findings of the A/L Study and agreed that the 8.0% assumption was reasonable. While we do not find the 8.0% assumed rate of return to be unreasonable, we find PwC's silence on this key assumption unusual.

In addition, lowering the inflation assumption by 0.75% without a change in the investment return assumption of 8.0% (the assumed rate at the time) resulted in an increase in the real rate of return from 4.75% to 5.50%. This is a significant change that we believe should have been directly noted in the experience study report even if qualified by a phrase such as "if the 8.0% assumed rate of return is maintained" or "under the current 8.0% assumption" to indicate the comment may not apply if the 8.0% assumption was changed in the A/L Study.

COLA: Closely related to the inflation assumption is the COLA assumption. Because there was a significant decrease in the inflation assumption, the decrease in the COLA assumption follows. PwC recommended the COLA assumption be set to 2.50% and we find the assumption reasonable based on the Board's COLA policy at that time.

2. Actuarial Assumptions

Payroll Growth Assumption (Wage Inflation): The UAAL is amortized as a level percentage of payroll over the amortization period. As a result, a payroll growth assumption is necessary to develop the UAAL contribution rate. The payroll growth assumption consists of inflation and the real wage growth. For PSRS and PEERS, the cost of active health insurance is included in total pay so the real wage growth assumption must reflect the impact of health care costs in addition to general wage increases observed in the general economy. PwC does a nice job of laying out the analysis which supports their recommendation to change the payroll growth assumption to 3.50% for PSRS and 3.75% for PEERS, composed of 2.50% inflation, 0.50% real wage growth and 0.50%/0.75% (PSRS/PEERS) due to the inclusion of health insurance costs in gross pay. We find the assumptions to be reasonable.

Salary Scale: There are several factors that generally affect salary increases and are typically reflected in the salary scale. The first of these is price inflation. As the price of goods and services increase, we expect wages to increase as well. The second component, productivity (sometimes called the real wage growth), is a measure of how much wages increase across the whole labor pool in excess of the rate of price inflation. The combination of price inflation and the productivity component is called wage inflation or the total wage growth assumption. For PSRS and PEERS an additional component of wage inflation is the impact of including health care insurance in total pay. (See the discussion in the prior paragraph.) The third component, frequently identified as merit, reflects the portion of salary increases provided at the individual level, including promotion, increased skills, longevity pay, and other similar items. The combination of these three components is reflected in the total salary scale.

In developing their recommendation for this assumption, PwC included a table showing the salary experience for each of the five years included in the study. We would note that for both PSRS and PEERS, the actual increases for FY 2006, 2008 and 2010 appeared to be particularly low and the increases observed for FY 2009 appeared to be very high. With three years out of five appearing to be much lower than normal and one year much higher, it might call the credibility of the data for this period into question, particularly given that some of the observed data occurred during and after the Great Recession. We likely would not have been comfortable making a change to the merit component of the salary increase assumption based on the data and time period observed. However, we would still have been comfortable with implementing the more significant change in the salary increase assumption arising from the recommended change in the wage inflation assumption. We note that the high year and low years of salary increases somewhat offset each other, so we find the overall resulting salary increase assumption to be reasonable.

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2. Actuarial Assumptions

Demographic Assumptions

The major demographic assumptions are the assumed rates of retirement, withdrawal (with or without a vested benefit), disability, and mortality (death before or after retirement). We would also note that the study period included the economic downturn of 2008 and early 2009, a period of time that was very different from anything previously experienced by current workers. Consequently, it is very likely that voluntary decisions like retiring or changing jobs may have been made with a different perspective and different results. We have repeatedly observed different patterns of retirement, termination of employment and salary increases in years impacted by the economic downturn, and have generally treated these as temporary deviations from long term patterns. PwC, in contrast, views these recent years as more indicative of future trends. This is a difference in professional judgment, and arises because no one knows what will happen in the future.

PwC focused on just the current study period (July 1, 2005 to June 30, 2010), and did not mention any of the findings from the prior study period (July 1, 2000 to June 30, 2005) in their analysis. We believe considering the results of the prior study might help to identify the longer term patterns and to prevent decisions that might be unduly influenced by short-term events. In response to our audit report, PwC indicated that they did consider the analysis and conclusions in the prior experience study. While such analysis may have taken place, there is no mention of it in the formal report, and so we feel our comment is appropriate.

General Comments

We found two items about the methodology in the Experience Study that we believe are unusual and out of mainstream practice for experience studies performed for public retirement systems. They caused us to feel somewhat uncomfortable about heavily relying on the analysis presented in the Experience Study report. They are:
(1) weighting of experience using factors of 10%, 15%, 20%, 25%, and 30%; and
(2) lack of use of the Actual/Expected Ratio (A/E Ratio), the key measurement most commonly used by actuaries to communicate the results of an experience study.

More discussion follows on each of these items.

Weighting of Demographic Experience

The Experience Study is based on census data for five years (plan years ending June 30, 2006 through 2010). For the demographic experience analysis, the actual observed experience for each year from 2006 through 2010 was weighted in the final numbers shown as the results and on which the recommended assumptions were based. The following weightings were applied to FY 2006 through 2010: 10%, 15%, 20%, 25%, 30%. While it may make sense to assign weights to the demographic experience in certain situations, there was no explanation in the report as to how these weights were determined or why they were applied as they were. The effect of the weights

was that experience in 2010 (weighted 30%) received three times the credibility as the FY 2006 experience. Furthermore, the weighting applied to data in the last two years (25% and 30%) results in those two years representing over 50% of the total experience, which likely influenced the recommended changes. This approach heavily weighted the actual observed results in the latter part of the study period, which happen to be the years after the Great Recession. In their response to our audit report, PwC explained that their expectation was that the trends for lower salary increases and later retirement ages were likely to continue for the foreseeable future, so they felt that giving greater weight to recent experience was reasonable. This is clearly a subjective matter that reflects professional judgment so there is room for differences of opinion. We would not have expected this type of weighting on most of the demographic experience and would point out that it may have distorted the actual experience if plan years ending in 2009 and 2010 were atypical because of the prevailing economic conditions. Without access to the actual, observed results for each year prior to the weights being applied, we cannot provide an opinion as to the impact of the weighting factors. Thus, the approach leaves us somewhat uncomfortable with the results and findings of the experience study.

While a case may be able to be made for using the weighting factors on decrements that are based on voluntary decisions like retirement and termination of employment, mortality experience is not impacted by voluntary member choices and therefore, we do not believe that it is appropriate to weight the mortality experience in each year of the study differently. Such action heavily weights the resulting actual rates in recent experience, a two to three year period. We are also uneasy about weighting certain years so heavily given the size of the group. We have observed significant variance in mortality experience from one year to another and this type of weighting could unduly assign credibility to years that are atypical. Without information on the actual observed deaths in each year, we cannot provide an opinion on the impact of using the weighting factors for the mortality assumption. However, we would note that we have not used this approach in our work or observed it in the work of other actuaries we have reviewed.

Lack of Actual/Expected Ratio in Analysis

The purpose of a study of demographic experience is to compare what actually happened to the individual members of the System during the study period (July 1, 2005 through June 30, 2010) with what was expected to happen based on the actuarial assumptions.

The basic steps performed by most actuaries include the following:

- First, the number of members changing membership status, called decrements, during the study is tabulated by age, duration, gender, group, and membership class as appropriate (active, retired, etc.).

- Next, the number of members expected to change status is calculated by multiplying certain membership statistics, called exposure, by the expected rates of decrement.

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- Finally, the number of actual decrements is compared with the number of expected decrements. The comparison is called the actual to expected ratio (A/E Ratio), and is expressed as a percentage.

While it is evident that PwC performed steps 1 and 2, it does not appear that they followed with step 3 as there is no disclosure of an A/E ratio or a similar concept anywhere in the Experience Study report. We find this to be a major shortcoming of the report. Even as experienced public plan actuaries, it is difficult for us to analyze the experience and evaluate the recommendations being made because the report is missing a key evaluation tool, the A/E ratio.

The A/E ratio is a key indicator as to the overall fit of actual experience to that expected based on the assumptions. While not the sole consideration, it is an important measurement and we find it unusual that PwC does not include it in their analysis in the Experience Study report. The A/E ratio also provides a good way to evaluate the recommended assumption in comparison to the current assumption to determine how much the assumption was adjusted.

It is our understanding from discussions with PwC that they did analyze A/E ratios, but chose to omit them from the presentation format that was used as the report. We understand the desire to communicate the experience study results in ways that the Board and staff can most easily understand, but we recommend the A/E ratios be included either in the report itself or in an appendix.

In the following paragraphs, we make specific comments on the demographic assumptions.

Rates of Mortality: One of the most important demographic assumptions in the pension valuation is mortality because it projects how long benefit payments are expected to be made. The longer retirees live and receive benefits, the larger the liability of the system, thus increasing the contributions required to fund the system. In addition, if members live longer than expected based on the assumption, the true cost of future benefit obligations will be understated and contributions will increase as the unfavorable experience unfolds.

Because of potential differences in mortality, healthy retirees, disabled participants, and active members are usually studied separately. The mortality assumption applies to members both before and after retirement although the post-retirement mortality assumption has a far greater impact on valuation results. Most often, gender distinct rates are used since studies continually show that females live longer than males, although that gap has been shrinking according to recent mortality studies.

It is commonly recognized that rates of mortality have been declining, which means people, in general, are living longer. ASOP 35, "*Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*", requires the actuary to include an assumption as to expected mortality improvement after the measurement date. While ASOP 35 doesn't require

that the actuary assume future mortality improvements, it does require the actuary to disclose whether future mortality improvements are assumed and reflected in the mortality assumption.

There are two approaches to anticipating future improvements in mortality:

(1) setting the mortality assumption so that it includes a "margin", and

(2) using the generational mortality improvements.

The first approach intentionally selects a mortality table with lower mortality rates than are currently being observed, thus providing room for mortality improvements in the future. Under this approach, the AE ratio is well over 100% initially because the actual deaths are higher than expected by the table with margin. Under the second approach (generational mortality), the starting mortality rates are set close to the observed experience (with resulting AE ratios around 100%), and then future improvements are directly reflected by applying a mortality improvement scale to the mortality rates in each future year to reduce the probability of death. Under the generational approach, the greatest change in life expectancy is reflected for younger members who have more years of mortality improvement.

While tables showing the exposure and actual number of decrements were provided for the other demographic assumptions, there was no data provided for mortality other than the graphs of the male and female retiree experience and male and female active member mortality experience. We agree that the graphs are a useful communication tool and we regularly use them in our experience studies too, but never without supporting documentation or at least the AE ratio. The broad age range, from age 50 to 100, on the x axis and mortality rates from 0.00% to 50.00% on the y axis produce a very wide range of values. As a result, little can be discerned from the data points for ages 55 to 80 which are key ages for retirees due to the amount of liability for the members in those age groups. By their very nature, the graphs present all data points equally even though the exposure and liability varies with age, e.g. the importance of matching mortality experience from ages 55 to 80 is more important than matching mortality experience from age 85 to 100.

In their experience study report, PwC stated that the current mortality assumption was "too conservative". While looking at the graphs might have implied the assumption was too conservative because the differences at older ages is obvious, a different story might have been revealed had the mortality experience at ages 55 to 80 been analyzed or if the overall AE ratio was evaluated. In the prior experience study, prepared by Gabriel Roeder Smith & Company (GRS), they noted that the overall A/E ratio for male PSRS retirees and beneficiaries was 111% (indicating 11% more deaths than anticipated), but the A/E ratio for ages under age 85 was 103%. For female PSRS retirees, the overall A/E ratio was 124%, but the A/E ratio at ages under 85 was 105%. The tables provided by GRS in the prior study clearly indicate a significant difference in the A/E ratios at core retirement ages versus older ages (this is based on the assumption in place prior to the change recommended in the 2011 Study). As stated earlier, the portion of liability at ages under 85 is significant so it is important to have a good fit to mortality rates at those ages. If PwC analyzed the overall AE ratio, looked at the fit of the assumption at the core retirement ages, and considered the mortality findings of the prior experience study, it is not evident in their written report.

2. Actuarial Assumptions

In order to have sufficient detail to evaluate PwC's recommended change to the mortality assumption, we asked them to provide supplemental information including: exposure, actual death and expected deaths on the current and recommended assumptions. This was provided by age for each system and separately for males and females. We then grouped the data in 5-year age bands to evaluate the "fit" of the recommended assumption to the observed experience. The results are shown in the table below for the PSRS Females for discussion purposes. The complete set of tables for both males and females in PSRS and PEERS is included in an appendix to this report.

PSRS Female Retiree Experience

			PSRS Females			
			Current		Proposed	
	Exposure	Actual	Expected	A/E Ratio	Expected	A/E Ratio
Under 55	4,443	16	6.312	2.535	7.335	2.181
55-59	21,301	68	46.436	1.464	63.338	1.074
60-64	28,601	107	111.719	0.958	155.229	0.689
65-69	21,860	131	164.632	0.796	217.422	0.603
70-74	14,767	183	186.786	0.980	247.169	0.740
75-79	11,598	245	237.060	1.033	318.993	0.768
80-84	8,245	347	290.363	1.195	373.294	0.930
85-89	6,328	485	384.627	1.261	508.828	0.953
90-94	3,793	559	390.167	1.433	515.355	1.085
95-99	1,663	340	274.750	1.237	324.904	1.046
Over 99	333	112	80.961	1.383	79.742	1.405
Total	122,932	2,593	2,174	1.193	2,812	0.922
Ages 55-79	98,127	734	747	0.983	1,002	0.732

When evaluating the actual experience, an AE ratio above 100% indicates that there were more deaths than anticipated by the assumption, i.e., there is room for mortality to improve in the future (so conservatism exists). An AE ratio less than 100% indicates that there were fewer deaths than expected. In that scenario, current rates are understating observed mortality so there is no margin for future mortality improvement. The concern is that if members live longer than expected, the liabilities and costs are understated.

For all but the PEERS male group, the recommended change in the mortality assumption significantly reduced the AE ratio. The change was quite dramatic for females, decreasing the overall AE ratio from 119% to 92% for PSRS and 130% to 90% for PEERS. In addition, the AE ratios at the core retirement ages of 55 to 80 declined for PSRS Females from 98% to 73% and for PEERS Females from 118% to 79%. Based on their response to follow-up questions, PwC said that the actual experience was only considered partially credible (an evaluation of how much confidence the actuary has that the observed data represents the true underlying experience).

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According to PwC, they placed much heavier reliance on the published tables because they were developed from much larger mortality studies. However, they used age setbacks and age set forwards with the RP-2000 Mortality Table to make adjustments for the actual experience. It remains unclear to us how their decision on age adjustments were made and why the results were considered reasonable. We would note that an additional one-year age setback (for all except PEERS Males) would have moved the overall AE ratios to around 100% and an additional two-year age setback would have resulted in AE Ratios around 110%, providing a reasonable margin for future mortality improvements. It is interesting to note that the recommended change to the mortality assumption for PEERS Males had the opposite result, increasing the AE ratio from 101% to 111% overall and increasing the AE ratio at ages 55 to 80 from 92% to 117%. It raises a question as to why the RP-2000 Mortality Table with an age adjustment of +1 for PEERS Males (which produced an AE ratio of 111%) was PwC's recommended assumption while the age adjustments to the other groups resulted in AE ratios around 90%.

PwC also mentioned that they wanted to move to a version of the RP- 2000 Mortality Tables as they were perceived to be more "up-to-date" than the 1994 GAM tables at that time. In our opinion, the important factor in selecting a mortality assumption is to match the general pattern of mortality exhibited by the group. The date the table was published, the underlying data on which it is based, and the purpose for which it was created are less important than how well the table matches the group's mortality patterns. In order to meet the goal of the valuation process, which is to reasonably estimate the value of future benefit payments, the mortality table that best "fits" the observed characteristics of the mortality of the group should be selected regardless of perception.

In their experience study, PwC states "the mortality assumption should continue to factor future improvements in mortality." However, in the report they do not provide any insight into how that was accomplished with the recommended assumption. Given that a static mortality table is used in the valuation of PSRS and PEERS, the use of a margin is the measurement of the magnitude of mortality improvement provided by the assumption. Based on the overall AE ratios for both male and female PSRS retirees and female PEERS retirees, it does not appear to us that there is any margin for mortality improvement. In fact, the underlying mortality rates in PwC's recommended assumption actually anticipate that actual mortality rates will increase (more deaths) rather than decrease. When PwC was asked how future mortality improvements were reflected in the assumptions, their response was that the RP-2000 Mortality Table (with age setbacks noted) would have only been projected to 2008 (midpoint of the study period) or 2011 (year of implementation) rather than projected to 2016 (date of the next experience study). Given the duration of benefit payments and the portion of benefits payable 20 to 30 years from the valuation date, projecting mortality improvements for five years does not seem an appropriate method for reflecting future mortality improvements. Furthermore, the AE ratios would have been even lower than the numbers disclosed above if mortality improvements had only been projected to 2008 (midpoint of the study period) or 2011. In other words, even with the projected improvements for five years, the overall fit of the assumption was to anticipate 10% higher death rates than actually occurred. We note for completeness, the assumption for PEERS Males includes a margin of 11% which,

while reasonable, appears to be inconsistent with how PwC set the other mortality recommendations.

While it is not unusual to see other actuaries rely on a published mortality tables with age adjustments, we do NOT typically see an end result with AE ratios far less than 100%, especially when there is an intention to reflect room for mortality improvements. Based on our experience with similar size systems, we believe that the actual experience for PSRS females, in particular, is large enough that the table could be credibly adjusted to achieve an AE ratio sufficiently above 100% (assuming margin was desired). In addition, the fact that a similar mortality pattern was observed in the prior experience study (low death rates at ages 55 to 80) indicates to us that the observed experience in the 2006-2011 study period was not atypical and there is no compelling reason to expect it will not continue in the future. As a result, we believe that PwC's recommendation for the mortality assumption dramatically stripped out any margin for future mortality improvements and not only eliminated the conservatism that existed in the current table at that time, but likely overstates future mortality experience (deaths) and understates liabilities and costs. The dollar impact on liabilities and costs cannot be determined without the selection of a more appropriate mortality assumption which is outside the scope of this project. The 2016 experience study should provide further insight into the situation.

Our suggestions for the next experience study are:

(a) Include the calculation of A/E ratios for all decrements, including mortality, and show the detailed data underlying the results including exposure, expected decrements and actual decrements either in the report or in an appendix.

(b) Studies have shown that retirees with higher benefit amounts tend to live longer than those with lower benefit amounts. This means that, if the assumptions are accurately predicting the number of deaths, they may still be overstating the release of liability expected when a retiree dies, which would impact the valuation. We believe it might be useful to include analysis with benefit weighting for the mortality assumption in the next experience study.

(c) It is important to have a good fit of mortality rates at the key retirement ages of 55 through 80. The specific fit at these ages should be studied and disclosed in the experience study report as well as the overall findings, similar to the tables included for mortality analysis in the GRS experience study.

(d) Evaluate the mortality pattern observed and, if it is consistent with prior patterns, assign more credibility to the actual experience and select a mortality assumption that better fits the actual experience.

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(e) Select a mortality assumption that will provide for future mortality improvements. Our recommendation would be to use generational mortality, if feasible administratively. If it is determined that a static table must be used, we recommend a margin of around 10% (so an AE ratio of around 110%).

Additional Information on Mortality

The Society of Actuaries (SOA) released a new mortality table in October, 2014 which included a new mortality improvement scale, called MP-2014. The SOA subsequently issued MP-2015, an updated mortality improvement scale based on two additional years of data. The new mortality table has received a fair amount of attention in the media. The mortality improvement scales with the RP-2014 Mortality Table indicated that mortality had improved more rapidly than was anticipated by the projection scale published with the RP-2000 Mortality Table (which was used to project mortality to 2016 for PSRS/PEERS), indicating that the actual improvement in mortality was greater than expected. The SOA is working on a new research project that will result in a mortality table based solely on data from public retirement systems. The table is not expected to be published until 2017 or 2018.

We share this information on the RP-2014 Mortality Table and MP-2014/2015 Projection Scales for educational purposes only. The membership of the systems is large enough to assign a fair amount of credibility to the actual experience in setting the mortality assumption. Standard mortality tables, most often issued by the SOA, are generally used with some adjustment like age set-forwards and age set-backs as well as collar adjustments, to obtain a better fit to the actual experience. However, it is important to note that the fit of the mortality assumption to the observed data is more important than the date the table was issued or the data upon which it was based. Just because a new mortality table was issued by the SOA does not mean that PSRS/PEERS should automatically adopt that table, but to the extent the general trend in observed mortality shows that people are living longer that is an important consideration for all retirement systems.

Rates of Retirement: PwC stated that retirement experience from 2005 to 2010 indicated a trend toward later retirement ages. We have observed a general trend toward retirement occurring later, so the reduced retirement rates are consistent with our experience with similar systems. We would note that the fit of the proposed PSRS assumption for retirement at ages 55 to 62 with service of 25, 26 or 27 is not a particularly good match to the actual experience. Several of the combinations of age/service indicated higher retirement rates than are reflected in the proposed assumption, and so we might have expected some adjustment. Nonetheless, the proposed rates appear to be reasonable in light of the observed experience. Again, the recommended assumption for PEERS from ages 62 to 69 with 25 years of service and ages 65 to 70 with 26 to 28 years of service was not a good fit with the actual experience. While we might have made a different recommendation, we believe the current assumptions are reasonable.

Rates of Termination: The termination of employment (withdrawal) assumption is a service-based assumption which is the most commonly used format for termination assumptions in other public retirement systems. PwC recommended no change to the assumption for PSRS and PEERS and we concur with that recommendation. The rates appear reasonable in light of the observed experience.

Rates of Disability: There were very few disabilities observed during the study period (178 in a five year period for PSRS and 154 for PEERS), so this assumption is very difficult to evaluate. In the prior experience study, the disability rates for PSRS were increased based on the observed experience. Given the small number of occurrences and the fact that the assumption was increased in the prior study, we might have been inclined to keep the rates rather than make a change. However, PwC's recommended assumption is based on the observed data and is consistent with their philosophy of setting the assumption close to the actual experience.

The disability experience for PEERS was lower than the assumption in place and consequently, PwC recommended lowering the rates. While we agree that the actual experience indicated some adjustment would be appropriate, we would not have moved all the way to fit the new assumption to the actual data, given the small number of disabilities and the resulting volatility expected from one study period to another.

Refund of Employee Contributions: In the valuation process, this assumption is applied to active members who terminate employment after five years of service and are vested. It anticipates the election of a refund of accumulated employee contributions by the member and the forfeiture of any vested monthly benefit at retirement eligibility. PwC recommended reducing the assumption from 30% to 12% for PSRS and from 50% to 20% for PEERS.

Based on the counts shown in the data table in the experience study report, it appears that both inactive non-vested and vested members from the valuation may have been included in the actual election experience. Since the assumption is used to anticipate the election of a refund by an active member who terminates after five years of service, technically the exposure for this study should be members who terminated employment (other than death, disability and retirement) from active status during the study period and elected a refund in the next few years. Including non-vested members or members who terminated employment prior to the study period may have distorted the experience and impacted the resulting recommended assumptions. However, because the liability results appear somewhat insensitive to this assumption, we do not anticipate that such a distortion would be material.

PwC comments that "there is likely an age and/or service-based pattern for refund….." and we agree. Even though this assumption appears to have little impact on the overall liabilities of the Systems, we would prefer to see some analysis performed, on age, service, or both, to indicate if the demographic profile of the members electing a refund is significantly different than those who do not. The impact of an election for a refund by a young, short service members is very different

than that of an older, long-service members. We recommend PwC include this analysis in the next experience study.

We would also note that the higher contributions currently being made by members may result in more active members electing a refund upon termination in future years which might actually increase the liabilities if the value of the refund is larger than the value of the deferred benefit.

Service Purchases: PwC recommended the normal cost rate be loaded (2% for PSRS and 1.5% for PEERS) to anticipate the losses incurred from service purchases. For PSRS the dollar amount of service purchases changed significantly over the five year study period, but there was no explanation as to why this might have occurred or whether it impacted the recommendation. The recommended load was set close to the actual loss from service purchases in the last year of the study, and based on the available data, that seems reasonable. We note that while the losses from service purchases appear meaningful when compared to the normal cost amount, they would be much smaller as a percent of the actuarial accrued liability, which is where the experience actually appeared in the prior valuations.

We have not seen other systems use this approach, but many systems have moved to an actuarial cost basis for service purchases so any negative cost impact in the valuation is small.

Other Assumptions: There are some miscellaneous assumptions that were addressed in the experience study report. For the most part, these assumptions do not have a major impact on the valuation results and we do not have any concerns with these. However, we have some suggestions for PwC to consider for future valuations.

Age Difference of Spouse: PwC includes the data underlying their recommended change to the assumption for the difference in spouse ages. The data shown in the Experience Study reports support their recommended assumption of a four year age difference with retirees older than their spouses for PSRS (regardless of gender) and a five year age difference for PEERS. While this is unusual compared to age differences observed in other systems (female are consistently younger than males whether they are retirees or beneficiaries) members can elect to name any family member as their joint annuitant (including children or grandchildren). We believe this explains the difference in the joint annuitant age observed in the data and we find this assumption to be reasonable.

Optional Form of Payment Election: PwC recommended retaining the current assumption. However, there was no analysis shown to substantiate that it is a reasonable assumption. Once new form factor tables were adopted by PSRS and PEERS, this load was dropped.

Return of Unused Employee Contributions: PwC uses an assumption for the number of years of benefit payments to exceed the value of a member's accumulated employee contributions plus interest. This period is 5 years for PSRS and 3 years for PEERS. There is no supporting documentation to support the assumption based on either actual data or hypothetical scenarios.

We assume this assumption is used in valuing the liability related to the return of contributions for active members who are assumed to retire in the future, but die before receiving benefit payments equal to their employee contribution balance at retirement. If so, we would note that the valuation software used by PwC can directly value the modified cash refund feature of the benefit (return of any employee accumulated balance at retirement over actual benefit payments received). We recommend that PwC consider eliminating the assumption and directly value the probability of a refund of employee contributions with interest after retirement. While the impact of this change is expected to be minor, in our opinion, it is usually better to directly value a benefit or provision than to use an assumption.

Interest on Employee Contributions: We agree with the recommendation to retain the current assumption.

Missing/Incomplete Data Assumptions: We agree with the recommendations.

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3. Actuarial Methods

Actuarial Cost Method

For all pension plans, whether defined benefit or defined contribution, the basic retirement funding equation is:

$$C + I = B + E$$

Where:

- C = employer and member contributions
- I = investment income
- B = benefits paid
- E = expenses paid from the fund, if any.

As can be seen from the formula, for a given level of benefits and expenses the greater "I" is, the smaller "C" is. This is the underlying reason for advance funding a pension plan, and historically investment income pays for 75% to 80% of the benefit dollars received by plan members. In other words, for every dollar paid to a member only 20 to 25 cents comes from contributions.

Of course, the problem with the formula is that in order to figure out exactly how much to contribute, the plan would have to be closed to new members and allowed to operate until all retirees were deceased. At that point, the benefits and expenses actually paid out, and the investment income actually earned would be known and, using the equation above, the true cost could be determined. Since the vast majority of plans are ongoing and have no intention of closing, and since even with a closed plan it takes a very long time before all benefits are finally paid out, plan sponsors hire actuaries to estimate the cost of their plans and to create a budget for systematic contributions to meet that cost.

In order to determine the contributions needed, the actuary's first step is to estimate on a given date (the valuation date) the value of all benefits (and expenses) that will be paid to the existing active and retired membership over their remaining lifetimes based on the plan's current benefit structure. This estimation requires the use of assumptions regarding both future events (termination, disability, retirement, death, etc.) and future economic conditions (return on assets, inflation, salary growth, etc.). The PSRS and PEERS assumptions were covered in the previous section.

By combining the assumptions for future events and the salary growth assumption, the actuary generates an expected benefit payment stream. In other words, a string of annual payments expected to be made to the current active and retired members from the valuation date until all members are no longer living. Then the actuary applies the investment return assumption to discount each year's payments to the valuation date, creating the present value of all future benefits or the total liability of the plan.

SAMPLE

3. Actuarial Methods

The difference between the total liability and the current assets of the plan represents the present value of future contributions (PVFC) that have to be made by either members or the employers. Usually the members and employers cannot contribute the entire difference in one year, but rather desire a relatively smooth contribution pattern over time that also meets any external constraints. In order to budget for the PVFC, the actuary applies an actuarial cost method. There are several acceptable cost methods, but it's important to recognize that they are nothing more than budgeting tools.

Different actuarial cost methods can provide for faster funding earlier in a plan's existence, more level funding over time, or more flexibility in funding. The choice of an actuarial cost method will determine the pattern or pace of the funding and, therefore, should be linked to the long-term financing objectives of the system and benefit security considerations.

The actuarial cost method used by PSRS and PEERS is the entry age normal method. This cost method determines the normal cost as a level percentage of pay which, if paid from entry into the plan to the last assumed retirement age, will accumulate to an amount sufficient to pay the expected benefit. Entry age normal tends to result in reasonably stable contribution rates, a feature that has helped make it the most commonly used cost method for public plans. An additional cost is determined by amortizing the unfunded actuarial accrued liability (discussed later in this section).

In our opinion, the actuarial cost method employed by the PSRS/PEERS and PwC is appropriate and will systematically fund the prospective pension benefits on an actuarially sound basis if all of the actuarial assumptions are realized and the actuarial required contributions are made. It is important to note, however, that the actual contribution rates are set by the Board of Trustees and are not necessarily equal to the actuarial required contribution rate. However, since the Board determine the actual contribution rate with consideration of the actuarial contribution rate, this policy should also work to fund the plans over the long term.

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ASSET VALUATION METHOD

Since the purpose of actuarial funding is to build up an asset pool (remember the importance of "I" in "C + I = B + E") actuaries need to value the current asset pool on each valuation date. The market value could be used, but it would tend to create too much volatility from valuation date to valuation date, and a single day's measurement is not necessarily indicative of the true underlying value of the investments held by the plan. Thus, most actuaries use an asset valuation method which smoothes out these fluctuations in pursuit of achieving more stable funding measures and (when relevant) developing more level contributions. A good asset valuation method places values on a plan's assets which are related to current market value, but which will also produce a smooth pattern of costs. This is a question of balancing fit (measured against market value) and smoothness.

Neither book nor market value of assets is generally felt to be appropriate in determining the actuarial contribution rate for an ongoing pension plan. Book value produces smooth predictable employer contributions, but it ignores sizeable appreciation and is not a good measure of the fund's true value (i.e., a poor fit to market value). On the other hand, market value is a realistic current measure of the fund but, on a long-term basis, one day's market value may not be a very meaningful figure for a pension fund. Furthermore, sharp short-term swings in market value can result in large fluctuations in the computed employer contributions required to fund the plan (i.e., not very smooth).

The goal of the actuarial asset valuation method is thus to smooth or reduce investment market fluctuations. This is particularly important during periods of volatile capital markets in which abrupt changes in asset values, when factored into the funding valuation, produce sudden unnecessary changes in contribution levels. In this case, "unnecessary" implies that the change in asset values is not necessarily a true revaluing of the assets involved, but rather a fluctuation reflecting a current economic climate or a short-term reaction to specific news.

In our opinion, 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 method should be easy to explain to all interested parties.
- The theoretical underpinnings should be solid and not produce a long-term lag to the fair value of assets. The value produced should account for market values.
- The method should smooth the effect of market fluctuations.

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- Investment decisions should not be affected by the actuarial asset valuation method, and vice versa.

- The value produced should be realistic; the price tag placed on assets should be sensible and should not cause other variables to be adjusted to account for unrealistic asset values.

PSRS/PEERS Asset Valuation Method: The asset valuation method used by PwC in the valuation is a variant of methods commonly used by other public sector retirement systems. The smoothing method finds the difference between the actual investment return on the market value of assets and the expected investment return on the actuarial value of assets. This difference is then recognized 20% per year over five years.

This smoothing method will result in no additional piece to defer if the market return on assets is exactly 8.0% of the actuarial value for a year. However, if that were to happen each year in the future, the actuarial value for PSRS would not equal the market value. In theory, this should happen after five years, but at some point in the past, the relationship between the market value, the actuarial value, and the deferred pieces have had minor errors creep in. If desired, this could be corrected, but the issue does not affect the functioning of the smoothing method.

Compliance with ASOP 44

Actuarial Standard of Practice Number 44, "*Selection and Use of Asset Valuation Methods for Pension Valuations*", provides guidance to the actuary when selecting an asset valuation method for purposes of a defined benefit pension plan actuarial valuation. When considering the use of an asset valuation method other than market value, ASOP 44 states the actuary should select an asset valuation method that is designed to produce actuarial values of assets that bear a reasonable relationship to the corresponding market values. Further guidance states that the asset valuation method must satisfy <u>both</u> of the following criteria:

(a) The asset values fall within a reasonable range around the corresponding market value.

AND

(b) Any differences between the actuarial value of assets and the market value of assets are recognized within a reasonable period of time.

In lieu of satisfying both (a) and (b) above, an asset valuation method meets ASOP 44 requirements if, <u>in the actuary's professional judgment</u>, the asset valuation method either:

(i) Produces values within a sufficiently narrow range around market value OR
(ii) Recognizes differences from market value in a sufficiently short period.

SAMPLE

3. Actuarial Methods

Several of the terms in the criteria of ASOP 44 such as "reasonable" and "sufficiently narrow" are not well defined. As a result, actuaries can differ in their opinion on these matters. As we consider the current asset valuation method used by PSRS and PEERS in light of ASOP 44, we believe it satisfies these requirements. Some asset valuation methods rely on a corridor (a constraint that the actuarial value be within a specified proportion of the market value) to meet these requirements, but we concur that a corridor is not needed for PSRS and PEERS.

We find the asset valuation method to be reasonable and in accordance with actuarial standards.

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AMORTIZATION OF UNFUNDED ACTUARIAL ACCRUED LIABILITY METHOD

The unfunded actuarial accrued liability is amortized using a layered base approach. Following the establishment of the initial UAAL base in 2011, each year gains or losses arising from asset and demographic experience are amortized over a new 30-year period with payments that are determined as a level percentage of payroll. Improvements in benefit provisions are amortized over 20 years, while reductions in benefits are amortized over 30 years. While not explicitly discussed, it appears that changes in assumptions are treated as experience gains or losses for this purpose.

We believe this amortization method is generally reasonable. By using layers of bases, the fresh-start UAL as of 6/30/2011 will be fully paid for by 2041. Assuming the assumptions are reasonably reflective of experience over time, future gains and losses are likely to be comparatively smaller and approximately offset each other. We do note that there has been some movement in the public pension actuarial community toward this layered approach with somewhat shorter amortization periods. For instance a recent white paper published by the Conference of Consulting Actuaries indicates a preference for amortizing gains and losses over a 15 to 20 year period. We believe this is something that PSRS and PEERS may wish to consider, but we wish to emphasize that the current method will pay off the UAAL over time, provided that contributions are approximately equal to the actuarially determined contribution rate and that assumptions are met reasonably well.

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4. Data Review

PwC and PSRS/PEERS supplied CMC with active, terminated vested, retired member and beneficiary data as of June 30, 2014. We compared the records and generally agreed with the processing being performed by PwC. We note that the data files provided from PSRS/PEERS to PwC require only minimal processing, but PwC also performs extensive reconciliation work that helps assure the quality of the data.

Usually a replication valuation is performed using the retained actuary's processed data to prevent data processing issues from affecting comparability. Due to some timing constraints, our replication study actually began with the raw data files supplied by PSRS/PEERS. The fact that our liability results are close to those of PwC is a further indication that the data processing is being performed well. In comparing summary results, we had identical or nearly identical counts, salaries, retirement benefit amounts, and member account balances. Consequently, we are comfortable with the data processing steps being utilized by PwC.

We understand that PSRS/PEERS has revised their information system since the data for the June 30, 2014 valuation was prepared. Usually when this occurs, the annual data file provided to the actuaries is reviewed and frequently additional data fields are provided if they would enhance the valuation process. For example, in the old data layout there was no specific field for the pop-up factor or amount. We assumed this specific data item, along with others, would have been discussed with PwC and added to the data file if available.

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REASONABLENESS OF THE ACTUARIAL VALUATION RESULTS

This section of our review discusses the reasonableness and accuracy of the valuation liabilities and costs.

Generally accepted actuarial standards and practices provide actuaries with the basic mathematics and the 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. Differences may also arise from the actuarial software used to make these calculations, especially in the allocation of liabilities between past and future service for active members. Although these factors may lead to differences in the calculated results, these differences should not be material. Generally, differences in the present value of benefits of 1% to 2% or less and differences in the actuarial liabilities of 5% or less are considered reasonable. The normal cost rate should generally be within 5% as well, but it is also important that it be consistent with the relationship of the present value of benefits and the actuarial liability.

As part of the actuarial audit, CMC used the data provided by PSRS/PEERS to reproduce the valuation liabilities used for the cost calculations. We have presented a summary of results at the end of this section. While the results are generally very close, we also looked at a finer level of detail than is displayed as well as some individual detailed sample lives. This allowed us to identify some minor issues that would not otherwise be apparent from the summarized results. However, the reasonable match of the summarized results emphasizes that the differences discussed in the remainder of this section are indeed minor. ***Based on the results of our review, overall, we find the actuarial liabilities, contribution rate calculations, and the GASB disclosures to be reasonable.***

In our efforts to replicate the valuation results, we noted one part of the calculations performed by PwC that we believe needs to be changed. We also have identified some other calculations where PwC's approach is acceptable, but we believe there is an opportunity for improvement. As noted above, our total calculations are generally close to those of PwC, so these issues are relatively minor and would not be expected to materially change any of the measures of the costs or financial condition of PSRS and PEERS.

One issue is the manner in which the COLA calculations for PSRS retirees are performed. The 80% COLA cap for PSRS retirees who retired when the COLA commenced on their fourth January of retirement is calculated as though the current COLA commencement on the second January of retirement applied. This results in a lower cap being applied to these individuals, slightly undervaluing their benefit. ***We believe that PwC should review this item and make any needed correction in the next valuation.***

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The remaining issues are items that we find to be unusual or less common. There may be a reasonable justification for their use in some cases, or it may be that a different approach was intended, but not implemented appropriately. We do not find any of these to be materially significant, but believe there are some potential theoretical improvements. ***We believe that PwC should review these items and determine if any changes are appropriate.*** The items are discussed in the following paragraphs.

1) For determining the required rate of pay to amortize the UAAL, PwC uses a number they label as "Anticipated Payroll" which is the annual pay for the 12 months following the valuation date for those members who have not reached age 70 (PSRS) or 75 (PEERS) when retirement is assumed to occur immediately (called certain retirement age). The amortization payment is developed as a level percentage of payroll under the assumption that payroll increases each year. This growth of total payroll is based on the expectation that as active members leave employment for any reason, they are replaced. Consequently, most actuaries determine the UAAL amortization rate by dividing by the total expected payroll, assuming that those who have reached certain retirement age are replaced as well. The implicit assumption by PwC is that the workers who are currently past certain retirement age will not be replaced, but all others will. If PwC adopts the more common approach of assuming these individuals are replaced, there would be a slight decrease in the UAAL amortization rate.

2) In calculating the normal cost rate, PwC divides by the same anticipated payroll number described in the prior paragraph. This anticipated payroll number is essentially the rate of pay for all members who have not reached certain retirement age. Excluding the pay of those past certain retirement is common since those individuals no longer have any normal cost. Thus, the normal cost divided by the payroll results in a rate that should be reflective of the on-going cost of the plan. However, the choice of software parameters (based on our understanding of the sample life output) that PwC uses to calculate the normal cost considers the expected pay for individuals each year from entry age through certain retirement age. This expected pay reflects a full year of pay should the member work a full year and half a year of pay if the member is assumed to end employment during the year. Thus, the most precise calculation of the normal cost rate would be to divide the normal cost by the expected pay, reflecting decrements, rather than the total rate of pay as is currently being done. We believe that if this were done, then the normal cost would not need to be increased with half a year's interest and the normal cost rate would not be very different from the current rate. Alternatively, PwC could decide that rather than determining the theoretical normal cost rate, the goal is to collect the dollar amount of normal cost, in which case the dollar amount of normal cost should be increased with half a year's interest and then divided by the total expected payroll for the year, including those past certain retirement age if they are expected to be replaced. This is admittedly a very technical issue, and we do not have complete access to all of the parameters in the valuation software coding. We encourage PwC to review their coding and the software technical documentation to see if a refinement is appropriate, particularly in the use of salary

adjustments during the year when calculating the Present Value of Future Salaries (PVFS). In our replication we have utilized our preferred approach to developing payroll for the normal cost rate, although have used PwC's approach for calculating the PVFS.

3) Under Entry Age Normal calculations, the intent is to determine the rate of pay from entry to exit which would be sufficient to pay the promised benefits should all assumptions be met. To perform these calculations, projections on each member are made not only forward from the valuation date until assumed certain retirement, but also backward from the valuation date to the member's entry into the plan. In projecting back to entry, there are two broad approaches to reflecting actual history. One approach ignores any past actual salary history, including its effects on accumulated member contributions, by assuming all salaries in the past have exactly met assumptions and developing a hypothetical member account balance had current member contribution rates always been applicable. This approach also ignores any past benefit structures that are no longer applicable, grandfathering earned benefits as part of the actuarial liability, but excluding them from the normal cost calculation. The alternative approach reflects available actual historical salaries, filling in unknown years by assuming that the assumptions were exactly met prior to the historical salaries used. The member's account balance in past years is adjusted (depending upon software) to end up at the current balance. Past benefit structures are potentially reflected as well. Both methods are widely used in practice, and are considered acceptable. The first method produces a theoretically more accurate normal cost rate, but generally is more complex to program with minimal gain in many situations. PwC uses the second method, while our personal bias is toward the first method. In particular, we note that the impact of using first approach would be significant for the PEERS termination decrement, increasing the normal cost rate about 0.8% of pay, but reducing the actuarial liability. We do not necessarily suggest a change, but provide this information for PwC to evaluate their approach for possible refinements. For purposes of replication, we used PwC's approach.

4) One unusual aspect of the way PwC implements its historical Entry Age Normal calculations is that for PSRS, the retirement rates for years before 2014 reflect that a different benefit structure was in place that resulted in different retirement patterns. We usually find that when a provision has been eliminated or replaced, the historical retirement or other applicable decrement rates are not used. Instead, the current rates are used to reflect the on-going nature of the plan. In the case of PSRS, the present value of benefits is unaffected by this use of a different set of rates in the past. However, the PwC approach serves to increase the normal cost rate since the value of benefits at entry age is increased. This, in turn, reduces the actuarial accrued liability. We adopted PwC's approach on the retirement rates for purposes of our replication. We anticipate that if only the current retirement rates were assumed retrospectively, the normal cost rate would decrease and the UAAL amortization rate would increase, largely offsetting each other. While we would not classify this particular approach as an error, we do believe that it is not typical and would suggest PwC consider changing to a more common approach.

5) When PwC determines the actuarially contribution rate, the development is based on calculations that are as of the valuation date, resulting in a rate that is calculated for the current plan year (the one immediately following the valuation date). However, because of the timing requirements of preparing the valuation and the advance notice necessary to implement contribution rate changes, the rate is deemed to be effective for the plan year starting 12 months after the valuation. This is a common approach in the public plan arena and is reasonable, especially in light of the Board using the actuarial contribution rate as guidance in maintaining or changing the actual contribution rate. We do note that some systems reflect this lag directly in the development of the actuarial contribution rate, either by allowing the dollar amount of the required cost to grow with interest and the covered payroll to increase with assumed salary growth. Others estimate the expected UAAL at the following valuation date and calculate the anticipated amortization contribution rate at that point in time as well. We believe that any of these methods is reasonable, but encourage PwC to periodically review the rate lag to confirm that the current methodology is still reasonable.

6) Finally, there are several places in the report where intermediate asset or liability amounts are adjusted to the middle of the year. PwC performs these calculations by using simple interest, or 4%, for half a year. While this is reasonable, we note that many actuaries would use half a year reflecting compound interest of 8% per year and thus use an interest adjustment of 3.92%. This is very minor and point it out only for PwC's consideration.

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Comparison of June 30, 2014 Liability Measures

PSRS

	PwC	CMC	CMC/PWC
Present Value of Benefits			
Active Members			
Retirement	21,127,975,054	21,168,543,271	1.002
All other decrements	849,278,945	748,581,569	0.881
Total active	21,977,253,999	21,917,124,840	0.997
Retirees	23,579,997,567	23,113,114,592	0.980
Inactives	722,212,570	726,898,290	1.006
Total	46,279,464,136	45,757,137,722	0.989
Actuarial Liability			
Active Members	14,180,973,795	14,202,022,449	1.001
Retirees	23,579,997,567	23,113,114,592	0.980
Inactives	722,212,570	726,898,290	1.006
Total	38,483,183,932	38,042,035,331	0.989
Normal Cost Amount (No Interest Adjustment)			
Retirement	703,313,998	714,278,675	1.016
All other decrements	100,614,032	81,360,171	0.809
Total	803,928,030	795,638,846	0.990
Payroll for Normal Cost Rate	4,425,567,630	4,382,023,268	0.990
Normal Cost Rate			
Retirement	16.53%	16.16%	0.977
All other decrements	2.36%	1.85%	0.783
Total	18.89%	18.00%	0.953

SAMPLE

Comparison of June 30, 2014 Liability Measures

PEERS

	PwC	CMC	CMC/PWC
Present Value of Benefits			
Active Members			
Retirement	3,121,769,619	3,094,348,316	0.991
All other decrements	259,016,258	278,503,274	1.075
Total active	3,380,785,877	3,372,851,590	0.998
Retirees	1,861,575,021	1,932,623,598	1.038
Inactives	174,655,146	179,438,868	1.027
Total	5,417,016,044	5,484,914,056	1.013
Actuarial Liability			
Active Members	2,175,258,66	2,127,522,687	0.978
Retirees	1,861,575,021	1,932,623,598	1.038
Inactives	174,655,146	179,438,868	1.027
Total	4,211,488,832	4,239,585,153	1.007
Normal Cost Amount (No Interest Adjustment)			
Retirement	117,739,096	119,578,921	1.016
All other decrements	32,837,482	35,148,066	1.070
Total	150,576,578	154,726,987	1.028
Payroll for Normal Cost Rate	1,442,700,979	1,396,203,291	0.968
Normal Cost Rate			
Retirement	8.49%	8.56%	1.009
All other decrements	2.36%	2.52%	1.067
Total	10.85%	11.08%	1.021

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CONTENT OF THE ACTUARIAL REPORTS

The American Academy of Actuaries has issued a number of Actuarial Standards of Practice which deal with measuring pension obligations and communicating the results (ASOP No. 4, 23, 27, 35, 41 and 44). Those standards list specific elements to be included, either directly or by reference to other documents, in pension actuarial communications. Some of the elements would not be pertinent in all communications, but since an actuarial valuation report is the most complete picture of the actuarial status of the plan, all of the elements listed should be covered in the report, even if only briefly.

The June 30, 2014 Actuarial Valuation Reports for PSRS and PEERS generally provide sufficient information for another actuary to understand what was done and to assess the reasonableness of the results. We compared the contents of the reports to over 30 specific items detailed for pension actuarial work in ASOPs 4 and 41. ***In our review of the report, we found it to be substantially in compliance with the applicable ASOPs***. One exception is that ASOP 4 requires the inclusion of a statement indicating that future measurements may differ from those presented in the report. Such a statement should be included in the future. We wish to note that an updated version of ASOP 4 is applicable for measurement dates on or after December 31, 2014, so there may be additional changes required for the June 30, 2015 valuation.

In addition to the requirements of the ASOPs, we also reviewed the reports to consider if there were changes that might improve the communication of the results. We have tried to avoid suggestions that are merely stylistic, recognizing that the current report reflects the influences, provided through time, of the retained actuary, the PSRS/PEER staff, and the Board. Nonetheless, we have identified two items that we believe could enhance the reports.

First, the PwC presentation of the liabilities (page 6, for example) breaks the various liability measures down into member contribution balances, in-pay member liabilities, inactive member liabilities, and active member liabilities. Our concern is that this may not clearly present the liability by membership group. The member contribution balances shown include balances for active members, vested inactive members, and non-vested inactive members. What is not obvious is that approximately 85% to 90% (for PEERS and PSRS respectively) of this total balance is attributable to active members. At the same time, the liability shown for inactive members is only a fraction of the total obligation because much of the liability for this group is the value of the member contribution balances.

For instance, consider the PSRS actuarial accrued liability, which is displayed in the valuation report as:

Member Contribution Balances	$ 6,985,665,067
Retiree/Beneficiary/Disabled	23,579,997,567
Inactive	101,926,552
Active	7,815,564,746
Total	38,483,183,932

Alternatively, this could be displayed in the following manner:

Retiree/Beneficiary/Disabled	$ 23,579,997,567
Inactive – vested	629,814,979
Inactive – nonvested	92,417,591
Active	14,180,943,795
Total	38,483,183,932

This alternative presentation may be more effective in communicating the relative importance of the various groups of members to the total liability. At the same time, the current presentation helps to illustrate that member contributions are a significant portion of the total not-in-pay liability. Because both breakdowns provide some important insights, it may be worth considering the possibility of including both allocations. Further displaying the active present value of benefits by decrement could also provide valuable information.

Second, for the development of the actuarial value of assets, we would encourage the inclusion of the prior excess (positive or negative) returns or the remaining portion to be recognized in addition to the amount being currently recognized. While all of these pieces can be derived from the information provided, we think this might help non-actuarial users better follow the development of the actuarial value of assets.

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APPENDIX

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APPENDIX – SUMMARY OF PWC MORTALITY DATA

	PSRS Males						PSRS Females					
			Current		Proposed				Current		Proposed	
	Exposure	Actual	Expected	A/E Ratio	Expected	A/E Ratio	Exposure	Actual	Expected	A/E Ratio	Expected	A/E Ratio
Under 55	1,656	6	4.257	1.409	3.181	1.886	4,443	16	6.312	2.535	7.335	2.181
55-59	9,145	33	38.441	0.858	30.789	1.072	21,301	68	46.436	1.464	63.338	1.074
60-64	13,877	79	99.804	0.792	85.820	0.921	28,601	107	111.719	0.958	155.229	0.689
65-69	11,851	117	152.150	0.769	135.447	0.864	21,860	131	164.632	0.796	217.422	0.603
70-74	8,705	142	188.755	0.752	168.239	0.844	14,767	183	186.786	0.980	247.169	0.740
75-79	6,565	200	222.578	0.899	224.112	0.892	11,598	245	237.060	1.033	318.993	0.768
80-84	3,957	226	217.187	1.041	245.018	0.922	8,245	347	290.363	1.195	373.294	0.930
85-89	1,904	203	166.598	1.219	206.450	0.983	6,328	485	384.627	1.261	508.828	0.953
90-94	645	113	86.606	1.305	117.028	0.966	3,793	559	390.167	1.433	515.355	1.085
95-99	142	42	28.723	1.462	37.282	1.127	1,663	340	274.750	1.237	324.904	1.046
Over 99	9	4	2.550	1.569	3.064	1.306	333	112	80.961	1.383	79.742	1.405
Total	58,456	1,165	1,208	0.965	1,256	0.927	122,932	2,593	2,174	1.193	2,812	0.922
Ages 55-79	50,143	571	702	0.814	644	0.886	98,127	734	747	0.983	1,002	0.732

	PEERS Males						PEERS Females					
			Current		Proposed				Current		Proposed	
	Exposure	Actual	Expected	A/E Ratio	Expected	A/E Ratio	Exposure	Actual	Expected	A/E Ratio	Expected	A/E Ratio
Under 55	326	4	1.138	3.514	0.689	5.806	222	1	0.294	3.405	0.365	2.742
55-59	796	9	5.287	1.702	3.397	2.649	2,451	9	5.559	1.619	8.673	1.038
60-64	2,213	22	27.121	0.811	18.711	1.176	9,267	48	38.101	1.260	60.314	0.796
65-69	4,002	68	80.187	0.848	58.458	1.163	13,293	112	102.335	1.094	150.111	0.746
70-74	4,138	111	129.912	0.854	100.117	1.109	11,664	159	148.383	1.072	218.865	0.726
75-79	3,519	176	175.557	1.003	148.181	1.188	9,767	254	199.823	1.271	296.495	0.857
80-84	2,337	199	191.146	1.041	182.584	1.090	7,199	313	252.968	1.237	360.618	0.868
85-89	1,316	171	163.689	1.045	175.488	0.974	4,458	358	266.701	1.342	392.192	0.913
90-94	458	107	86.679	1.234	96.542	1.108	1,889	281	190.119	1.478	274.769	1.023
95-99	82	28	21.993	1.273	23.822	1.175	445	116	71.420	1.624	89.880	1.291
Over 99	7	2	2.733	0.732	2.709	0.738	60	21	14.683	1.430	14.901	1.409
Total	19,194	897	885	1.013	811	1.106	60,715	1,672	1,290	1.296	1,867	0.895
Ages 55-79	14,668	386	418	0.923	329	1.174	46,442	582	494	1.178	734	0.792

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North Dakota Teachers' Fund for Retirement

Request for Proposal for Actuarial Audit Services

RFP Number: 190-16-01

Due: February 16, 2016

Cost Proposal

Submitted by:
Patrice A. Beckham, FSA, FCA, EA, MAAA
Principal and Consulting Actuary

Brent A. Banister, PhD, FSA, FCA, EA, MAAA
Chief Pension Actuary

Cavanaugh Macdonald Consulting, LLC
3906 Raynor Parkway, Suite 106
Bellevue, NE 68123
405-902-4461 – Phone; 405-902-4464 – Fax

www.CavMacConsulting.com

ATTACHMENT 4

COST PROPOSAL FORMAT

Cost Proposal
2015 Actuarial Audit
ND Teachers' Fund for Retirement

	Estimated Total Hours	Total Fixed Fee*
Actuarial Audit	125 Hours	$ 37,500

*Total Fixed Fee does not include travel expenses (including transportation, lodging, meals, and other travel related expenses) and should not be included in your proposal. Travel expenses for the presentation to the TFFR Board of Trustees in July 2016 will be reimbursed if the Chief Retirement Officer has given prior approval for each individual to incur such expenses. NDTFFR is under no obligation to reimburse the consultant if no approval was given.

Memorandum

TO: **TFFR Board**

FROM: **Fay Kopp**

DATE: **March 1, 2016**

SUBJ: **Actuarial Audit RFP**

NDRIO worked with the State Procurement Office and Attorney General's Office in issuing the RFP for Actuarial Audit Services. The RFP was issued on January 5, 2016. Responses to questions were posted on January 26, 2016.

RIO received proposals from the following six firms by the February 16, 2016 deadline.

1. Bolton Partners
2. Cavanaugh Macdonald Consulting
3. Cheiron
4. Gabriel, Roeder, Smith & Company
5. Gallagher Benefit Services
6. Pension Trustee Advisors (partnered with KMS Actuaries)

The proposals were first examined to determine if they were sufficiently responsive to the RFP requirements to permit valid comparison. All six proposals were determined to be responsive.

The six proposals were then independently reviewed by the Proposal Evaluation Committee (Fay, Shelly, and Dave). Each committee member evaluated the technical proposals and awarded points for understanding, methodology, management plan, experience and qualifications as described in the RFP.

An NDRIO staff member who was not on the Proposal Evaluation Committee (Connie) awarded the points to each cost proposal separately from the technical proposal, and provided them to the Committee after the technical proposals were rated.

The Proposal Evaluation Committee has completed its review and awarded points as follows:

Rank	Firm	Technical (70)	Cost (30)	Total (100)
1	Gabriel, Roeder, Smith & Co.	68.7	30.0	98.7
2	Cavanaugh Macdonald	68.7	27.6	96.3
3	Cheiron	58.0	18.8	76.8
4	Bolton Partners	53.0	20.9	73.9
5	Pension Trustee Advisors	57.0	10.4	67.4
6	Gallagher Benefit Services	37.6	23.4	61.0

In general, the proposals received were of excellent quality. GRS and CavMac were ranked the highest with the greatest number of total points in both technical and cost proposals. Costs from the six firms ranged from $34,500 to $99,450 for the actuarial audit and related work required under the RFP.

Based on the ratings, the Proposal Evaluation Committee has selected GRS and CavMac as finalists to make oral presentations at the March 17, 2016 board meeting. Each finalist has been allotted a maximum of one hour for their presentation and Q & A.

A copy of each finalist's proposal is attached. Please note that the proposals are being sent to you separately from the board materials posted on the public website. Proposal information is exempt and may not be disclosed to the public until all oral presentations regarding the proposals have been heard in accordance with NDCC 44-04-18.4(6).

After the oral presentations have concluded (agenda item 3), the Board can discuss selection of the consultant to perform the actuarial audit (agenda item 4). Factors to be considered may include proposal information (technical understanding, methodology, management plan, experience, and qualifications), contract cost, oral presentations and communication skills, references, and any other factors the Board deems applicable.

BOARD ACTION REQUESTED: Select firm to conduct an actuarial audit of TFFR as outlined in the actuarial audit services RFP.

Attachments

MEMORANDUM

TO: **TFFR Board**
FROM: **Fay Kopp**
DATE: **March 10, 2016**
SUBJ: **Eligible Salary Determination – Equipment maintenance and repair duties**

Eligible Salary Issue

As discussed at the January 21, 2015 TFFR Board meeting, a number of recent employer audits and reviews of various ND Career and Technology centers or programs conducted by NDRIO Audit Services staff has prompted us to review whether or not payments for certain duties are eligible compensation for TFFR purposes. It appears that certain payments made to licensed teachers for similar types of duties are being treated differently by TFFR employers. At this time, two employer compliance audits are being held until the following question is answered.

Should payments for the following duties be reported as eligible pensionable salary to TFFR if duties are performed by an employee licensed by ESPB and contracted to provide teaching, supervisory, administrative, or extracurricular services at a career and technology education center, school district, or other TFFR participating employer?

- **Equipment and machinery maintenance, repair, rotation (welders, tools, etc.)**
- **Computer equipment maintenance and repair (computers, routers, printers, etc.)**
- **Jobsite prep or finish work for building construction**

Staff Review

To begin researching this issue, in November 2015, Retirement Program Manager Shelly Schumacher and I met with Wayne Kutzer and Mark Wagner at ND CTE. In our meetings, it became apparent that there are a wide variety of programs, governance structures, payment structures, and processes being utilized by school districts and CTCs. To better understand employer practices relating to equipment maintenance and repair, jobsite prep and finish work, and similar types of duties, we decided to form a small working group of state and local directors of CTE programs and centers. We met on January 22, 2016 in Valley City. The NDTFFR – NDCTE working group meeting was very beneficial and provided us with a great opportunity to gather input regarding the work duties, employment structures, and payments made for these duties and to review TFFR statutes and administrative rules relating to eligible retirement salary (see p. 3-4 of memo).

Audit Services Supervisor Terra Miller Bowley, Shelly Schumacher, and I have reviewed all feedback and related information, and developed the following recommendation for the Board's consideration.

NDCC 15-39.1-04 (10)(h) provides that eligible salary does not include *"other benefits or payments not defined in this section which the board determines to be ineligible teachers' fund for retirement salary."* Therefore, staff is requesting that the Board make a determination on this issue.

TFFR's legal counsel, Assistant Attorney General Jan Murtha, was also asked to review staff's recommendation and has no concerns. She noted: 1) the Board has the discretion to make this determination under state law; 2) the analysis generally follows the criteria for making member salary determination set out in administrative code; and 3) the presumption of requiring the duties to be included in a written contract is supported under applicable law.

Staff Recommendation

Additional payments made by a TFFR participating employer to a TFFR member for equipment maintenance and repair, jobsite prep and finish work, and similar types of nonteaching duties are not eligible salary for TFFR purposes IF the duties are not included on the member's regular teaching contract(s).

This recommendation is based on the following:

- The duties are outside of the member's regular teaching contract(s).
- The duties do not require a teaching license.
- The duties are not considered teaching, supervisory, administrative, or extracurricular.
- The duties are service oriented, and may be performed by outside contractors or other skilled persons who do not possess a teaching license.

1) IF equipment maintenance, repair, and similar types of duties <u>are not</u> included as part of a member's regular teaching contract(s), additional payments for such nonteaching duties are not eligible TFFR salary. For example, after school, weekend, and summer work for additional equipment maintenance, repair, inventory, rotation; building construction jobsite prep or finish work; or other nonteaching duties which may be covered under a separate service contract or work agreement, are not part of the member's regular teaching contract(s), do not require a teaching license to perform, are not considered teaching duties, and therefore are not reportable to TFFR.

2) IF equipment maintenance, repair, and similar types of duties <u>are</u> included as part of a member's regular teaching contract(s), the total contract amount is eligible TFFR salary. For example, prep time for classroom instruction, prep time for equipment maintenance and repair, and related duties which are expected as part of the job and are performed under the regular teaching contract(s), or extended contract(s) are reportable to TFFR.

Board Action Requested: Approve staff recommendation, revise staff recommendation, request additional information, OR provide board direction on this salary determination issue. Authorize staff to draft board policy based on decision.

NDCC 15-39.1-04(10) defines SALARY for TFFR purposes:

"Salary" means a member's earnings in eligible employment under this chapter for teaching, supervisory, administrative, and extracurricular services during a plan year reported as salary on the member's federal income tax withholding statements plus any salary reduction or salary deferral amounts under 26 U.S.C. 125, 132(f), 401(k), 403(b), 414(h), or 457, as amended. "Salary" includes amounts paid to members for performance of duties, unless amounts are conditioned on or made in anticipation of an individual member's retirement or termination. The annual salary of each member taken into account in determining benefit accruals and contributions may not exceed the annual compensation limits established under 26 U.S.C. 401(a)(17)(B), as amended, as adjusted for increases in the cost of living in accordance with 26 U.S.C. 401(a)(17)(B), as amended. A salary maximum is not applicable to members whose participation began before July 1, 1996.

"Salary" does not include:

a. Fringe benefits or side, nonwage, benefits that accompany or are in addition to a member's employment, including insurance programs, annuities, transportation allowances, housing allowances, meals, lodging, or expense allowances, or other benefits provided by employer.

b. Insurance programs, including medical, dental, vision, disability, life, long-term care, workforce safety and insurance, or other insurance premiums or benefits.

c. Payments for unused sick leave, personal leave, vacation leave, or other unused leave.

d. Early retirement incentive pay, severance pay, or other payments conditioned on or made in anticipation of retirement or termination.

e. Teacher's aide pay, referee pay, bus driver pay, or janitorial pay.

f. Amounts received by a member in lieu of previously employer-provided benefits or payments that are made on an individual selection basis.

g. Signing bonuses as defined under section 15.1-09-33.1.

h. Other benefits or payments not defined in this section which the board determines to be ineligible teachers' fund for retirement salary.

NDCC 15-39.1-04 (4) defines CONTRACT for TFFR purposes:

“Contract” means a written agreement with a school board or other governing body of a school district or special education unit of this state or a letter of appointment by a state institution, state agency, or other employer participating in the fund.

NDAC 82-02-01-01 defines the following terms for TFFR purposes:

3) Administrative means to manage, direct, or superintend a program, service, or school district or other participating employer.

10) Extracurricular means outside of the regular curriculum of a school district or other participating employer which includes advising, directing, monitoring, or coaching athletics, music, drama, journalism, and other supplemental programs.

18) Supervisory means to have general oversight or authority over students or teachers, or both, of a school district or other participating employer.

19) Teaching means to impart knowledge or skills to students or teachers, or both, by means or oral or written lessons, instructions, and information.

21) Written Agreement means a teaching contract, school board minutes, or other official document evidencing a contractual relationship between a teacher and a participating employer.

TFFR Investment Update

For the Periods Ended December 31, 2015

March 7, 2016

Note: This update contains unaudited results for the current fiscal year, which are subject to change, but deemed to be materially accurate.

Dave Hunter, Executive Director/CIO

Darren Schulz, Deputy Chief Investment Officer

ND Retirement & Investment Office (RIO)

State Investment Board (SIB)

Executive Summary – December 31, 2015

Investment Performance –

- **For the one year ended December 31, 2015, TFFR generated a net investment return of 0.64% versus a policy benchmark of 0.15%. Active investment management enhanced TFFR's return by approximately $10 million (or 49 basis points) in the last year.** Modest returns in U.S. Equity (+1.4% actual versus -0.25% index) and U.S. Fixed Income (+0.18% actual versus -0.89% index) were offset by sharply negative results in International Fixed Income (-7.6% actual versus -6.0% index) and International Equity (-1.1% actual versus -3.6% index). Global Real Assets outperformed its relative benchmark (+9.0% actual versus +7.9% index) as impressive Real Estate results (+14% actual versus +12% index) were partially offset by weak Infrastructure returns (-0.5% actual versus +0.4% index). Private Equity (-8.2%) also performed poorly. Timber returns were positively impacted by one-time adjustments which were primarily responsible for the recent strong performance (+5.7% actual versus +5.0% index).

- **Asset allocation is the primary driver of returns over the long-term.** TFFR generated a net return of 6.9% for the 5-years ended December 31, 2015, which exceeded the policy benchmark by 0.69%. During the last 5-years, asset allocation and active management generated approximately **$560 million** (90%) and **$60 million**[1] (10%) of TFFR's overall investment income, respectively.

- **TFFR's investment returns have consistently ranked in the 1st or 2nd quartile of the Callan Public Fund Sponsor Database over the last 1-, 3-, and 5-year periods ended December 31, 2015.** These returns have been achieved using less risk than peers during the last 1- and 3-year periods.

Risk Update –

- In the "Last 5 Years", TFFR risk (as measured by actual standard deviation divided by the investment policy benchmark) has declined from over 115% down to 105% on a rolling 3- and 5-years basis.

Footnote 1: The market value of TFFR's assets approximated $1.8 billion for the five-years ended Dec.31, 2015 ($1.8 billion x 0.69% = $12 million x 5 years = $60 million).

TFFR Investment Ends – December 31, 2015

SIB clients should receive investment returns consistent with their written investment policies and market variables. This "End" is evaluated based on comparison of each client's (a) actual net rate of return, (b) standard deviation and (c) risk adjusted excess return, to the client's policy benchmark over 5-years.

	Current FYTD 12/31/2015	1 Yr Ended 12/31/2015	3 Yrs Ended 12/31/2015	5 Yrs Ended 12/31/2015	Risk 5 Yrs Ended 12/31/2015	Risk Adj Excess Return 5 Yrs Ended 12/31/2015
Teachers' Fund for Retirement						
Total Fund Return - Net	-2.40%	**0.64%**	7.60%	**6.90%**	8.3%	**0.37%**
Policy Benchmark Return	-2.00%	**0.15%**	6.74%	**6.22%**	8.0%	
Excess Return	**-0.40%**	**0.49%**	**0.86%**	**0.69%**	**105%**	

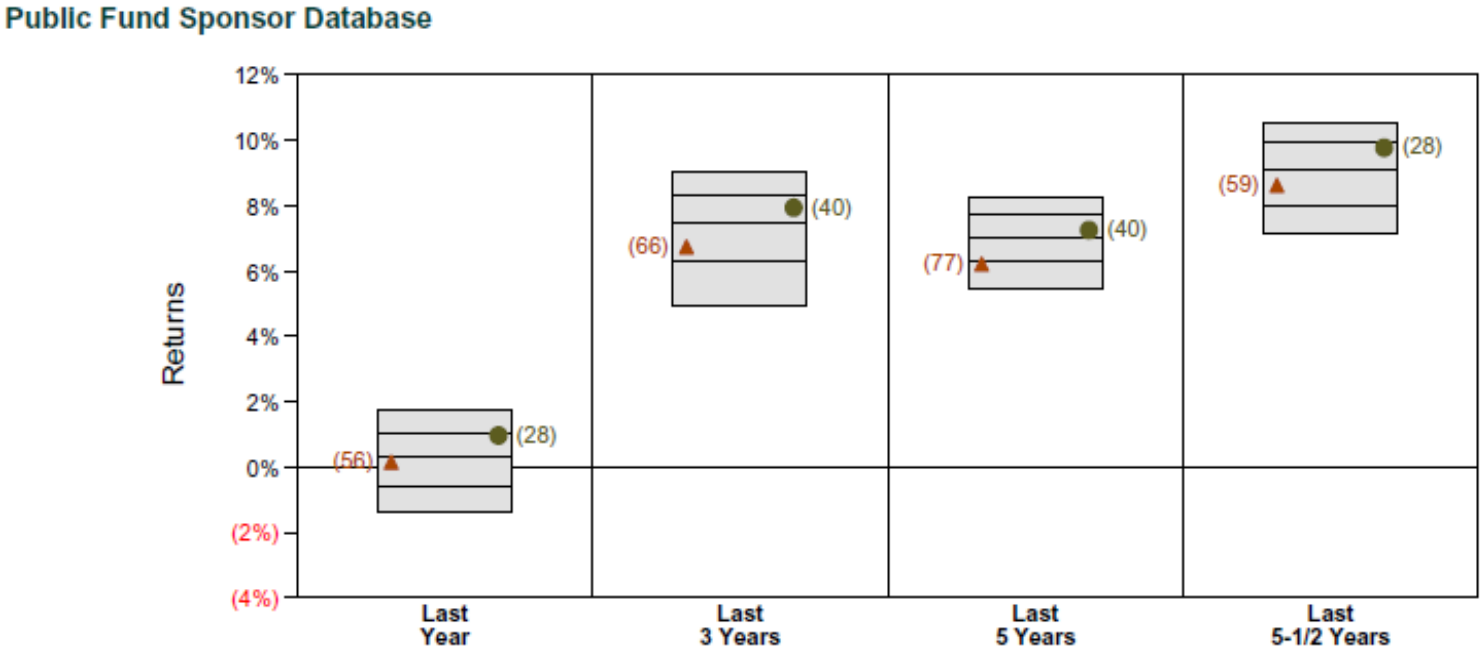
Net Return: TFFR's net investment rate of return for the 5-years ended December 31, 2015 was **6.90%** versus a policy benchmark of **6.22%** resulting in an **Excess Return of 0.69% (or 69 bps)**.

Risk: TFFR's standard deviation for the 5-years ended December 31, 2015 was 8.3% versus a policy benchmark of 8.0% resulting in a **portfolio risk ratio of 105%**. This is within TFFR's stated risk tolerance which indicates this ratio should **not exceed 115%**.

The Risk-Adjusted Excess Return of TFFR's portfolio (net of fees and expenses) was **0.37%** for the 5-year period ended December 31, 2015.

TFFR Return History – Unadjusted Peer Comparison using Callan's "Gross" Returns

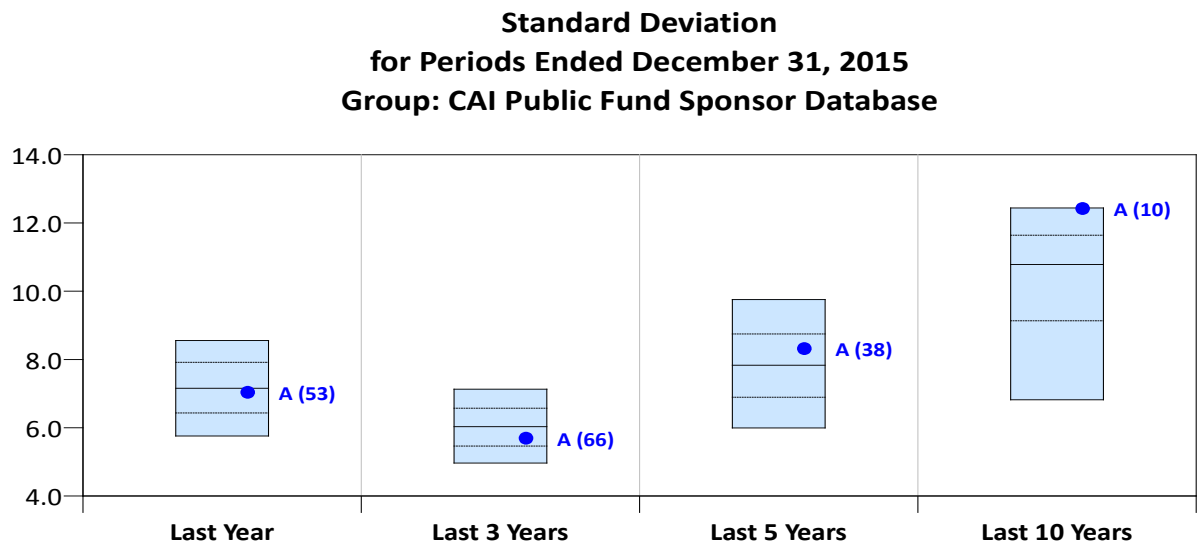
Source: Callan "Public Fund Sponsor Database" for U.S. public pension plans with $1 billion or more in assets under management.



	Last Year	Last 3 Years	Last 5 Years	Last 5-1/2 Years
10th Percentile	1.73	9.07	8.28	10.53
25th Percentile	1.04	8.34	7.73	9.94
Median	0.33	7.50	6.99	9.10
75th Percentile	(0.61)	6.29	6.28	8.01
90th Percentile	(1.40)	4.92	5.46	7.13
Total Fund ●	0.96	7.94	7.25	9.77
Policy Target ▲	0.14	6.74	6.21	8.63

TFFR's returns have consistently outperformed other public pension plans ranging from the 28th to 40th percentile over the last 5-1/2 years.

Pension "Risk" has declined as measured by Standard Deviation



	Last Year	Last 3 Years	Last 5 Years	Last 10 Years
10th Percentile	8.6	7.1	9.8	12.4
25th Percentile	7.9	6.6	8.8	11.6
Median	7.2	6.0	7.8	10.8
75th Percentile	6.4	5.5	6.9	9.1
90th Percentile	5.8	5.0	6.0	6.8
Member Count	267	251	228	201
Total Fund-TFFR ● A	**7.0**	**5.7**	**8.3**	**12.4**

Portfolio volatility, as measured by Standard Deviation, has generally declined versus peers and currently resides in the 3rd quartile for the 1- and 3-year periods ended 12/31/15, although the absolute level of volatility has increased in the "Last Year" versus the "Last 3 Years".

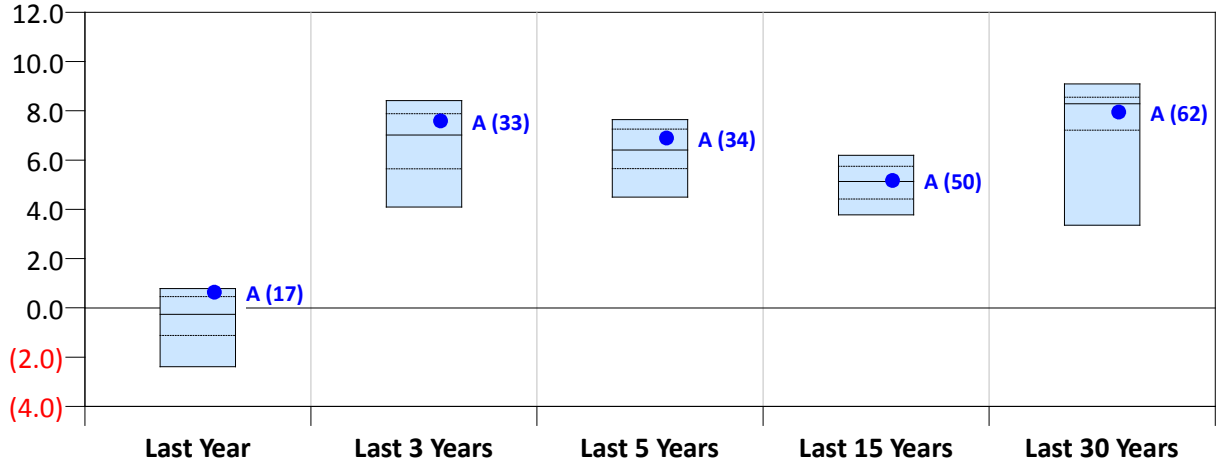
TFFR – Peer Comparison of Net of Fee Returns

Summary:

TFFR has been ranked in the 33rd or 34th percentile over the last 3- and 5-year periods ended December 31, 2015.

Source:
Callan Public Fund Sponsor Database of U.S. Public Pension Plans which report returns net of fees.

Net of Fee Returns
for Periods Ended December 31, 2015
Callan Public Fund Sponsor Database

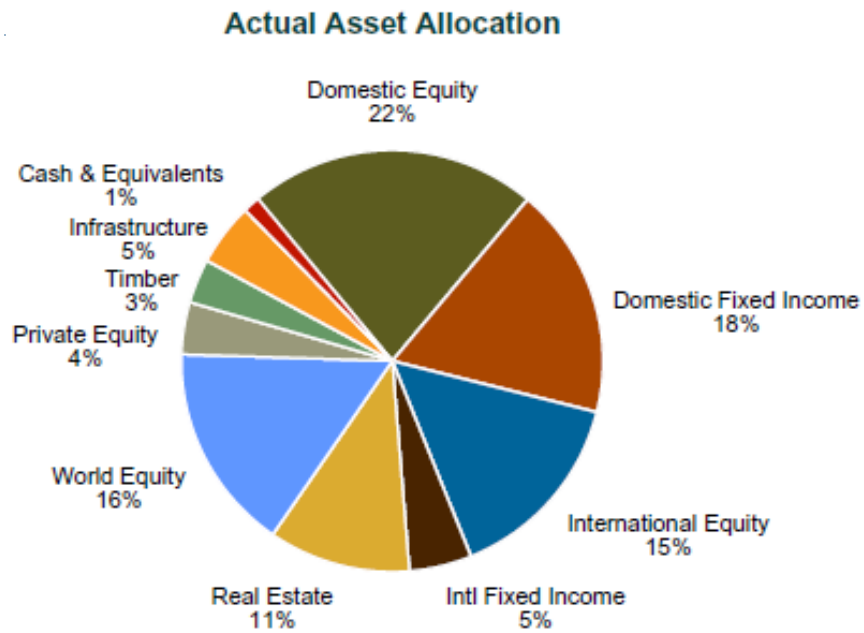


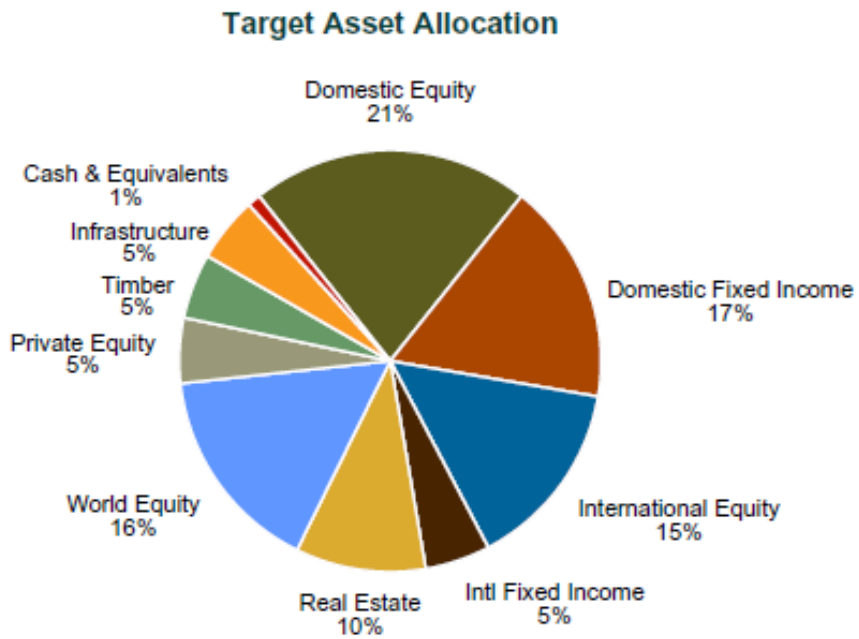
		Last Year	Last 3 Years	Last 5 Years	Last 15 Years	Last 30 Years
10th Percentile		0.8	8.4	7.6	6.2	9.1
25th Percentile		0.5	7.9	7.3	5.8	8.6
Median		(0.3)	7.0	6.4	5.1	8.3
75th Percentile		(1.1)	5.6	5.7	4.4	7.2
90th Percentile		(2.4)	4.1	4.5	3.8	3.4
Member Count		135	123	103	70	10
Total Fund-TFFR	● A	**0.6**	**7.6**	**6.9**	**5.2**	**8.0**

TFFR Investment Review

As of December 31, 2015

Actual Allocations were within 1% to 2% of Approved Targets





Asset Class	$000s Actual	Weight Actual	Target	Percent Difference	$000s Difference
Domestic Equity	451,887	22.2%	21.4%	0.8%	16,128
Domestic Fixed Income	361,670	17.8%	17.0%	0.8%	15,506
International Equity	304,547	15.0%	14.6%	0.4%	7,253
Intl Fixed Income	97,532	4.8%	5.0%	(0.2%)	(4,281)
Real Estate	222,901	10.9%	10.0%	0.9%	19,275
World Equity	324,514	15.9%	16.0%	(0.1%)	(1,287)
Private Equity	80,813	4.0%	5.0%	(1.0%)	(21,000)
Timber	69,159	3.4%	5.0%	(1.6%)	(32,654)
Infrastructure	97,718	4.8%	5.0%	(0.2%)	(4,095)
Cash & Equivalents	25,519	1.3%	1.0%	0.3%	5,156
Total	2,036,260	100.0%	100.0%		

* Current Quarter Target = 16.6% Russell 1000 Index, 16.0% MSCI World Index, 12.0% Barclays Aggregate Index, 11.8% MSCI EAFE Index, 10.0% NCREIF Total Index, 5.0% CPI-W, 5.0% Barclays HY Corp 2% Issue, 5.0% NDSIB TFFR - Private Equity, 5.0% Global Agg ex USD, 5.0% NCREIF Timberland Index, 4.8% Russell 2000 Index, 2.8% MSCI Emerging Mkts - Net and 1.0% 3-month Treasury Bill.

TFFR - Actual vs. Target Returns – December 31, 2015

Actual Returns were disappointing last year but outperformed Target Returns

One Year Relative Attribution Effects

Asset Class	Effective Actual Weight	Effective Target Weight	Actual Return	Target Return	Manager Effect	Asset Allocation	Total Relative Return
Domestic Equity	22%	21%	1.61%	(0.25%)	0.42%	(0.02%)	0.39%
Domestic Fixed Income	18%	17%	0.39%	(0.89%)	0.23%	(0.03%)	0.20%
Real Estate	10%	10%	15.26%	13.33%	0.17%	0.01%	0.18%
Infrastructure	5%	5%	(0.02%)	0.38%	(0.01%)	(0.01%)	(0.02%)
Timber	4%	5%	5.70%	4.97%	0.04%	(0.07%)	(0.03%)
International Equity	15%	15%	(0.94%)	(3.59%)	0.40%	(0.07%)	0.33%
International Fixed Incom	5%	5%	(7.24%)	(6.02%)	(0.07%)	(0.00%)	(0.07%)
Private Equity	4%	5%	(8.23%)	(8.23%)	0.00%	0.05%	0.05%
World Equity	16%	16%	(1.97%)	(0.87%)	(0.17%)	(0.04%)	(0.21%)
Cash & Equivalents	1%	1%	0.11%	0.05%	0.00%	0.00%	0.00%
Total			**0.96% =**	**0.14% +**	**1.00% +**	**(0.18%)**	**0.82%**

- **TFFR generated an "Actual (Callan Gross) Return" of 0.96% for the year ended Dec. 31, 2015.** Actual Returns of most asset classes exceeded their benchmark with notable exceptions for International Fixed Income and World Equity with negative Manager Effects of (0.07%) to (0.17%). Asset allocations were within 1% to 2% of approved targets. Strong absolute returns in Real Estate (+15%) and modest returns in U.S. Equity (+1.6%) and Fixed Income (+0.4%) were materially offset by disappointing results in International Equity (-0.9%), International Fixed Income (-7%), Private Equity (-8%) and World Equity (-2%). Timber results were positively impacted by unusual items including a fee reversal in the last calendar quarter of 2015.

* Current Quarter Target = 16.6% Russell 1000 Index, 16.0% MSCI World Index, 12.0% Barclays Aggregate Index, 11.8% MSCI EAFE Index, 10.0% NCREIF Total Index, 5.0% CPI-W, 5.0% Barclays HY Corp 2% Issue, 5.0% NDSIB TFFR - Private Equity, 5.0% Global Agg ex USD, 5.0% NCREIF Timberland Index, 4.8% Russell 2000 Index, 2.8% MSCI Emerging Mkts - Net and 1.0% 3-month Treasury Bill.

TFFR Five Year Return Attribution – December 31, 2015

Actual Returns materially exceeded Target Returns over the last 5-years

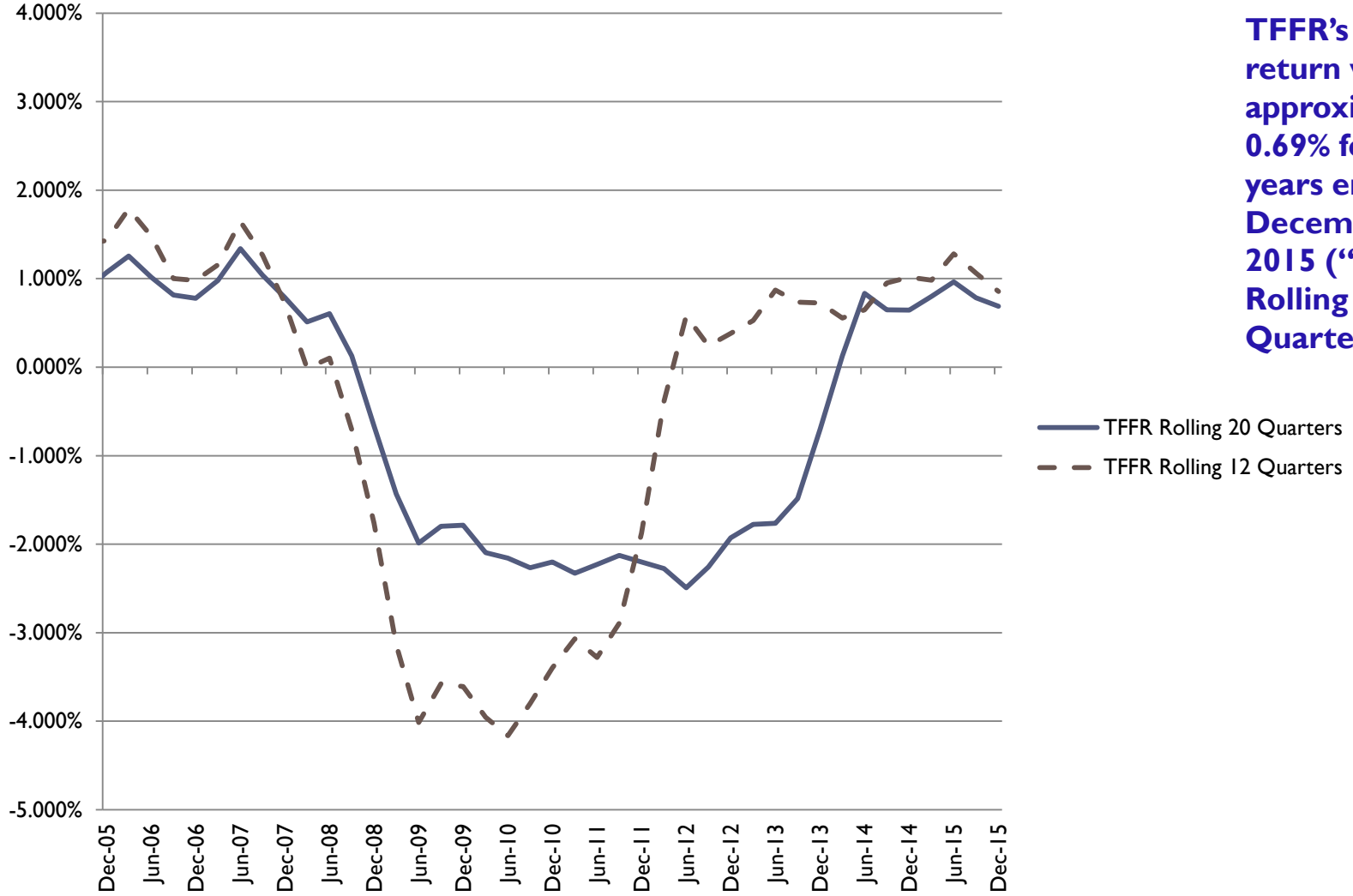
Five Year Annualized Relative Attribution Effects

Asset Class	Effective Actual Weight	Effective Target Weight	Actual Return	Target Return	Manager Effect	Asset Allocation	Total Relative Return
Domestic Equity	27%	26%	12.38%	11.78%	0.08%	0.11%	0.20%
Domestic Fixed Income	18%	17%	5.25%	3.69%	0.26%	(0.01%)	0.25%
Real Estate	10%	10%	14.85%	12.18%	0.25%	0.04%	0.29%
Timber	4%	4%	-	-	(0.28%)	(0.01%)	(0.29%)
Infrastructure	3%	4%	-	-	0.18%	0.12%	0.30%
International Equity	17%	17%	3.56%	1.82%	0.30%	(0.02%)	0.28%
International Fixed Incom	5%	5%	1.25%	(0.83%)	0.12%	(0.01%)	0.10%
Private Equity	5%	5%	2.54%	2.54%	0.00%	(0.05%)	(0.05%)
World Equity	11%	11%	-	-	0.01%	(0.05%)	(0.04%)
Cash & Equivalents	1%	1%	0.08%	0.07%	0.00%	(0.01%)	(0.01%)
Total			**7.25% =**	**6.21% +**	**0.92% +**	**0.12%**	**1.04%**

- **TFFR generated an "Actual (Callan Gross) Return" of 7.2%** for the 5-years ended Dec. 31, 2015. Actual Returns of every Asset Class exceeded their performance benchmark excluding Timber and Private Equity. After adjusting Callan's gross "Actual Return" for investment management and performance fees, the net return for TFFR was 6.90% over the last five-years.

* Current Quarter Target = 16.6% Russell 1000 Index, 16.0% MSCI World Index, 12.0% Barclays Aggregate Index, 11.8% MSCI EAFE Index, 10.0% NCREIF Total Index, 5.0% CPI-W, 5.0% Barclays HY Corp 2% Issue, 5.0% NDSIB TFFR - Private Equity, 5.0% Global Agg ex USD, 5.0% NCREIF Timberland Index, 4.8% Russell 2000 Index, 2.8% MSCI Emerging Mkts - Net and 1.0% 3-month Treasury Bill.

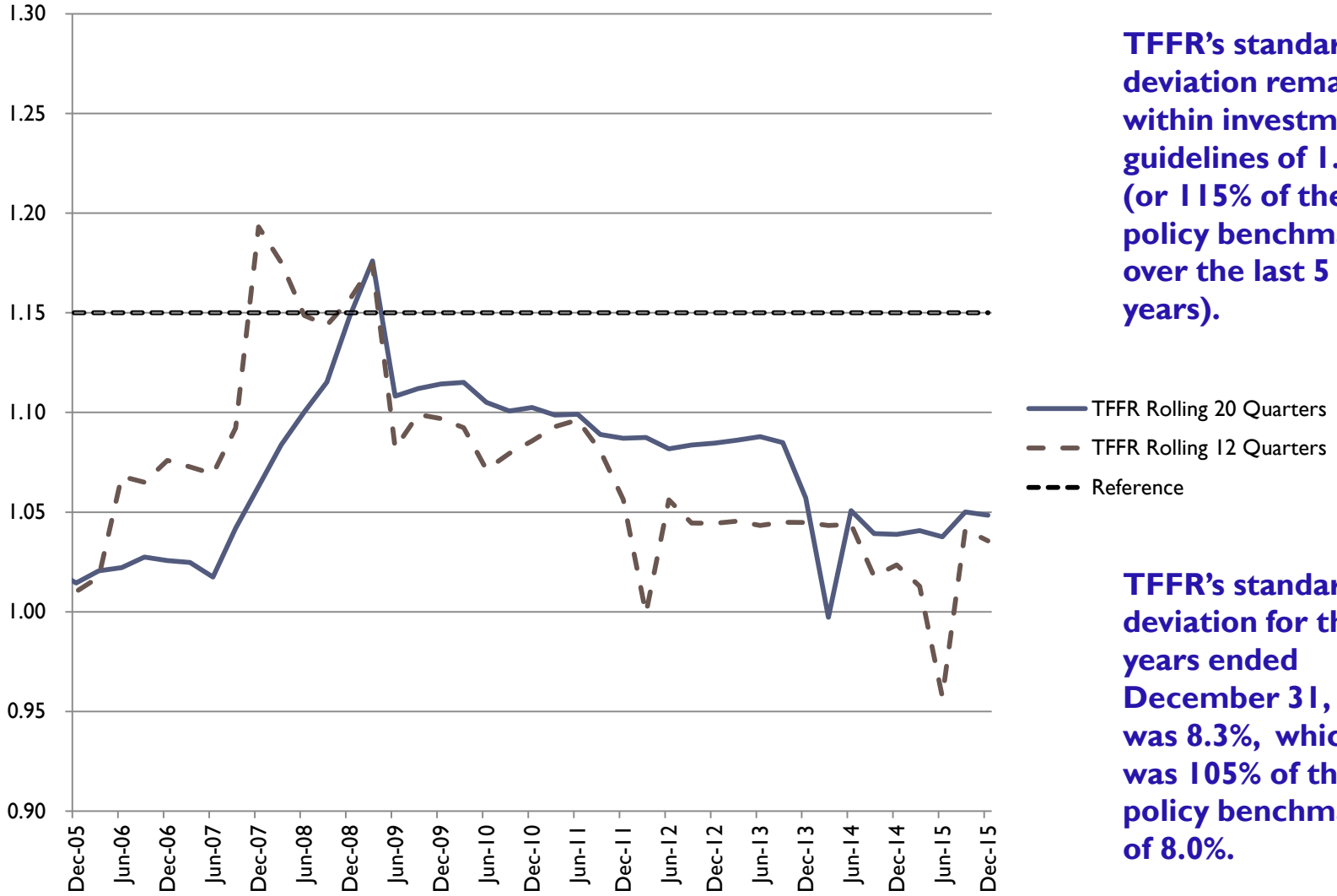
Excess Return Relative to Policy Benchmark
10 Years Ended 12/31/2015



TFFR's excess return was approximately 0.69% for the 5-years ended December 31, 2015 ("TFFR Rolling 20 Quarters").

Relative Standard Deviation Relative to Policy Benchmark

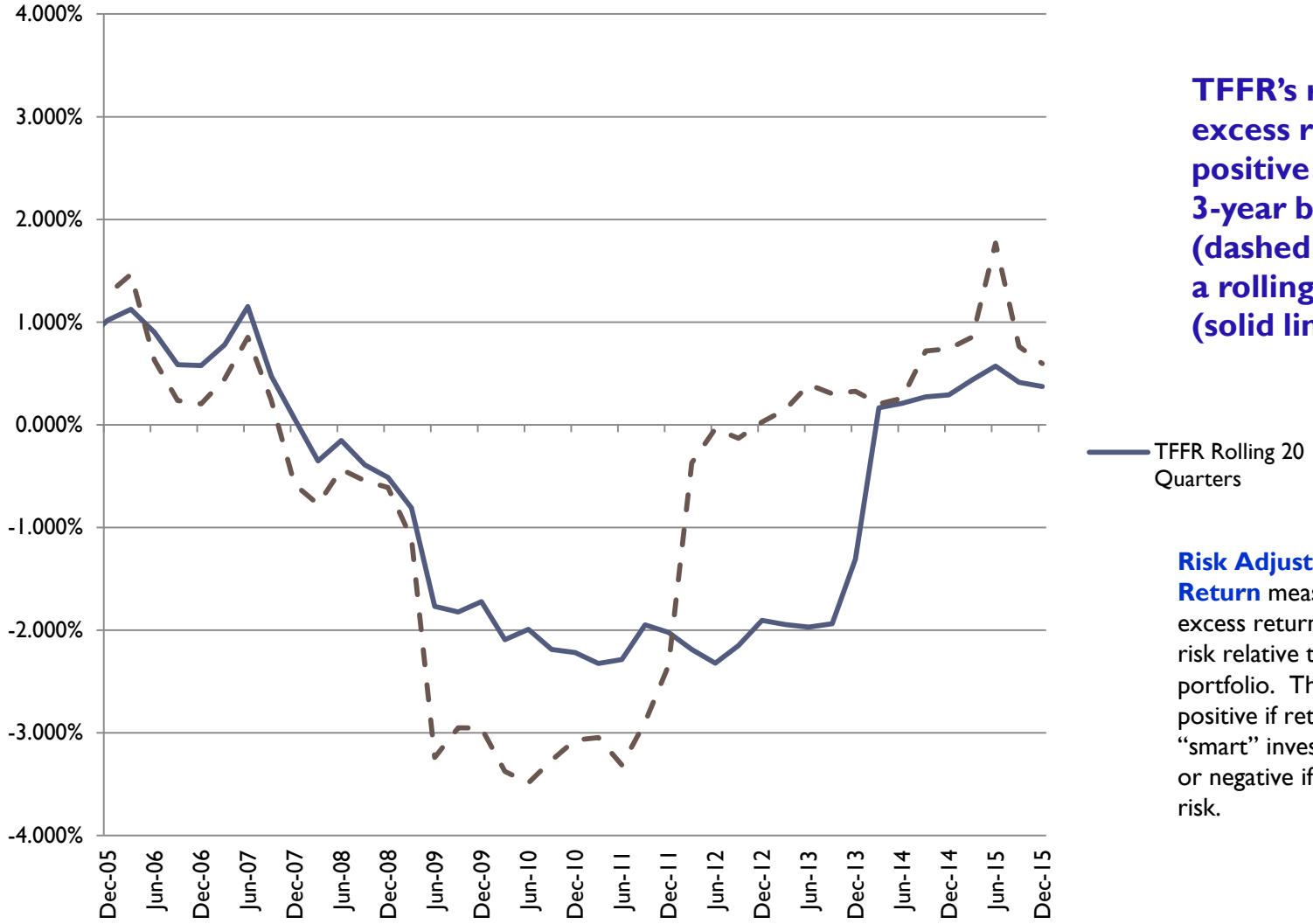
10 Years Ended 12/31/2015



TFFR's standard deviation remains within investment guidelines of 1.15 (or 115% of the policy benchmark over the last 5 years).

TFFR's standard deviation for the 5-years ended December 31, 2015 was 8.3%, which was 105% of the policy benchmark of 8.0%.

Risk Adjusted Excess Return
10 Years Ended 12/31/2015



TFFR's risk adjusted excess return turned positive on a rolling 3-year basis in 2013 (dashed line) and on a rolling 5-year basis (solid line) in 2014.

Risk Adjusted Excess Return measures a portfolio's excess return adjusted by its risk relative to a benchmark portfolio. This metric is positive if returns are due to "smart" investment decisions or negative if driven by excess risk.

TFFR Investment Policy Statement

Approved by the State Investment Board on February 26, 2016

Dave Hunter, Executive Director/CIO

Darren Schulz, Deputy Chief Investment Officer

ND Retirement & Investment Office (RIO)

State Investment Board (SIB)

TFFR Investment Policy Statement
Summary of TFFR Board and SIB Approved Revisions

- RIO and Callan recommended relatively minor revisions to TFFR's existing investment policy statement noting the vast majority of the changes are conforming in nature:

  1. Reducing the actuarial rate of return on assets to 7.75% from 8.00%; and
  2. Adopting the asset class terminology used in Callan's "Asset Liability Study".

  As example, Global Equity allocations are segmented into Public and Private, while Global Fixed Income allocations are segmented into Investment Grade and Non-Investment Grade.

TFFR engaged Callan to conduct an asset liability study which resulted in the following asset allocation recommendation after review and discussion with RIO staff.

Asset Class	Current Target	TFFR Board Approved
Global Equity	57%	58%
Public	52%	52%
Private	5%	6%
Global Fixed Income	22%	23%
Investment Grade	17%	19%
Non-Investment Grade	5%	4%
Global Real Assets	20%	18%
Real Estate	10%	10%
Other	10%	8%
Global Alternatives	0%	0%
Cash Equivalents	1%	1%
Totals	100%	100%
Expected Return	7.1%	7.1%
Standard Deviation	14.7%	14.7%

The TFFR Board approved the recommended asset allocation on January 21, 2016. The new allocation includes a 1% increase to both Global Equity and Fixed Income and a 2% decrease to Global Real Assets (Timber) while maintaining a consistent profile for Expected Return and Risk (as measured by Standard Deviation).

Callan's "Expected Return" does not incorporate "active management premiums" and "are below longer-term expectations" with a lower inflation assumption.

- While the Fund's expected return over the next 10 years falls short of the 7.75% return assumption, there are a few key items not factored into the 7.1% projection.
  - Callan's public market return projections do not incorporate active management premiums.
    - *Active management premiums accrue when investment firms selected by the State Investment Board outperform their passive benchmarks. It is important to note, though, that investment firms will at times underperform their passive benchmarks. The Plan's returns have benefitted from active management by approximately 50 basis points over the past five years.*
  - Callan's 10-year numbers are below longer-term expectations due to the current economic environment and the forecast for the next several years.
    - *Callan's 10-year return projections are approximately 50 to 200 basis points below longer-term (30+ years) expectations depending on the asset class.*
  - The actuary assumes 2.75% price inflation versus Callan's 2.25% assumption which means the liability return is closer to 7.4% rather than 7.75%.
    - *The 7.75% return is not reduced by a full 50 basis points since retirees do not receive an automatic COLA (100% CPI) every year.*
  - The Plan still has a reasonable chance of achieving a 7.75% return over 10 years (46% probability).
- In general, the efficient mixes suggest greater allocations to private equity and fixed income in lieu of real assets.

Source: Callan's *Asset Allocation and Liability Study* for the North Dakota Teachers' Fund for Retirement dated January 21, 2016.

RETIREMENT AND INVESTMENT OFFICE
AUDIT SERVICES
2015 - 2016 2nd Quarter Audit Activities Report
October 1, 2015 – December 31, 2015

The audit objective of Audit Services is twofold: first, to provide comprehensive, practical audit coverage of the Retirement and Investment Office (RIO) programs; second, to assist RIO management and the State Investment Board (SIB) by conducting special reviews or audits.

Audit coverage is based on the July 1, 2015 through June 30, 2016 work plan approved by the SIB Audit Committee. The audit activities undertaken are consistent with the Audit Services charter and goals, and the goals of RIO. To the extent possible, our audits are being carried out in accordance with the International Standards for the Professional Practice of Internal Auditing. Audit effort is being directed to the needs of RIO and the concerns of management and the SIB Audit Committee.

Retirement Program Audit Activities

- **TFFR Compliance Audits and Not In Compliance (NIC) Reviews**

We examine employer reporting to the Teachers' Fund for Retirement (TFFR) to determine whether retirement salaries and contributions reported for members of TFFR are in compliance with the definition of salary as it appears in NDCC 15-39.1-04(9). Other reporting procedures reviewed during the audit process are calculation of service hours and eligibility for TFFR membership. A written report is issued after each audit examination is completed.

Nine employer audits were completed in the second quarter. A total of fifteen employer audits have been completed year to date including fourteen TFFR Compliance Audits and one Not in Compliance (NIC) Review. Eight TFFR Compliance Audits are currently in progress. The eight audits currently in progress represent the end of the third audit cycle. It is the intention of Audit Services to focus available recourses on concluding the third audit cycle by late 2016.

It was initially anticipated that the third audit cycle may conclude sooner than expected, therefore six audit notifications were sent to employers in the fourth audit cycle. Information has been received and as a result six employer audits are currently pending but not yet started. Given that available resources are being focused on concluding the third audit cycle, all six employers have been notified that a delay has occurred and contact will be made once their audit is underway. At this time Audit Services does not anticipate notifying any additional employers of upcoming audits until the end of 2016.

This is an area that requires special emphasis due to the level of risk identified through previous audit results. Our long-range plans include auditing each employer over a five year period.

- **TFFR File Maintenance Audits**

Audit Services tests changes made to TFFR member account data by RIO employees on a quarterly basis. Audit tables are generated and stored indicating any file maintenance changes made to member accounts. The TFFR File Maintenance Audit for the first quarter of fiscal year 2016 was completed and no exceptions were noted.

Administrative and Investment Audit Activities

- **Executive Limitation Audit**

Work on the Executive Limitation Audit for calendar year 2015 commenced in November 2015. On an annual basis Audit Services reviews the Executive Director/CIO's level of compliance with SIB Governance Manual Executive Limitation policies A-1 through A-11. Executive Limitation A-2 references staff relations. In an effort to gain insight into the relationship which exists between the Executive Director/CIO and staff an organization wide employee survey is conducted to provide employees the opportunity to evaluate the effectiveness of the Executive Director/CIO in the area of leadership, communication, and valuing employees. This survey was administered in December 2015 and the results will be incorporated into the final audit report.

- **Investment Performance Summary Review**

At the request of the Executive Director/CIO Audit Services was asked to review the reasonableness of the "Investment Performance Summary" table in RIO's CAFR for the last five fiscal years ended June 30, 2015 and annualized returns for the 3, 5, 10, and 20 year periods ended June 15, 2015. Audit work on the Investment Performance Summary Review commenced in December 2015. Work has been done with the Fiscal and Investment Operations Manager in the last several months in an effort to devise an audit approach and locate source data which will allow for the recalculation of the Investment Performance Summary table which appears in the CAFR. Necessary data was obtained in February 2016 and it is anticipated that this audit will conclude prior to the close of the current fiscal year.

Professional Development Activities

Audit Services continues to pursue networking and professional development opportunities via the IIA's local chapter, Central Nodak. In October 2015 the Supervisor of Audit Services participated in the IIA's annual student night as a round table discussion leader and staff attended a seminar entitled "How to Audit…Better!" presented by John J. Hall. Staff also attended a risk management seminar presented by Danny M. Goldberg in November 2015. In December 2015 the Supervisor of Audit Services was elected to a leadership position within the Central Nodak IIA Chapter. In January 2015 a professional development plan was approved for the Supervisor of Audit Services which is nearing completion. As of November 2015 the Supervisor of Audit Services has completed Part I and Part II of the three part Certified Internal Auditor Exam (CIA).

Summary

Audit effort is directed to activities that are of greatest concern to the SIB Audit Committee, RIO Management, and our external audit partners. Audit Services will continue to work closely with the SIB Audit Committee, RIO Management, and our external audit partners to continue to improve overall efficiency, effectiveness, and economy of total audit activity.

NORTH DAKOTA RETIREMENT AND INVESTMENT OFFICE
AUDIT SERVICES
TFFR EMPLOYER COMPLIANCE AUDITS
JULY 1, 2015 TO JUNE 30, 2016

			EMPLOYER	FISCAL YEARS	TOTAL MEMBERS	REPORT DATE	EMPLOYER CONTRIB'S DR(CR)	MEMBER SALARY ADJUSTED	MEMBER SERVICE CREDIT ADJUSTED	STATUS
	✕		Audit Pending - (6)				In Compliance		8	
	&		Audit in Progress - (8)				Generally in Compliance		6	
	✔		Audit Completed - (14)				Not in Compliance (NIC)		1	
	✔		NIC Review Completed - (1)						15	
			Audits Carried Over From 2014/15 - (15)							
			NIC Audits Carried Over From 2014/15 - (1)							
			Audit Notifications Sent 2015/16 - (13)							
			NIC Notifications Sent 2015/16 - (0)							
			Carry Forward From 2014/15							
			Notifications 2014/15							
1	✔	TMB	Billings County School District	6/30/2014, 13	18	8/12/2015	($172.63)	1	1	Generally in Compliance The District reported summer salary in the wrong fiscal year and reported service hours incorrectly.
2	✔	TMB	Dickinson	6/30/2014, 13	332	8/21/2015	($203.25)	2	8	Generally in Compliance The District reported contract salary and hours without a written agreement, summer salary was reported in the wrong fiscal year, service hours were reported incorrectly, summer agreements were not issued for one member, and the hours of retired teachers who have returned to covered employment are not monitored.
3	✔	TMB	Emerado	6/30/2014, 13	22	7/17/2015	$4,449.16	3	3	Generally in Compliance The District reported contract salary incorrectly, did not report eligible teachers salary/service, and reported service hours incorrectly.
4	✔	DT	Fordville-Lankin Amended Report	6/30/2014, 13	12	12/31/2015 1/27/2016	($73.43) $73.43	1 1	0 0	In Compliance Did not report eligible in-staff subbing and after school salary, overpaid driver's education salary, and did not monitor hours for a retired teacher who returned to covered employment. Amended report reversed overpayment of driver's education salary.
5	✔	TMB	Fargo Amended Report	6/30/2014, 13	1333	10/19/2015 1/11/2016	($640.89)	3	2	Generally in Compliance The District reported ineligible salary- cell phone payment, reported salary in the wrong fiscal year, did not report eligible salary - continuing education, reported salary without a written agreement; reported summer salary without a written agreement for Administrators, and reported service hours incorrectly. Amended report addressed Teach2Learn salary - no corrections made, guidance provided to employer.

NORTH DAKOTA RETIREMENT AND INVESTMENT OFFICE
AUDIT SERVICES
TFFR EMPLOYER COMPLIANCE AUDITS
JULY 1, 2015 TO JUNE 30, 2016

			EMPLOYER	FISCAL YEARS	TOTAL MEMBERS	REPORT DATE	EMPLOYER CONTRIB'S DR(CR)	MEMBER SALARY ADJUSTED	MEMBER SERVICE CREDIT ADJUSTED	STATUS
	✕		**Audit Pending - (6)**				**In Compliance**		**8**	
	&		**Audit in Progress - (8)**				**Generally in Compliance**		**6**	
	✔		**Audit Completed - (14)**				**Not in Compliance (NIC)**		**1**	
	✔		**NIC Review Completed - (1)**						**15**	
			Audits Carried Over From 2014/15 - (15)							
			NIC Audits Carried Over From 2014/15 - (1)							
			Audit Notifications Sent 2015/16 - (13)							
			NIC Notifications Sent 2015/16 - (0)							
6	&	DT	Fort Totten	6/30/2014, 13	36					Primary test disclosed a reporting procedure used by the employer that would affect a large portion of the population therefore the audit has been expanded to include 100% of the members. Audit currently in progress.
7	✔	TMB	James River Multi-District	6/30/2014, 13	20	8/12/2015	$0.00	0	0	In Compliance The District reported an insurance reimbursement in error.
8	✔	TMB	Kulm	6/30/2014, 13	22	10/2/2015	$187.87	1	1	In Compliance The District did not report the correct contract salary and reported service hours incorrectly.
9	✔	DT	Litchville-Marion	6/30/2014, 13	28	12/17/2015	$0.00	0	1	In Compliance Service hours reported incorrectly
10	✔	TMB	Maple Valley	6/30/2014, 13	38	10/21/2015	($23,475.67)	2	1	Generally in Compliance The District reported salary without a written agreement, reported an ineligible member, and reported service hours incorrectly.
11	✔	TMB	New Public School	6/30/2014, 13	57	8/21/2015	($2,310.02)	1	2	In Compliance The District reported salary and service hours with a written agreement; service hours reported incorrectly, and did not issue written agreements for part-time and summer school teachers.
12	&	DT	North Valley Area Careers	6/30/2014, 13	11					Two errors noted to date, TFFR Board decision required prior to proceeding. Audit currently in progress. Anticipate a March report date.
13	&	DT	Southeast Region Career and Tech	6/30/2014, 13	32					Audit information received, TFFR Board decision required prior to proceeding. Audit currently in progress. Anticipate a March report date.

NORTH DAKOTA RETIREMENT AND INVESTMENT OFFICE
AUDIT SERVICES
TFFR EMPLOYER COMPLIANCE AUDITS
JULY 1, 2015 TO JUNE 30, 2016

			EMPLOYER	FISCAL YEARS	TOTAL MEMBERS	REPORT DATE	EMPLOYER CONTRIB'S DR(CR)	MEMBER SALARY ADJUSTED	MEMBER SERVICE CREDIT ADJUSTED	STATUS
	✕		**Audit Pending - (6)**				**In Compliance**		**8**	
	&		**Audit in Progress - (8)**				**Generally in Compliance**		**6**	
	✔		**Audit Completed - (14)**				**Not in Compliance (NIC)**		**1**	
	✔		**NIC Review Completed - (1)**						**15**	
			Audits Carried Over From 2014/15 - (15)							
			NIC Audits Carried Over From 2014/15 - (1)							
			Audit Notifications Sent 2015/16 - (13)							
			NIC Notifications Sent 2015/16 - (0)							
14	✔	DT	West Fargo	6/30/2014, 13	875	11/12/2015	($523.81)	5	9	Generally in Compliance Reported summer salary in the wrong fiscal year, did not issue written agreements for summer salary, and reported service hours incorrectly.
15	✔	TMB	Wilmac Special Education	6/30/2014, 13	58	10/19/2015	$0.00	0	0	In Compliance Did not issue written agreements for summer salary.
			Notifications 2015/16							
16	✕	DT	Barnes County North	6/30/2014, 15	31					Received requested information. Audit pending not yet started.
17	✕	TMB	Bowman	6/30/2014, 15	53					Received requested information. Audit pending not yet started.
18	✕	DT	Eight Mile	6/30/2014, 15	23					Received requested information. Audit pending not yet started.
19	✕	TMB	Ft. Yates	6/30/2014, 15	32					Received requested information. Audit pending not yet started.
20	✕	TMB	Halliday	6/30/2014, 15	12					Received requested information. Audit pending not yet started.
21	&	TMB	Parshall	6/30/2014, 15	35					Received requested information. Audit in progress.
22	&	TMB	St. John	6/30/2014, 15	42					Received requested information. Audit in progress.
23	&	TMB	Solen-Cannonball	6/30/2014, 15	29					Received requested information. Audit in progress.
24	✔	TMB	Starkweather	6/30/2014, 15	14	12/3/2015	($730.84)	2	1	In Compliance The District reported salary/service hours without a written agreement, reported contract salary after deductions, and reported service hours incorrectly.

NORTH DAKOTA RETIREMENT AND INVESTMENT OFFICE
AUDIT SERVICES
TFFR EMPLOYER COMPLIANCE AUDITS
JULY 1, 2015 TO JUNE 30, 2016

			EMPLOYER	FISCAL YEARS	TOTAL MEMBERS	REPORT DATE	EMPLOYER CONTRIB'S DR(CR)	MEMBER SALARY ADJUSTED	MEMBER SERVICE CREDIT ADJUSTED	STATUS
	✕		**Audit Pending - (6)**				**In Compliance**		**8**	
	&		**Audit in Progress - (8)**				**Generally in Compliance**		**6**	
	✔		**Audit Completed - (14)**				**Not in Compliance (NIC)**		**1**	
	✔		**NIC Review Completed - (1)**						**15**	
			Audits Carried Over From 2014/15 - (15)							
			NIC Audits Carried Over From 2014/15 - (1)							
			Audit Notifications Sent 2015/16 - (13)							
			NIC Notifications Sent 2015/16 - (0)							
25	✕	DT	Velva	6/30/2014, 15	47					Received requested information. Audit pending not yet started.
26	&	DT	Warwick	6/30/2014, 15	31					Received requested information. Audit in progress.
27	&	TMB	White Shield	6/30/2014, 15	28					Received requested information. Audit pending not yet started. Anticipate fine will be issued for failure to comply with audit request.
28	✔	DT	Wing	6/30/2014, 15	19	12/17/2015	$0.00	0	0	In Compliance Did not have written agreements for summer salary and service hours reported incorrectly for a retired member who returned to covered employment.
				Totals	3,290		($23,420.08)	22	29	

Not in Compliance (NIC) Reviews

23	✔	TMB	Minnewaukan		36	8/10/2015	$903.52	4	0	Not in Compliance The District reported summer salary in the wrong fiscal year, did not report extra-curricular salary, reported contract salary incorrectly, did not issue written agreements for summer salary, did not monitor hours for retired teachers who returned to covered employment and one teacher had a license that had lapsed.
					3,326		($22,516.56)	26	29	

MEMORANDUM

TO: **TFFR Board**
FROM: **Fay Kopp**
DATE: **March 7, 2016**
SUBJ: **2016-17 Board Calendar and Education Plan**

TFFR Board policy C-2 requires the Board to conduct a minimum of six board meetings each year. Board meetings are generally scheduled for the day preceding the SIB meetings beginning in July of each year, unless a different day is determined. Special meetings may also be called as needed, or this schedule can be adjusted if warranted. Attached are suggested meeting dates for 2016-17. TFFR meetings are typically scheduled for Thursday's at 1 pm, and I did not schedule TFFR meetings during August and May (first and last weeks of school)

I am also working on the 2016-17 Board Education plan, and am very interested in any suggestions from board members on agenda items, topics or information that would assist you in carrying out your board responsibilities. As examples, here are some board education topics from the past few years:

2013-14

- Actuarial valuation process
- GASB actuarial, audit, and administrative implications
- TFFR plan overview
- TFFR employer reporting
- Fiduciary Duties/Ethics
- Open Records/Open Meetings

2014-15

- Actuarial valuation process
- Actuarial experience study process
- Defined benefit, defined contribution, and hybrid plan designs
- GASB actuarial, audit, and administrative implications
- ND education demographics (DPI)
- ND teacher shortage (ESPB)

2015-16

- Actuarial valuation process
- Asset liability study process
- Actuarial audit process
- Fiduciary Duties/Ethics (April 2016)
- Open Records/Open Meetings (April 2016)

BOARD ACTION: Approve or adjust 2016-17 board meeting schedule. Provide directives for board agenda or board education topics.

DRAFT
2016 - 17
TFFR AND SIB MEETING SCHEDULE

July 2016

21	TFFR	- 1:00 pm
22	SIB	- 8:30 am (Retreat)

August 2016

--	TFFR	- No meeting
26	SIB	- 8:30 am

September 2016

22	TFFR	- 1:00 pm
23	SIB	- 8:30 am
23	SIB Audit Comm	- 1:00 pm

October 2016

27	TFFR	- 1:00 pm
28	SIB	- 8:30 am

November 2016*

--	TFFR	- No meeting
17	SIB Audit Comm	- 3:00 pm
18	SIB	- 8:30 am

December 2016

--	No meetings

January 2017

26	TFFR	- 1:00 pm
27	SIB	- 8:30 am

February 2017

--	TFFR	- No meeting
23	SIB Audit Comm	- 3:00 pm
24	SIB	- 8:30 am

March 2017

23	TFFR	- 1:00 pm
24	SIB	- 8:30 am

April 2017

27	TFFR	- 1:00 pm
28	SIB	- 8:30 am

May 2017

--	TFFR	- No meeting
25	SIB Audit Comm	- 3:00 pm
26	SIB	- 8:30 am

June 2017

--	No meetings

Notes:

1) SIB meetings scheduled for 4th Friday of each month, except for November* which is 3rd Friday due to Thanksgiving.
2) TFFR meetings scheduled for day preceding SIB meetings.

01/25/16

MEMORANDUM

TO: **TFFR Board**

FROM: **Fay Kopp**

DATE: **March 7, 2016**

SUBJ: **Trustee Education**

Here are some dates and information for various 2016 pension trustee educational opportunities. If you are interested in attending any of these, or other conferences or training session, please contact Bonnie Heit or Fay.

- **National Council on Teacher Retirement (NCTR)**
  http://www.nctr.org/events/

Trustee Workshop	July 24-27, 2016	Berkeley, CA
Annual Conference	Oct. 8 -12, 2016	Providence, RI

  *Registration material is not yet available, but will be sent to you.

- **International Foundation of Employee Benefit Plans (IFEBP)**
  http://www.ifebp.org/education/schedule/Pages/PEschedule.aspx#k=#s=21

  *See attached 2016 public sector training schedule.

- **Callan College**
  https://www.callan.com/education

National Conference	Jan 25-27, 2016	San Francisco, CA
Intro to Investments	April 19-20, 2016	Atlanta, GA
	July 19-20, 2016	San Francisco, CA
	Oct. 18-19, 2016	Chicago, IL

Enclosures

2016 Public Sector Program Schedule

JAN 25-27
25th Annual Health Benefits Conference & Expo (HBCE)
www.**ifebp.org**/hbce
Clearwater Beach, Florida

FEB 15-17
Trustees and Administrators Institutes
www.**ifebp.org**/trusteesadministrators
Lake Buena Vista (Orlando), Florida

FEB 15-20
Certificate Series
www.**ifebp.org**/certificateseries
San Diego, California

MAR 14-16
Investments Institute
www.**ifebp.org**/investments
Las Vegas, Nevada

APR 11-13
Health Care Management Conference
www.**ifebp.org**/healthcare
Phoenix, Arizona

MAY 2-5
Portfolio Concepts and Management (Wharton)
www.**ifebp.org**/portfolio
Philadelphia, Pennsylvania

MAY 23-24
Washington Legislative Update
www.**ifebp.org**/washington
Washington, D.C.

JUN 7-8
Certificate of Achievement in Public Plan Policy (CAPPP®) Pensions and Health Part I
www.**ifebp.org**/cappp
Boston, Massachusetts

JUN 9-10
Certificate of Achievement in Public Plan Policy (CAPPP®) Pensions and Health Part II
www.**ifebp.org**/cappp
Boston, Massachusetts

JUL 11-16
Certificate Series
www.**ifebp.org**/certificateseries
Brookfield (Milwaukee), Wisconsin

JUL 18-19
Benefit Communication and Technology Institute
www.**ifebp.org**/benefitcommunication
Boston, Massachusetts

JUL 25-27
International and Emerging Market Investing (Wharton)
www.**ifebp.org**/intlinvesting
San Francisco, California

OCT 5-8 10-11
Certificate Series
www.**ifebp.org**/certificateseries
Boston, Massachusetts

NOV 12-13
Administrators Masters Program (AMP®)
www.**ifebp.org**/amp
Orlando, Florida

NOV 12-13
Certificate of Achievement in Public Plan Policy (CAPPP®) Pensions and Health Part I
www.**ifebp.org**/cappp
Orlando, Florida

NOV 12-13
Trustees Masters Program (TMP)
www.**ifebp.org**.org/tmp
Orlando, Florida

NOV 13
TMP Advanced Leadership Summit
www.**ifebp.org**/tmpsummit
Orlando, Florida

NOV 13-16
62nd Annual Employee Benefits Conference
www.**ifebp.org**/usannual
Orlando, Florida

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International Foundation OF EMPLOYEE BENEFIT PLANS

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CENTER for RETIREMENT RESEARCH at BOSTON COLLEGE

February 2016, Number 16-3

HOW DO NON-FINANCIAL FACTORS AFFECT RETIREMENT DECISIONS?

By Steven A. Sass*

Introduction

Financial factors clearly influence retirement decisions, as everyone would like to have sufficient income when they leave the workforce. But numerous studies find that such factors are only a small part of the story. Non-financial considerations clearly contribute to the decision to retire.[1]

This *brief* reviews studies, mainly by the Social Security Administration's Retirement Research Consortium, that examine how two types of non-financial factors affect retirement decisions: the worker's on-the-job experience and the allure of retirement activities.

The discussion proceeds as follows. The first section presents evidence that a positive work experience is a critical component in decisions of workers ages 65 and over to remain in the labor force. The second section identifies job characteristics that either incline workers to retire or to remain on the job. The third section examines how personal objectives affect work/retirement decisions. The final section concludes that non-financial benefits seem far more important than non-financial costs – both in keeping some workers in the labor force and drawing others into retirement.

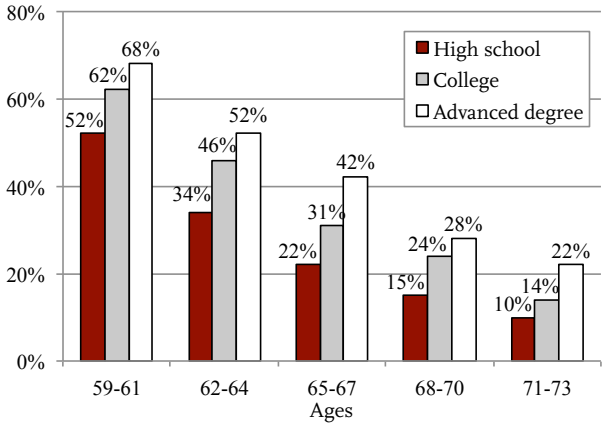
Individual Characteristics and Retirement Behavior

If financial considerations drive retirement decisions, workers financially prepared for retirement would exit the labor force and those not prepared would work longer. A study by Steven Haider and David Loughran shows that this is not the case for those who remain in the labor force past age 65.[2] Using data from the Census Bureau's *Current Population Survey* (CPS), the study finds that the individuals most likely to be working at these older ages are those with the strongest finances – those with the most education, greatest wealth, and highest lifetime incomes. Such workers have higher labor force participation at all ages, as they have fewer health impairments and better employment opportunities. But the gap by education widens dramatically at older ages, (see Figure 1 on the next page).[3]

Using data for the AHEAD cohort from the *Health and Retirement Study* (HRS), a biennial survey of a panel of older individuals, the study finds that those still working past age 70 earn significantly lower hourly wages than they had earlier in their careers

* Steven A. Sass is a research economist at the Center for Retirement Research at Boston College.

Figure 1. Labor Force Participation by Age and Education, 1991-1999



Source: Haider and Loughran (2001).

and are much more likely to work part-time.[4] It also finds that health shocks often lead to labor force exits after age 70, while financial factors, such as wages and wealth, have little or no effect. While these older workers likely value the additional income, the study characterizes their continued employment as more akin to "play" than "work." Overall, the study concludes that non-pecuniary considerations drive the labor force decisions of older workers.

The Work Environment and Retirement Decisions

A study by Marco Angrisani, Michael Hurd, Erik Meijer, Andrew Parker and Susann Rohwedder assesses the importance of a broad range of non-financial workplace characteristics on labor force transitions at older ages.[5] Using HRS data from 2002-2010, the study estimates the effect of these characteristics on the likelihood that, from one biennial survey to the next, full-time workers, ages 51-79: 1) remain in full-time employment; 2) shift to part-time employment; 3) shift to "non-employment, but not retirement;" or 4) retire.[6]

The great majority of these transitions occur prior to age 65. Relative to the Haider and Loughran findings for workers over age 70, retirement behavior for this younger group is more responsive to financial factors. Full-time workers with greater wealth and higher incomes are more likely to retire; those less prepared are more likely to remain in the labor force. Like Haider and Loughran, the study finds that educated workers, all else equal, are more likely to remain in full-time employment and less likely to retire. This finding is consistent with the notion that educated workers get more non-financial rewards from work, and that these rewards have a significant effect on their work and retirement decisions.

The study assesses the effects of a wide range of workplace characteristics on labor force transitions, from physical demands and stress levels to age discrimination and the enjoyment of work, using worker assessments recorded in the HRS. These assessments are collected by asking respondents the extent to which they agree with statements such as "I really enjoy going to work" on a scale from 1 to 4, with 1 meaning "strongly disagree" and 4 meaning "strongly agree."

Table 1 (on the next page) reports statistically significant relationships between a 1-unit increment on the response scale and the likelihood that a full-time worker remains in full-time employment, shifts to part-time employment, or retires over the two-year period between HRS interviews.[7] As expected, jobs that require physical effort or good eyesight increase the likelihood of retirement. So do a difficult or stressful work environment, perceived age discrimination, job inflexibility, and work interfering with the respondent's personal life. Consistent with Haider and Loughran's findings, the study finds that those who enjoy going to work – reaping non-financial rewards from employment – are more likely to remain in full-time employment and less likely to retire.[8]

The effect of health problems on the likelihood of retirement provides a useful yardstick for assessing the effect of these job characteristics. The study finds self-reported "fair" or "poor" health increases the likelihood of retirement by 6.3 percentage points. As indicated in Table 1, while no 1-point increment in a job characteristic affects the likelihood of retirement as much as health, 2-point increments for several of the characteristics would have a greater impact than "fair" or "poor" health. The study thus supports the notion that non-financial job characteristics can have large effects on labor force transitions.

Relatively few recent retirees in the HRS, however, cite adverse job characteristics as an especially important factor pushing them out of the labor force. Recently retired respondents are asked to identify whether: 1) poor health; 2) not liking work; 3) a desire to spend more time with family; or 4) a desire to do

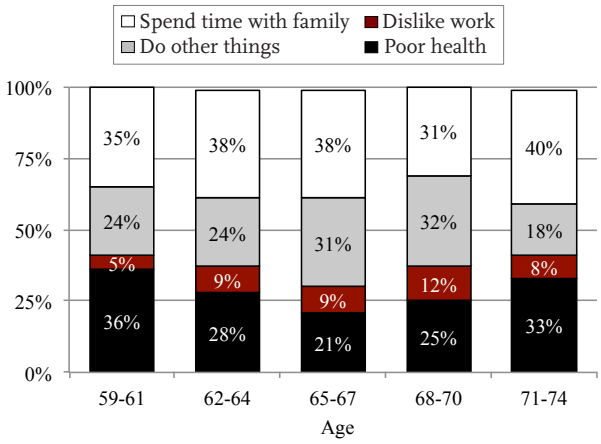
Table 1. Effect of Job Attributes on Likelihood of Labor Force Transitions, Percentage-Point Change

	Remain in full-time employment	Shift to part-time employment	Retire
Job requirements			
Job requires physical effort	-1.8***	1.0**	0.8***
Job requires good eyesight	-1.2***	0.0	1.1***
Job requires computer use	1.6**	-1.2**	-0.1
Work environment			
Difficult/stressful work environment	-1.2*	-0.4	1.9***
Perceived age discrimination	-2.5***	-0.7	3.2***
Job flexibility			
Cannot reduce hours	2.1**	-5.1***	2.7***
Wants to, but cannot, reduce hours	-6.5***	2.1***	4.2***
Feelings about work			
Enjoys going to work	5.4***	-0.2	-4.5***
Work interferes with personal life	-3.4**	0.2	2.4**

Notes: Statistically significant at 10-percent (**), 5-percent (**), or 1-percent level (***). These results show the likelihood of labor force transitions over a two-year period for full-time workers ages 51-79 during 2002-2010.
Source: Angrisani et al. (2013).

"other things" was a "very important reason" why they retired. Not liking work accounts for less than 10 percent of the "very important reasons" cited in the most recent 2012 survey, except for respondents ages 68-70 (see Figure 2). Poor health accounts for less than 30 percent, except for respondents younger than 62 or older than 70. Far more prevalent than these factors pushing workers out of the labor force are factors pulling them into retirement – a desire to "do other things" or "spend more time with family." This inclination is especially strong during the popular retirement ages of 62-67.[9]

Figure 2. Distribution of Factors Cited as "Very Important" in the Decision to Retire, by Age, 2012



Source: Authors' calculations from University of Michigan, *Health and Retirement Study* (2012).

The Allure of Retirement

A study by Ruby Brougham and David Walsh supports the importance of non-financial rewards in pulling workers into retirement. Interestingly, it also supports the Haider and Loughran finding that non-financial rewards keep *some* workers in the labor force longer. The study assesses how subjective assessments of the likelihood of achieving five different personal objectives affect the work and retirement plans of workers ages 55 and over at the University of Southern California. The five objectives are: 1) personal growth; 2) meaningful relationships; 3) a sense of identity; 4) financial security; and 5) passing one's knowledge and values to the next generation.

The study identifies two groups of workers – those planning to retire at least two years earlier than the median planned retirement age of their co-workers

(age 65) and those planning to retire at least two years later. Both those planning on retiring earlier and those planning on retiring later indicate that all five objectives are reasonably important.

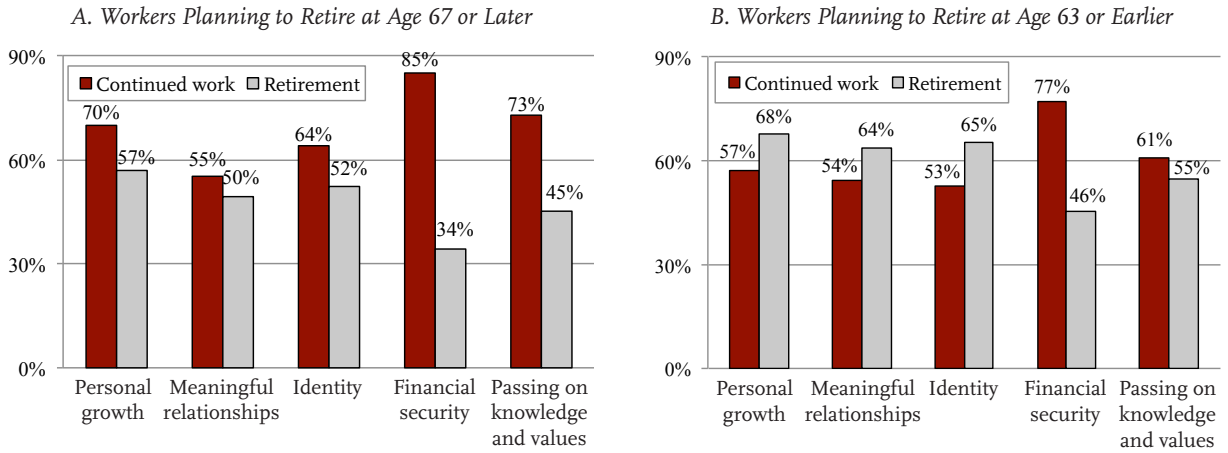
The study, however, finds significant differences in whether continued employment or retirement offers the better opportunity for achieving these objectives. Respondents were asked to assess the probability of attaining each objective if they continued to work or if they retired in the coming year. As shown in Figure 3a, those planning to retire at least two years later than their co-workers see themselves as more likely to achieve all five objectives by remaining employed, and unlikely or only marginally likely to achieve each objective should they retire. Those planning to retire early also see continued employment as significantly more likely to provide financial security (see Figure 3b). But, unlike those who plan to keep working, those planning to retire early see retirement providing better opportunities for achieving three of the other objectives: personal growth, meaningful relationships, and a strong identity.

The study's sample – university faculty and staff – is hardly representative of the nation at large. Nor does it assess the allure of simple leisure that retirement provides that in no way contributes to more lofty personal objectives (e.g., watching TV and snacking on chips). The findings are nevertheless consistent with the findings reported above based on data drawn from the nationally representative HRS. For those who plan on working longer, *employment* promises greater opportunities to meet personal objectives. For those who opt to exit the labor force early, *retirement* promises greater opportunities to meet key objectives, which tips the scales in favor of retirement despite the expected cost in financial security.

Conclusion

The studies reviewed in this *brief* provide little support for the notion that adverse job characteristics push a significant number of workers into retirement. They instead identify the importance of non-financial rewards in keeping some workers in the labor force and pulling others – the majority – into retirement. Non-financial factors rightly play an important role in work-and-retirement decisions. But given the importance of the decision to workers' financial well-being, it is important that they also understand and carefully weigh the financial implications in deciding when to exit the labor force. Few workers, however, are equipped even to estimate the financial implications. This inability raises the prospect of many workers being pulled out of the labor force too early to gain a financially secure retirement.

Figure 3. Mean Expectation of Meeting Objective by Continuing to Work or by Retiring



Source: Brougham and Walsh (2009).

Endnotes

1 Researchers found financial factors quite significant in retirement decisions when defined benefit pension plans provided strong incentives to retire at a particular age and modest Delayed Retirement Credits in the Social Security program offered strong incentives to retire by age 65 (Lumsdaine and Mitchell, 1999). These well-defined financial incentives are now largely gone, replaced by a much more amorphous set of financial incentives, typically to work longer than is generally the case. For a recent study that reviews the literature and illustrates the limited ability of financial considerations to explain current retirement behavior, see Rutledge, Gillis, and Webb (2015).

2 Haider and Loughran (2001).

3 The labor force participation data presented in Figure 1 is from 1991-1999, when defined benefit pension plans and relatively low Social Security Delayed Retirement Credits encouraged workers to retire by age 65 or earlier. Munnell (2013) updated Figure 1 using data from 1999 to 2012, when these incentives were significantly reduced or eliminated. While Munnell's results show labor force participation rising in all age and education groups, the disparities by education remain much the same. This finding suggests the continued importance of non-financial rewards in the work-and-retirement decisions of older workers.

4 AHEAD stands for the study of Aging and Health Dynamics among the Oldest Old. The AHEAD group consists of those born before 1924.

5 Angrisani et al. (2013). For a related study that includes objective, as well as self-reported, job attributes, see Angrisani, Kapteyn, and Meijer (2015).

6 The study controls for standard financial and demographic characteristics to isolate the effect of workplace characteristics on these labor force transitions.

7 Not shown is the likelihood of shifting to "non-employment, but not retirement"– the residual likelihood that brings the likelihood of all four transitions to 0.

8 See Haider and Loughran (2001) for similar results in an earlier period.

9 Consistent with the finding that a dislike of work is not a major reason for retiring, a large percentage of older workers report that they enjoy going to work. In addition, some of the workplace characteristics listed in Table 1 as increasing the likelihood of retirement – such as "work interfering with personal life" – suggest factors that pull workers into retirement rather than push them out of employment.

References

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Angrisani, Marco, Michael Hurd, Erik Meijer, Andrew Parker, and Susann Rohwedder. 2013. "Labor Force Transitions at Older Ages: The Roles of Work Environment and Personality." Working Paper 2013-295. Ann Arbor, MI: University of Michigan Retirement Research Center.

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National Institute on Aging. 2007. *Growing Older in America: The Health & Retirement Study*. Publication No. 07-5757. Bethesda, MD.

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University of Michigan. *Health and Retirement Study,* 2012. Ann Arbor, MI.

CENTER *for* RETIREMENT RESEARCH *at* BOSTON COLLEGE

About the Center

The mission of the Center for Retirement Research at Boston College is to produce first-class research and educational tools and forge a strong link between the academic community and decision-makers in the public and private sectors around an issue of critical importance to the nation's future. To achieve this mission, the Center sponsors a wide variety of research projects, transmits new findings to a broad audience, trains new scholars, and broadens access to valuable data sources. Since its inception in 1998, the Center has established a reputation as an authoritative source of information on all major aspects of the retirement income debate.

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State and Local Pension Plans

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GASB 68: HOW WILL STATE UNFUNDED PENSION LIABILITIES AFFECT BIG CITIES?

*By Alicia H. Munnell and Jean-Pierre Aubry**

Introduction

Beginning in 2015, under new provisions of the Governmental Accounting Standards Board (GASB), the unfunded actuarial accrued liability for public pension plans moved from the footnotes of financial statements to the balance sheets of employers. In addition, localities that participate in "cost-sharing" state plans are now required to report their share of that plan's unfunded liability on their books. This *brief* explores the implication of this latter shift.

The discussion proceeds as follows. The first section describes the new GASB provisions. The second section illustrates, in detail, our method for applying GASB 68. The third section presents the estimated impact of GASB 68 on the 92 cities in our sample that are participating in cost-sharing state plans, as well as the overall impact on our full sample of 173 cities. The fourth section compares individual results for selected cities. The final section concludes that forcing cities to recognize their share of the state's unfunded liability may lead them to take more interest in having these liabilities paid off.

New GASB Provisions

To increase the visibility of pension commitments, GASB Statement 68 makes two changes. First, it moves pension funding information from the footnotes to the balance sheets of employers. Second, it requires employers that participate in so-called "cost-sharing" plans to provide information regarding their share of the "net pension liability" on their books. Both changes are significant. Moving information to the balance sheet will raise the salience of pension costs. This analysis, however, focuses on the second change – the allocation of the liabilities associated with cost-sharing plans.

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Cost-sharing plans are a type of multiple-employer plan – that is, a plan that provides pensions to the employees of more than one employer. GASB divides multiple-employer plans into two groups – agent plans and cost-sharing plans. In agent plans, assets are pooled for investment purposes but the plan maintains separate accounts so that each employer's share of the pooled assets is legally available to pay benefits only for its employees. In cost-sharing plans, the pension obligations, as well as the assets, are pooled, and the assets can be used to pay the benefits of any participating employer.

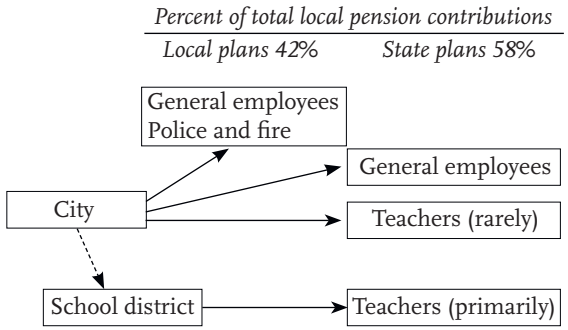
To date, funded information for employers in agent plans appears in the notes of their financial statements, so the only change will be moving that information into the balance sheet. In contrast, no information currently appears for employers participating in cost-sharing plans, so the new provisions require determining each employer's share of the net pension liability and including that amount on the balance sheet.

The new GASB statements also introduce new terms. The net pension liability is essentially the unfunded actuarial accrued liability. It is based on a concept of total pension liability, which is the present value of projected benefit payments for current active and inactive employees attributable to past periods of service, calculated using a particular actuarial cost method (traditional entry age). The net pension liability is the difference between the total pension liability and the fiduciary net position (plan assets at fair market value plus any deferred outflows or inflows). Since the data for our exercise are drawn mostly from 2012 reports, three years before the new GASB standards took effect, the discussion uses the familiar terminology of accrued liability and assets.

The Application of GASB 68

Figure 1 illustrates the flow of pension payments from city governments to various pension plans to which they contribute. For most city governments, pension payments include contributions to city-administered plans (often covering general employees and/or police and fire); contributions to non-teacher plans administered at the state level; and, very occasionally, contributions to state teacher plans. Generally, teacher plans receive their contributions from school districts, which raise their own revenue. These types of direct contributions made by the city or school district to the pension plan are represented by the solid lines in the figure. Occasionally, cities transfer funds to the school district, which is represented by the dotted line. Our analysis is limited to cities and does not examine the impact of GASB 68 on school districts.[1]

Figure 1. Contributions from Cities and Towns to Pension Plans



Source: Authors' illustration.

The analysis uses a sample of 173 cities and towns, which includes cities that administer their own local plans, cities that participate only in state plans, and cities that have some combination of the two.[2] The exercise involves reapportioning assets and liabilities in state cost-sharing plans to participating cities.[3]

GASB appears to allow some flexibility in how this reapportionment is executed. GASB simply says that the basis for each employer's proportion should reflect its share of the long-run contribution effort and "be consistent with the manner in which contributions to the pension plan ... are determined."[4]

For this exercise, the key metric was a city's contribution to a given state plan as a percentage of the plan's total ARC. If ARC information was not available, the apportionment was based on the ratio of a city's actual contributions to the state plan's total actual contributions. One would think that other measures, such as the ratio of the city's payrolls covered under the plan to the state plan's total payrolls, might also be acceptable.

A sample calculation for Cincinnati may help clarify the process used for this analysis. Cincinnati participates in three pension plans – one local plan and two cost-sharing state plans. The full assets and

Table 1. Estimated Funded Ratio for Cincinnati (in millions), FY 2012

Plan	Plan finances		Percentage to city under GASB 68	City finances		
	Assets	Liabilities		Assets	Liabilities	Funded ratio
Local plans	$1,368	$2,230				
Cincinnati ERS	1,368	2,230	100 %	$1,368	$2,230	61%
State plans	49,771	63,103				
OPERS-Local	39,493	47,095	0.3	114	136	84
Ohio P&F	10,278	16,008	10.0	1,031	1,606	64
City total				2,513	3,972	63

Note: Cincinnati ERS: Cincinnati Employees Retirement System, OPERS-Local: Ohio Public Employees Retirement System-Local, Ohio P&F: Ohio Police and Fire.
Sources: Authors' calculations based on various FY 2012 plan and government consolidated annual financial statements (CAFRs); and U.S. Census Bureau (2012).

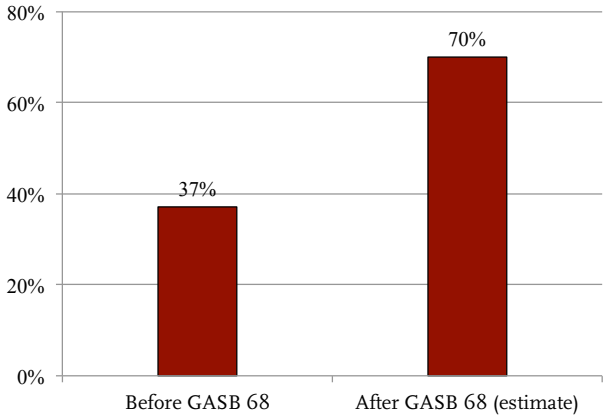
liabilities of the local plan are allocated to the city (see Table 1). However, because Cincinnati's ARC payment to the state plans represents only a fraction of the state plans' total ARC, only 0.3 percent of the general employee plan (OPERS) assets and liabilities and 10.0 percent of the police and fire plan (Ohio P&F) assets and liabilities are apportioned to Cincinnati. Finally, the allocated assets and liabilities from all plans are summed to obtain total assets, liabilities, and funded level for the city.

The Impact of GASB 68

Ninety-two of the cities in our sample participate in cost-sharing state plans and are affected by GASB 68. The measure of the impact in this analysis is the change in the unfunded liability relative to a city's own-source revenue (to standardize for city size). As shown in Figure 2, for the 92 cities affected, the unfunded liability as a percentage of revenue rises from 37 percent before GASB 68 to 70 percent after. Of course, because GASB 68 simply shifts the recognition of these liabilities from the states to the cities, the unfunded liability for the states drops by a corresponding amount (in dollar terms).

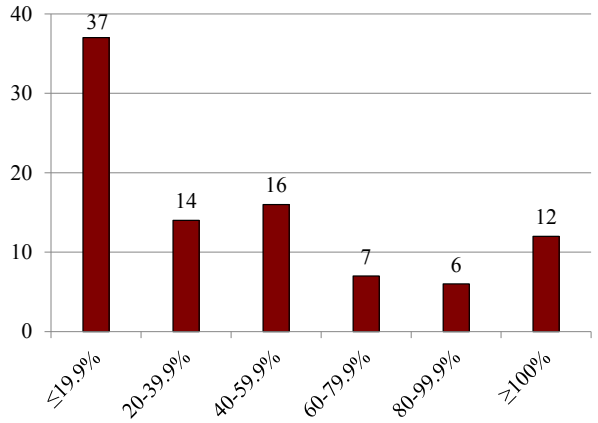
These aggregate numbers hide much variation. Thirty-seven percent of the 92 cities have their unfunded liability as a percentage of revenue increase by less than 20 percentage points (see Figure 3 on the next page). However, about a third of the affected cities in our sample – 25 cities – experience increases of over 60 percentage points. For a complete list of the before and after numbers for affected cities, see Appendix Table 1. Strong market returns for fiscal years 2013-2015 will have reduced these percentages somewhat.

Figure 2. Unfunded Liability as Percentage of Revenue for Major Cities Affected by GASB 68, FY 2012



Sources: Authors' calculations based on various FY 2012 plan and government CAFRs; and U.S. Census Bureau (2012).

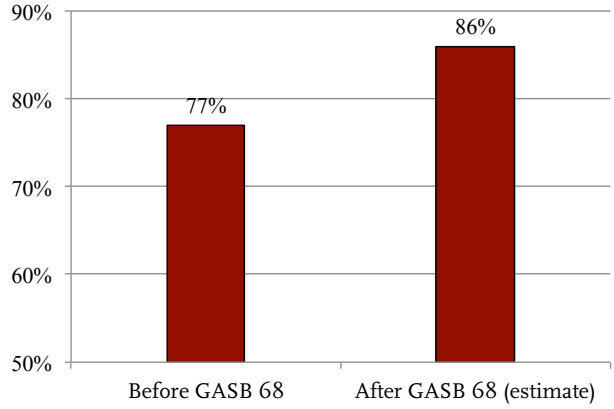
Figure 3. Distribution of Major Cities Affected by GASB 68, by Change in the Unfunded Liability as Percentage of Own-Source Revenue, FY 2012



Sources: Authors' calculations based on various FY 2012 plan and government CAFRs; and U.S. Census Bureau (2012).

Figure 4 shows unfunded liabilities as a percentage of revenue for the full sample of 173 plans, before and after GASB 68. While the overall impact of GASB 68 on the 92 affected cities within our sample is large, the impact on the 173 cities is much smaller – about 9 percentage points (a 12-percent increase). The reason is that the 92 cities are small; they make up only about a quarter of the total revenue in our sample cities.

Figure 4. Unfunded Liability as Percentage of Revenue for All Major Cities, FY 2012



Sources: Authors' calculations based on various FY 2012 plan and government CAFRs; and U.S. Census Bureau (2012).

Comparing Cities after GASB 68

Table 2 reports the cities with the lowest and highest unfunded liability as a percentage of own-source revenue, after state liabilities have been apportioned. Those cities affected by GASB 68 are marked with an asterisk; those without an asterisk do not participate in a state plan. The ratio of a stock (UAAL) to a flow (city revenue) will be high; so, the absolute level of the ratio is not the issue, but rather how the city's ratio compares to the sample-wide average of 86 percent.

Table 2. Sample Cities with the Lowest and Highest Burden of Unfunded Liabilities, FY 2012

Lowest burden				
Rank	State	City		UAAL/Revenue
1	WA	Vancouver	*	—
2	NH	Manchester	*	—
3	CA	Fresno		—
4	WA	Seattle	*	—
5	DC	Washington DC		—
6	OH	Toledo	*	0.1%
7	WI	Madison	*	0.6
8	NM	Albuquerque	*	0.8
9	TX	Garland		2.0
10	NC	Greensboro	*	4.4
Highest burden				
Rank	State	City		UAAL/Revenue
173	IL	Chicago		359%
172	MA	Springfield		315
171	OR	Portland	*	284
170	NJ	Newark	*	284
169	WV	Charleston	*	261
168	MT	Billings	*	245
167	NV	Las Vegas	*	234
166	OH	Cincinnati	*	216
165	MN	St Paul	*	199
164	MI	Saginaw		190

* Affected by GASB 68.
Note: The dash symbol (—) is for cities that are over 100 percent funded and, thus, have no unfunded liability (UAAL).
Sources: Authors' calculations based on various FY 2012 plan and government CAFRs; and U.S. Census Bureau (2012).

Note that some cities that escape scrutiny altogether when the focus is solely on locally-administered plans emerge as potential problems when the state burden is apportioned. For example, Newark, NJ, which does not administer a plan of its own and therefore is never included in studies of local plans, faces significant future demands on its revenue because it participates in three of New Jersey's cost-sharing state plans.[5] Thus, GASB 68 will rearrange the state and local pension landscape. For a complete list of the burden for all 173 cities, see Appendix Table 2.

Conclusion

Cities are now required to include on their balance sheets the pension accounting information currently in the footnotes of their financial statements and to report their share of the unfunded liability in cost-sharing plans. This calculation does not create new liabilities; it simply reallocates them from the state to the city. The total impact of this reallocation for our sample of 173 major cities is small – about a 12-percent increase in the unfunded liability – because the largest cities generally do not participate in state plans. However, for the 92 cities in our sample that do participate in cost-sharing state plans, the unfunded liability burden almost doubles.

The key question is whether the reallocation of pension burdens from states to cities will have any impact. Simply reporting part of state plan unfunded liabilities on local government balance sheets will not change the required payments made by local governments: their ARCs already reflect their share of both the normal cost and the payment to amortize the unfunded liability of the state plan. But, local governments – now saddled with a portion of the state plan's unfunded liabilities on their books – may be more interested in seeing the unfunded liability decline over time and will have a vested interest in ensuring that their contributions are doing just that.[6]

Endnotes

1 Interestingly, school districts are likely to be among the jurisdictions most affected by GASB 68 as virtually all school districts participate in a cost-sharing state teachers' plan. However, estimating the impact of GASB 68 on school districts is difficult due to the current lack of clarity on how state pension payments on behalf of school districts will be treated.

2 The sample of 173 cities was designed to cover the two largest cities in each state, so that the total sample reflects the distribution of population across states. Because the largest cities tend to administer their own plans, additional large cities and towns that participate in state plans were added to the sample in order to capture the variation in pension organization across localities. While the sample covers only 0.5 percent of the 35,879 cities and towns identified in the U.S. Census, it covers about 60 percent of the reported revenue of all cities and towns.

City/state cost sharing may not capture the true impact of GASB 68. Large counties may be more likely than cities to have their own plans and cost share on state plans as well. Future analysis will address this topic.

3 The data collected for each city include: 1) the assets and liabilities for each locally-administered plan; 2) the city's portion of the assets and liabilities for each state-administered agent plan (available from footnotes in the city's Comprehensive Annual Financial Report (CAFR); 3) the total assets and liabilities for each state-administered cost-sharing plan; and 4) a variable for both the city and state plan that can serve as a basis for apportioning a share of each cost-sharing state-administered plan to the city.

4 Governmental Accounting Standards Board (2012).

5 The three New Jersey plans are: Public Employees' Retirement System, Police and Firemen's Retirement System, and Consolidated Police and Fire Retirement System.

6 In fact, one expert we spoke with reported that political tensions have already begun to emerge between a state and local governments involved in its cost-sharing plans.

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U.S. Census Bureau. 2012. *State and Local Government Finances*. Washington, DC.

APPENDIX

Appendix Table 1. Unfunded Actuarial Accrued Liability (UAAL) and UAAL Relative to Own-Source Revenue for Affected Cities, Before and Estimated After GASB 68, FY 2012

Rank	State	City	UAAL			UAAL/Revenue		
			Before GASB 68	After GASB 68	Change	Before GASB 68	After GASB 68	Change
1	NJ	Newark	$0	$1,289	$1,289	0 %	284%	284%
2	MT	Billings	0	335	335	0	245	245
3	NV	Las Vegas	0	921	921	0	234	234
4	MN	St Paul	0	866	866	0	199	199
5	NV	Reno	0	428	428	0	176	176
6	CT	New Britain	22	254	232	14	167	153
7	MT	Missoula	0	75	75	0	151	151
8	AK	Fairbanks	0	45	45	0	145	145
9	OH	Columbus	0	2,044	2,044	0	144	144
10	NV	Henderson	0	366	366	0	129	129
11	NJ	Jersey City	92	669	577	19	138	119
12	NY	Syracuse	0	259	259	0	106	106
13	MN	Minneapolis	583	1,500	917	62	160	98
14	FL	Miami Gardens	0	53	53	0	96	96
15	RI	Woonsocket	59	141	82	68	160	92
16	OH	Cincinnati	862	1,459	597	128	216	88
17	SC	Greenville	8	87	79	8	94	86
18	OR	Salem	0	168	168	0	83	83
19	AZ	Mesa	243	660	417	46	125	79
20	MS	Jackson	63	203	140	36	115	79
21	KY	Louisville-Jefferson	26	716	690	3	82	79
22	OH	Dayton	0	207	207	0	75	75
23	OH	Cleveland	0	719	719	0	67	67
24	OH	Akron	0	202	202	0	64	64
25	NY	Yonkers	0	326	326	0	61	61
26	HI	Honolulu	0	1,258	1,258	0	60	60
27	SC	Spartanburg	6	47	41	8	66	58
28	NH	Nashua	8	122	114	4	61	57
29	OR	Portland	2,654	3,319	665	227	284	57
30	NM	Las Cruces	0	104	104	0	57	57
31	ME	Lewiston	1	40	39	2	57	55
32	KY	Owensboro	3	120	117	1	53	52
33	SC	Columbia	0	132	132	0	52	52
34	WV	Wheeling	46	82	36	65	116	51
35	IA	Des Moines	0	182	182	0	50	50

Rank	State	City	UAAL			UAAL/Revenue		
			Before GASB 68	After GASB 68	Change	Before GASB 68	After GASB 68	Change
36	CO	Colorado Springs	32	881	849	2 %	52 %	50 %
37	ID	Pocatello	0	28	28	0	48	48
38	KY	Lexington-Fayette	149	379	230	31	78	47
39	NY	Rochester	0	140	140	0	44	44
40	NY	Buffalo	0	141	141	0	43	43
41	AZ	Tucson	855	1,108	253	137	178	41
42	RI	Providence	759	964	205	147	186	39
43	IA	Cedar Rapids	0	104	104	0	39	39
44	KS	Kansas City-Wyandotte	76	293	217	13	49	36
45	SC	Charleston	0	103	103	0	36	36
46	ND	West Fargo	0	11	11	0	34	34
47	ME	Portland	0	81	81	0	33	33
48	CA	San Jose	1,772	2,261	489	109	139	30
49	WY	Casper	0	16	16	0	29	29
50	MN	Duluth	0	49	49	0	29	29
51	MN	Bloomington	0	33	33	0	28	28
52	AK	Anchorage	72	323	251	8	35	27
53	LA	New Orleans	604	862	258	58	83	25
54	UT	West Valley City	0	29	29	0	23	23
55	AR	Fort Smith	61	88	27	46	66	20
56	MD	Bowie	0	7	7	0	17	17
57	OK	Lawton	28	46	18	26	43	17
58	WY	Cheyenne	0	14	14	0	17	17
59	MS	Gulfport	11	81	70	3	19	16
60	CT	Bridgeport	200	252	52	62	78	16
61	IN	Fort Wayne	196	241	45	70	86	16
62	ND	Fargo	51	79	28	29	45	16
63	VT	Montpelier	0	3	3	0	15	15
64	WV	Charleston	274	291	17	246	261	15
65	LA	Baton Rouge-East Baton Rouge	0	101	101	0	13	13
66	LA	Lafayette	0	80	80	0	13	13
67	ID	Boise	0	29	29	0	12	12
68	SD	Rapid City	0	15	15	0	11	11
69	OK	Tulsa	119	204	85	16	27	11
70	AZ	Phoenix	2,424	2,677	253	99	109	10

Rank	State	City	UAAL			UAAL/Revenue		
			Before GASB 68	After GASB 68	Change	Before GASB 68	After GASB 68	Change
71	NH	Manchester	-61	-36	25	-24%	-14%	10%
72	FL	Pensacola	117	124	7	98	104	6
73	OK	Oklahoma City	280	345	65	24	30	6
74	DE	Wilmington	166	172	6	84	87	3
75	CO	Denver	440	500	60	16	18	2
76	IN	Gary	16	17	1	13	15	2
77	UT	Salt Lake City	84	92	8	15	17	2
78	IN	Indianapolis	846	870	24	34	35	1
79	NM	Albuquerque	0	6	6	0	1	1
80	WI	Madison	0	2	2	0	1	1
81	NC	Raleigh	24	26	2	4	5	1
82	TX	Dallas	1,665	1,680	15	62	62	0
83	DE	Dover	42	43	1	32	32	0
84	NC	Durham	15	16	1	5	5	0
85	NC	Greensboro	16	17	1	4	4	0
86	NC	Charlotte	128	131	3	10	10	0
87	FL	Jacksonville	1,790	1,796	6	50	50	0
88	OH	Toledo	0	0[a]	0[a]	0	0[a]	0[a]
89	WA	Tacoma	159	117	-42	20	14	-6
90	WA	Vancouver	3	-33	-36	1	-17	-18
91	WA	Spokane	146	25	-121	42	7	-35
92	WA	Seattle	1,299	-283	-1,582	50	-11	-61

[a] Toledo has a UAAL of $0.4 after GASB 68 and a UAAL/revenue ratio of 0.1 after GASB 68.
Sources: Authors' calculations based on various FY 2012 plan and government CAFRs; and U.S. Census Bureau (2012).

Appendix Table 2. Unfunded Actuarial Accrued Liability (UAAL) and UAAL Relative to Own-Source Revenue for Full Sample of 173 Major Cities, Estimated After GASB 68, FY 2012

Rank	State	City		UAAL (millions)	UAAL/Revenue
Total				$177,789	86 %
1	IL	Chicago		19,352	359
2	MA	Springfield		657	315
3	OR	Portland	*	3,319	284
4	NJ	Newark	*	1,289	284
5	WV	Charleston	*	291	261
6	MT	Billings	*	335	245
7	NV	Las Vegas	*	921	234
8	OH	Cincinnati	*	1,459	216
9	MN	St Paul	*	866	199
10	MI	Saginaw		146	190
11	RI	Providence	*	964	186
12	AZ	Tucson	*	1,108	178
13	NV	Reno	*	428	176
14	CT	New Haven		505	173
15	CT	New Britain	*	254	167
16	RI	Woonsocket	*	141	160
17	MN	Minneapolis	*	1,500	160
18	CT	Hartford		526	159
19	IL	Aurora		298	155
20	MT	Missoula	*	75	151
21	NE	Omaha		794	150
22	AK	Fairbanks	*	45	145
23	OH	Columbus	*	2,044	144
24	PA	Allentown		183	142
25	CA	San Jose	*	2,261	139
26	NJ	Jersey City	*	669	138
27	WV	Morgantown		71	137
28	MA	Boston		3,127	135
29	FL	Miami		736	134
30	MI	Warren		181	134
31	NV	Henderson	*	366	129
32	FL	Hialeah		228	126
33	AZ	Mesa	*	660	125
34	NY	New York		71,947	121
35	WV	Wheeling	*	82	116

Rank	State	City		UAAL (millions)	UAAL/Revenue
36	MS	Jackson	*	203	115 %
37	PA	Pittsburgh		485	109
38	AZ	Phoenix	*	2,677	109
39	PA	Philadelphia		5,461	106
40	NY	Syracuse	*	259	106
41	CA	Fremont		193	104
42	FL	Pensacola	*	125	104
43	CA	Oakland		1,143	100
44	MA	Worcester		339	97
45	FL	Miami Gardens	*	53	96
46	VA	Newport News		496	96
47	SC	Greenville	*	87	94
48	CA	Huntington Beach		234	91
49	DE	Wilmington	*	171.8	87
50	CA	San Diego		2,279	86
51	IN	Fort Wayne	*	241	86
52	LA	New Orleans	*	862	83
53	OR	Salem	*	168	83
54	KY	Louisville-Jefferson County	*	716	82
55	CT	Bridgeport	*	252	78
56	KY	Lexington-Fayette	*	379	78
57	TX	Houston		2,971	78
58	CA	Los Angeles		9,357	75
59	OH	Dayton	*	207	75
60	AL	Montgomery		181	74
61	AR	Little Rock		205	74
62	CA	Stockton		217	69
63	MD	Baltimore		1,242	68
64	MI	Flint		292	68
65	CA	Santa Ana		243	67
66	OH	Cleveland	*	719	67
67	AL	Birmingham		362	67
68	AR	Fort Smith	*	88	66
69	SC	Spartanburg	*	47	66
70	WI	Milwaukee		430	65
71	TX	El Paso		490	65
72	OH	Akron	*	202	64
73	TX	Dallas	*	1,680	62

Rank	State	City		UAAL (millions)	UAAL/Revenue
74	CA	San Francisco		3,424	61%
75	NY	Yonkers	*	326	61
76	NH	Nashua	*	122	61
77	TX	Fort Worth		748	61
78	HI	Honolulu	*	1,258	60
79	CA	Bakersfield		176	58
80	CA	Sacramento		483	58
81	ME	Lewiston	*	40	57
82	NM	Las Cruces	*	104	57
83	LA	Shreveport		196	56
84	MI	Grand Rapids		154	56
85	TX	Corpus Christi		260	55
86	KY	Owensboro	*	120	53
87	TX	Austin		1,449	52
88	CO	Colorado Springs	*	881	52
89	SC	Columbia	*	132	52
90	IA	Des Moines	*	182	50
91	FL	Jacksonville	*	1,796	50
92	MO	St Louis		431	50
93	VA	Virginia Beach		521	49
94	KS	Wyandotte County and Kansas City	*	293	49
95	MO	Kansas City		611	49
96	CA	Modesto		117	49
97	AL	Mobile		180	48
98	ID	Pocatello	*	28	48
99	FL	St Petersburg		160	47
100	VA	Richmond		370	46
101	AL	Hoover		45	46
102	ND	Fargo	*	79	45
103	NY	Rochester	*	140	44
104	NY	Buffalo	*	141	43
105	OK	Lawton	*	46	43
106	MI	Detroit		787	43
107	FL	Orlando		208	41
108	VA	Chesapeake		218	39
109	IA	Cedar Rapids	*	104	39
110	SD	Sioux Falls		93	38
111	VT	Burlington		59	38

Rank	State	City		UAAL (millions)	UAAL/Revenue
112	TN	Memphis		940	37 %
113	SC	Charleston	*	103	36
114	CT	Greenwich		132	36
115	AK	Anchorage	*	323	35
116	IN	Indianapolis	*	870	35
117	ND	West Fargo	*	11	34
118	CA	Anaheim		345	33
119	ME	Portland	*	81	33
120	DE	Dover	*	43	32
121	VA	Norfolk		238	32
122	GA	Atlanta		548	31
123	OK	Oklahoma City	*	345	30
124	TX	Lubbock		153	30
125	CA	Riverside		219	29
126	WY	Casper	*	17	29
127	MN	Duluth	*	49	29
128	MN	Bloomington	*	33	28
129	OK	Tulsa	*	204	27
130	MO	Independence		85	26
131	TX	Arlington		117	24
132	UT	West Valley City	*	29	23
133	FL	Fort Lauderdale		92	23
134	GA	Columbus		54	20
135	CO	Aurora		89	20
136	KS	Wichita		107	20
137	MS	Gulfport	*	81	19
138	ND	Bismarck		17	19
139	TN	Chattanooga		175	19
140	CO	Denver	*	500	18
141	CA	Long Beach		334	18
142	MD	Bowie	*	7	17
143	FL	Tallahassee		114	17
144	WY	Cheyenne	*	14	17
145	TN	Nashville-Davidson County		508	17
146	UT	Salt Lake City	*	92	17
147	TN	Knoxville		148	16
148	FL	Tampa		91	15
149	VT	Montpelier	*	3	15

Rank	State	City		UAAL (millions)	UAAL/Revenue
150	IN	Gary	*	17	15 %
151	GA	Roswell		10	15
152	WA	Tacoma	*	117	14
153	LA	Baton Rouge-East Baton Rouge	*	101	13
154	LA	Lafayette	*	80	13
155	ID	Boise	*	29	12
156	SD	Rapid City	*	15	11
157	NC	Charlotte	*	131	10
158	NE	Lincoln		50	10
159	TN	Clarksville		31	9
160	TX	San Antonio		313	9
161	WA	Spokane	*	26	7
162	NC	Durham	*	16	5
163	NC	Raleigh	*	26	5
164	NC	Greensboro	*	17	4
165	TX	Garland		10	2
166	NM	Albuquerque	*	6	1
167	WI	Madison	*	2	1
168	OH	Toledo	*	0 [a]	0 [a]
169	DC	Washington DC		-158	-2
170	WA	Seattle	*	-284	-11
171	CA	Fresno		-71	-12
172	NH	Manchester	*	-36	-14
173	WA	Vancouver	*	-33	-17

* Affected by GASB 68.
[a] Toledo has a UAAL of $0.4 and a UAAL/revenue ratio of 0.1.
Sources: Authors' calculations based on various FY 2012 plan and government CAFRs; and U.S. Census Bureau (2012).

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Are California Teachers Better off with a Pension or a 401(k)?

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UC Berkeley Center for Labor Research and Education

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CONTENTS

4 Executive Summary

7 I. Introduction

12 II. Policy considerations for teacher retirement plan design

16 III. Turnover and tenure among California teachers

24 IV. Modeling outcomes from alternative retirement benefits

34 V. Conclusion

39 Appendix A: Methodology

43 Appendix B: Supplemental Tables

EXECUTIVE SUMMARY

> Overall, the CalSTRS pension benefit structure—which is designed to reward teachers who stay until at least early retirement age—is better matched to the needs of the active teaching workforce than 401(k) or cash balance plans.

Pensions form a significant part of public school teacher compensation, and provide the primary source of retirement security for teachers, many of whom are not included in Social Security. While most private sector employers have shifted the retirement benefit costs and risks to employees by switching to 401(k) style plans, most public school teachers are still covered by defined benefit pensions that provide guaranteed retirement income and reward long service. While 401(k) plans have the advantage of portability for a mobile workforce, defined benefit pensions provide greater retirement income security and reduce turnover. Given the role of retirement benefits in meeting both employer goals for workforce retention and employee goals for retirement income security, this study examines the suitability of defined benefit pensions for California teachers compared to alternative retirement benefits.

Recent studies have questioned the adequacy and fairness of defined benefit pensions—including the pension provided by the California State Teachers' Retirement System (CalSTRS)—based on the fact that a large percentage of new-hire teachers drop out early, and thus do not stay long enough to collect full pension benefits.* These studies conclude that an account-based system would be fairer, whether that be a defined contribution plan such as a 401(k) or a cash balance plan. However, while early career turnover is a serious concern with respect to lost investment in training, analyses based primarily on new-hire attrition rates ignore the fact that most classroom teaching positions are not occupied by those who leave after a few years, but by those who stay long term.

This study compares CalSTRS pension benefits for California public school teachers to alternative retirement benefits, focusing on the currently active teaching workforce. We first analyze teacher turnover patterns and project the final tenure—years of service at retirement or separation—for the current teaching workforce using CalSTRS' actuarial assumptions. We then model benefits under alternative plan designs—an idealized 401(k) plan and a generous cash balance plan that guarantees 7% interest on contributions—and compare them to the current CalSTRS pension for teachers hired since 2013. Finally, we analyze benefit outcomes for the three plans in the context of our tenure analysis findings in order to estimate the share of active teachers who are better off in the current defined benefit plan versus alternative retirement plans, and vice versa.

Overall, the CalSTRS pension benefit structure—which is designed to reward teachers who stay until at least early retirement age—is better matched to the needs of the active teaching workforce than 401(k) or cash balance plans. Although early career turnover is high, most of the teachers that a student will have during their K–12 education journey in California will have served 20 to 30 years or more before they leave public education in the state. Thus, the vast majority of the educators currently

* Johnson and Southgate 2015; McGee and Winters 2013.

serving in California public schools can expect to collect pension benefits under CalSTRS that are superior in value and security to what they could receive under an ideal 401(k)-style plan. The CalSTRS pension system also offers significantly higher benefits compared to a generously modeled cash balance plan for a large majority of active teachers. **Ultimately, switching to an account-based retirement system—such as a 401(k) or cash balance plan—would sharply reduce the retirement income security of teachers who account for a large majority of educational labor in California.**

KEY FINDINGS ARE AS FOLLOWS:

1. **Most classroom teaching in California is performed by long-career teachers who are well-positioned to benefit from a traditional pension.**
   - The typical teacher in the classroom today can expect to leave at age 61, and half of teachers (49%) will retire with 30 or more years of service.
   - Three-quarters of classroom teaching is performed by teachers who will have been covered by CalSTRS for at least 20 years by the time they depart.
   - The typical new hire in California schools is significantly older than the 25-year-old illustrated in recent studies. The current median age for new hires is 29, and the mean is 33.

2. **For the vast majority of California teachers (six out of seven), the CalSTRS defined benefit pension provides greater, more secure retirement income compared to a 401(k)-style plan.**
   - The CalSTRS defined benefit pension becomes more valuable than an idealized 401(k) at age 51 for vested teachers hired before age 35, and earlier for those hired at older ages. The vast majority of active teachers (86%) in the state will stay in California schools until at least age 51.
   - Our model assumes that everyone receives the reduced benefit formula implemented for new hires since 2012—2% of final average salary replaced at age 62. This is a conservative assumption because in reality, most current teachers fall under the older, more generous pension formula—2% at age 60.
   - In addition, four out of five active teachers (79%) will stay until at least age 56, when the CalSTRS pension exceeds the value of a generously structured cash balance plan.

3. **Conversely, only one out of seven teachers currently teaching in California schools will accrue less benefit under the CalSTRS defined benefit plan than they would if contributions were deposited into a defined contribution, 401(k)-type plan—assuming average investment returns.**
   - Only 14% of active teachers will receive less benefit from the CalSTRS defined benefit plan than a hypothetical defined contribution plan. This includes 6% comprised by recent hires who will leave before vesting, i.e., with less than five years of service, and 8% comprised by teachers who will vest, but leave before age 51, when the defined benefit benefit starts to exceed the defined contribution benefit for younger hires.
   - Another 7% will vest, but leave between ages 52 and 56, when the defined benefit pension becomes more valuable than a hypothetical cash balance plan with generous benefits. Thus only one out of five active teachers (21%) would accrue higher benefits under a generous cash balance plan compared to the CalSTRS pension.
   - The biggest reason why the CalSTRS pension provides a lower benefit than the idealized defined contribution plan for the 8% of teachers who vest but leave before age 51 is that the final salary used to calculate benefits loses value over time if the separation date occurs before retirement age. Indexing the final average salary to inflation during this period would mitigate this loss, but require a slightly higher contribution rate.

4. **Focusing on new-hire attrition rates is misleading.**
   - While 40% of new hires leave before vesting, these leavers represent just 6% of teaching positions. The vast majority of public school teaching in California is performed by educators who have remained, or will remain, beyond the initial high-attrition years and are very likely to stay long term.

- While some active teachers who terminate prior to retirement eligibility may receive higher benefits under an idealized account-based retirement plan, this advantage is dwarfed by the larger benefits that the vast majority of active teachers will receive under the DB plan compared to alternative plans.
- From a public education policy perspective, it makes little sense to restructure retirement benefits to advantage those who leave, in a manner that dramatically reduces benefits for those who conduct the vast majority of teaching work.

5. **401(k) and cash balance plans generate their own risks and inequalities in retirement income, decreasing the incentive for early and mid-career teachers to stay, and making it harder for older teachers to retire.**
   - Account-based retirement plans reward those who leave early with proportionally greater retirement benefit than those who stay. For instance, contributions for a 25-year-old yields lifetime retirement income worth more than 3% of that year's pay in inflation-adjusted terms, compared to less than 1% for someone on the cusp of retirement.
   - 401(k) plans create stark, arbitrary inequalities between retirement cohorts because retirement income varies wildly with financial market conditions. Roughly half of teachers will either have income that exceeds the expected benefit by one-third or more, or have income that falls short by one-third or more.
   - Given the lack of deferred compensation in defined contribution and cash balance plans, and the lower benefits compared to defined benefit pension for those who stay until retirement age, account-based retirement benefits would increase the incentive for early and mid-career teachers to leave, and also decrease the ability of older teachers to retire.

I. INTRODUCTION

> The CalSTRS pension benefit structure, which is designed to reward full-career teachers, is generally well-matched to the career trajectories of most California teachers.

For retirement income security, California public school teachers rely primarily on the California State Teachers' Retirement System (CalSTRS), which covers nearly 880,000 members and beneficiaries, including nearly 421,000 active members.[1] The primary retirement benefit—as in most public school systems—is a traditional defined benefit (DB) plan in which lifetime monthly benefits are calculated based on age, number of years of service, and final pay. This benefit is funded jointly by teachers, school districts, and the state. Because California teachers are not covered by Social Security, the CalSTRS pension represents their sole source of guaranteed retirement income.

Some recent studies—including one focused on CalSTRS—have been critical of teacher DB pensions, arguing that "most teachers" do not receive meaningful pension benefits.[2] Such studies cite turnover and job mobility as the basis for claiming that account-based retirement plans—i.e., a defined contribution (DC) plan such as a 401(k) or a cash balance (CB) plan—would deliver greater, more equitable benefits to teachers.[3] CalSTRS offers portability of benefits throughout the entire state. But more importantly, analyses based exclusively on cohort turnover give equal weight to those who leave after a single year of service and those who will have spent decades teaching under the same pension system by the time they retire. This approach offers little insight into whether the pension system fits the career trajectories of the educators who are actually working in classrooms and schools across California at any given time.

The purpose of this study is to evaluate the suitability and adequacy of the CalSTRS pension system for California teachers in comparison to alternative retirement plans, through an analysis of:

1. Overarching policy considerations in evaluating retirement benefit design for public school teachers;
2. The tenure profile—projected length of service at withdrawal or retirement—among teachers currently serving in California public schools; and
3. Projected retirement benefit outcomes under an idealized 401(k) plan and a generous cash balance plan, compared to the current DB plan.

We find that the CalSTRS pension benefit structure, which is designed to reward full-career teachers, is generally well-matched to the career trajectories of most California teachers. The typical classroom teacher today can expect to separate at age 61 with 29 years of service. In addition, the vast majority of teachers (86%) will stay until age 51 or later, when even teachers hired at younger ages can expect to collect retirement benefits that are superior, in terms of both benefit value and income security, to what they would receive under an idealized 401(k)-style plan—assuming 1) low fees; 2) no investment mistakes; and 3) average market returns. The CalSTRS pension system also offers higher benefits compared to a generously modeled cash balance plan for most teachers.

This study demonstrates that the teachers who leave during the initial high-turnover years account for a small share of overall teaching workload—and by extension, a small share of students taught. This is because those who survive the crucible of on-the-job learning and new job adjustment tend to stay in California schools for the long haul—a fact that has serious implications for any proposal to restructure retirement benefits, and for any action to correct imbalances in the benefits provided to partial- and full-career teachers.

While there is indeed inequity between short- and long-career teachers in a traditional DB pension, this is mitigated by two factors. First, the vast majority of teaching is performed by long-career, as opposed to short-career, teachers. Second, a DB plan generates higher retirement income than does a 401(k) plan, partly through plan efficiencies and partly through the fact that the employer bears substantial risk on behalf of employees. When individuals bear these risks, costs increase. For instance, DB pensions pool longevity risk, and offer annuities at significantly higher interest rates—and therefore lower cost—than insurance companies. Finally, the shortfall in benefits for younger, shorter-career teachers compared to what they could earn in a DC plan can be mitigated within a traditional DB platform by indexing final pay to inflation, though this will entail an incremental increase in plan cost.

Another consideration is that account-based retirement plans do not erase inequality in benefits—at least, not from a retirement income perspective. Instead, 401(k) and CB plans create another form of inequality that makes little sense from a workforce management perspective. They provide young, inexperienced teachers proportionately higher retirement income—as a percentage of real pay—compared to older, more experienced teachers. In addition, 401(k) plans generate large, arbitrary windfalls and deficits in retirement income for teachers with the exact same career trajectory, but different start and retirement dates because of financial market fluctuations.

THIS REPORT IS ORGANIZED AS FOLLOWS:

- The remainder of this section highlights the analytical distinction between turnover and tenure, and provides a summary of California teacher retirement benefits.
- Section II discusses three key policy considerations for teacher retirement plan design—retirement income security, workforce management, and efficiency—and considers these factors in the context of research on teacher turnover, tenure, and mobility.
- Section III analyzes tenure, hire age, and exit age among active California teachers.
- Section IV presents the results of benefit modeling for alternative retirement plans, compared to the current CalSTRS DB pension, and applies our tenure analysis findings to the results to estimate the share of currently active teachers who are better off in the DB plan, or better off in the alternative plans.

UNDERSTANDING TENURE, AND WHY TURNOVER DOES NOT TELL THE WHOLE STORY

Recent critiques of DB pensions for teachers have hinged on turnover statistics. New teacher attrition is about 30% in the first five years from the profession as a whole, and higher at the level of schools and pension systems.[4] Thus an argument that "most teachers" do not earn reasonable benefits from traditional DB pensions, which favor long careers, may seem compelling at first glance. However, as labor researchers recognize, turnover rates say little about actual career patterns in an industry or profession. A detailed analysis of tenure—the projected length of time that each worker will stay, based on how long they have already worked—is required to understand whether "most teachers" are short-term or long-term. In other words, is most teaching in California performed by short-timers who stand to gain little from a back-loaded pension plan, or career teachers who are better off with a traditional pension than a 401(k) plan?

In order to understand this, let us take two employers—Employer A and Employer B—that have 100 jobs each. Both have 100% turnover, meaning that there were 100 separations/new hires over the course of the year. However, this translates into very different workforce profiles depending on the timing and location of turnover.

For Employer A, every position turns over once a year and all of the firm's positions are filled by short-term workers. In contrast, Employer B finds that new workers rarely stay more than a few weeks, but that those who survive the first year tend to stay for the long-haul. In this case, 10 positions turn over 10 times each year, and the other 90 positions have been stable for several years.

These different tenure profiles—one in which most positions turn over frequently, and one in which only a few positions do—have different implications for retirement benefit design. A traditional pension makes more sense for a firm that relies on long-term employees than for a firm that relies mostly on short-term workers. At the same time, retirement benefit design itself has an impact on turnover and tenure.

OVERVIEW OF CALIFORNIA TEACHER RETIREMENT BENEFITS

The CalSTRS DB pension provides the primary, and generally the only, source of secure retirement income for California public school teachers. Teacher retirement benefits in California have three components: a traditional DB pension, a supplemental Cash Balance plan, and a voluntary DC system. Unlike private sector employees and some public employees, California public school teachers are not covered by Social Security.

CalSTRS Defined Benefit Pension

The primary component is a DB plan administered by CalSTRS and jointly funded by teachers, school districts, and the state. In this study, the term "CalSTRS pension" refers to this DB plan. Benefits are based on the number of years of service multiplied by an age factor, multiplied by either a 12-month or three-year final average salary. There are two main benefit formulas, depending on hire date. Teachers hired before 2013 are covered under the 2% at 60 formula, which provides an initial benefit of 2% of final salary per year of service at age 60. That is, a teacher with 29 years of service retiring at age 60 will receive 58% (2% x 29) of the average of their highest 12 consecutive months of pay. (If the retiree chooses a joint survivor annuity that will provide income to a spouse after the teacher passes away, the benefit is reduced somewhat.) The multiplier, or age factor, is reduced for early retirements with a minimum retirement age of 55. The age factor is increased for later retirements and reaches a maximum of 2.4% per year of service at age 63.[5]

In 2013, the California Legislature enacted pension benefit reductions for new hires through the Public Employee Pension Reform Act (PEPRA). Teachers hired in 2013 and later are covered under a 2% at age 62 formula; that is, they need to work to age 62, rather than age 60, to reach a 2% multiplier for benefit calculations. Accordingly, the multiplier for retirement years before age 62 is reduced in comparison to the pre-PEPRA benefit and tops out at 2.4% at age 65.[6]

The "normal cost" for the CalSTRS DB pension system—defined as the percentage of payroll required to fund promised benefits for each year's service—is 14.42% for separations and retirements under PEPRA for new members.[7] A small additional amount is added to the pension cost to cover death and disability benefits.

Funding for the pension comes from employees (teachers) and employers (school districts and the state). Employer contributions to CalSTRS are dependent on state legislation, in contrast to the California Public Employees' Retirement System (CalPERS), which has the authority to adjust employer contribution rates in response to financial market conditions. Because the rates set by the state legislature for teacher pensions have consistently fallen short of actuarially required levels for decades, CalSTRS was 68.5% funded as of Fiscal Year (FY) 2014.[8] Fortunately, in 2014 the state enacted a funding plan to close the system's projected $73.7 billion funding gap and restore the plan's funding level to 100% over 32 years.[9]

Historically, California teachers have contributed 8% of pay towards the normal cost of their pension. Under PEPRA, new teachers are required to pay for at least half of the normal cost of the plan. In addition, the state's plan to restore CalSTRS to full funding includes teacher contribution increases. Rates were raised incrementally from 8% in FY 2014 to 9.205% in FY 2017 for the 2% at 62 benefit, and to 10.25% for the 2% at 60 benefit.[10]

Cash Balance Plan (Defined Benefit Supplement Program)

The second component is a CB Plan called the Defined Benefit Supplement (DBS). When teachers perform "extra-pay duties" outside their normal work, for instance teaching a summer class or coaching a sports team after school, and thus accumulate more than one year's worth of service, the pension contributions for the excess service are deposited in DBS.[11] The fund is invested by CalSTRS in much the same manner as the main pension fund, and maintains a notional account for each teacher that includes contributions, a minimum annual interest credit based on the 30-year Treasury rate, and extra earnings depending on the fund's investment performance. Balances can be cashed out as a lump sum upon separation or retirement, or converted into an annuity on favorable terms compared to private insurance interest rates.

Voluntary Defined Contribution Plan

The third, voluntary component is a DC system in which employees manage their own contributions and investments. The most common plan types are 403(b) plans and 457(b) plans, which are essentially 401(k)-style plans for governmental, education, and nonprofit employees. California has a highly decentralized system in which more than 1,000 individual school districts select private plan providers and investments, and there is little control over fees and fund quality.[12] Teachers can also opt for Pension2, the 403(b)/457(b) plan managed directly by CalSTRS.

No Social Security Coverage

Historically, the retirement system in the US has three pillars: Social Security for basic income, employer-sponsored pensions, and personal savings. However, public agencies are not required to participate in Social Security, and must opt in to do so. Many governmental employers, under the logic that they can provide retirement income more economically through an employer-sponsored pension system than through Social Security, have not opted in. CalSTRS members voted against opting into Social Security in 1955.[13] While nationally, public pensions for non-Social Security workers tend to be modestly more generous than plans for those covered by Social Security,[14] that is not the case for California teachers. CalSTRS pension benefits for teachers are not any more generous than the typical CalPERS plan for state and local government workers with Social Security. A key advantage of most public pensions, including CalSTRS, is that the age for claiming full retirement benefits is higher—60 for older members and 62 for new members under CalSTRS compared to 66, going on 67, for Social Security.

Teachers who have more than 40 quarters of Social Security taxable earnings—e.g., from previous jobs—see their Social Security benefits reduced by the Windfall Elimination Provision. Similarly, the Government Pension Offset reduces spousal and widow/widower's benefits under Social Security. A teacher who would otherwise have $1,000 in monthly Social Security widower benefits and receives as little as $1,500 from CalSTRS will have their entire spousal benefit eliminated.[15]

COMPARING THE DATA IN THIS REPORT WITH OFFICIAL CALSTRS-PUBLISHED STATISTICS

Most of the data in this report is based solely on the 421,000 active members in the CalSTRS defined benefit pension plan, and is meant to represent California's current educational workforce. In effect, our data is weighted by teaching position, which in turn serves as a proxy for teaching workload. In contrast, official published statistics from CalSTRS reflect its total member population, consisting of active, inactive and retired members—including many who left California schools a long time ago—and weighs each individual equally regardless of the amount of teaching work performed.

Our results look forward to the future behavior of the active membership, in order to estimate the share of teaching positions—and teaching workload—filled by educators who are better off with the current CalSTRS pension versus an idealized 401(k)-type plan, and vice versa. CalSTRS-published statistics look back at the prior behavior of its total population over time. This means our results will not directly align with CalSTRS-published statistics on historical teacher career and retirement patterns.

For example, the average (mean) retirement age currently reported by CalSTRS is 62, with 25 years of service.[16] This is the average age at which members initiated retirement benefits from CalSTRS, regardless of when they worked or separated from service. In contrast, this report projects a mean exit age of 60 and a median exit age of 61 for active members, with a median 29 years of service. The median exit age is based not only on retirement, but also on other ways a member could leave CalSTRS-covered employment, including separation from service and—to a much smaller extent—disability and death before retirement eligibility. (Members who become disabled while eligible for immediate retirement will collect pension benefits like any other retiree. And if a member dies while eligible for retirement, their surviving spouse collects their share of CalSTRS pension benefits.)

The member segment we use—active versus the total CalSTRS population—and timeframe of analysis explain the differences between the data in this report and official CalSTRS-published statistics.

II. POLICY CONSIDERATIONS FOR TEACHER RETIREMENT PLAN DESIGN

Workplace retirement plans serve a dual purpose, in that they serve employee goals with regard to retirement security, and employer goals with respect to workforce management, e.g., recruitment, retention, and productivity. These goals must be balanced against efficiency and risk.

From the employer perspective, the choice between defined benefit (DB) pensions and alternative plans is contingent on preferences for long-career versus short-career employees, willingness to absorb risk, and cost. From the employee perspective, retirement security in terms of both the level and predictability of income is the likely primary factor, and empirical evidence on teacher choice seems to support the conclusion that teachers—including new hires—prefer DB pensions.

Ultimately, if the goal of teacher retirement plan design is retirement income security and long-term teacher retention, DB pensions are preferable. If public school employers want to shorten average tenure and are willing to absorb the cost of increased turnover—and teachers are less risk-averse than their current behavior indicates—then they might prefer defined contribution (DC) plans such as 401(k)s or cash balance (CB) plans.

RETIREMENT INCOME SECURITY: INCOME AND OLD AGE INSURANCE VS. WEALTH

Pensions, like Social Security, were created as old-age insurance to ensure that seniors can retire with a decent standard of living after a lifetime of work. Pensions and Social Security also socialize key risks related to retirement income security, including the risk of accumulating insufficient assets and longevity risk (the risk of outliving one's savings). In the case of Social Security, these risks are borne by society as a whole. In the case of workplace DB pensions, they are pooled across the workforce and ultimately borne by the employer.

Analyses of retirement benefits that are framed entirely in terms of wealth, or account balances, neglect the critical value of DB pensions as insurance. Because employers serve as the guarantor, participants enjoy income security that is impossible to purchase in the private market without considerable cost. To achieve the same level of retirement income security on their own, workers would have to invest exclusively in low-risk securities such as Treasuries or high-grade bonds, and compensate for lower returns with a much higher contribution rate. They would also have to engage in sophisticated investment strategies to ensure that their portfolio generated a predictable income level regardless of the interest rate environment.

Private sector workers now face heightened retirement income insecurity. Since the 1980s, increasing financial market volatility, improved life expectancy, declining employer commitment to employees, and regulatory changes that have increased the cost of DB pensions have led to the decline of corporate DB pensions and the rise of 401(k) plans.[17] In the world of 401(k)s and IRAs, the focus is on retirement wealth—account balances—rather than on retirement income.[18] As an increasing share of older workers and retirees rely on DC plans as the key source of retirement benefit after Social Security, participants are challenged to turn their account balances into a consistent income stream.[19]

While policy debates continue regarding the capacity of employers and governments to absorb the risks in DB plans, there is a strong body of evidence indicating that the shift to DC plans in general, and the focus on retirement wealth rather than retirement income in particular, have been harmful to workers' retirement security.[20] Academics, policymakers and the financial sector are focused on retirement income solutions, such as encouraging participants to think about monthly or annual retirement income and income replacement, rather than lump-sum retirement wealth, and structuring DC plans to encourage conversion of account balances to lifetime income.[21]

WORKFORCE MANAGEMENT

In general, schools have an interest in reducing turnover and encouraging older teachers to retire. Turnover is high in the early years of teaching. Recent studies estimate that 30% of new teachers leave the profession within the first five years—not as high as originally thought, but still substantial.[22] Turnover is costly, both in terms of lost investment in training and the transaction cost of hiring new employees. One study estimated the annual cost of turnover in the early 2000s in San Francisco and Oakland school districts to be about $12 million a year each.[23] At the same time, older teachers may be less productive, or at least more expensive, once they reach a certain age. DB pensions allow employers to encourage older workers to leave, without running afoul of anti-discrimination laws. As we will discuss further in this paper, the CalSTRS DB pension evidently succeeds both in retaining teachers for the long haul, and in encouraging teachers to exit in their 60s.

DC and CB plans, in contrast, would increase the incentive for young and mid-career teachers to leave, and also decrease the ability of older teachers to retire. Furthermore, a 2011 study released by the Center for American Progress suggests that because turnover is negatively correlated with teacher effectiveness, increased turnover resulting from a DC or CB plan will lower the average effectiveness of the teaching workforce.[24]

EFFICIENCY AND RISK

A shared goal of employees and employers is to generate the greatest benefit for the lowest cost. This is contingent in large part on the willingness of the employer to bear risk, without which the cost would be much higher.

Based on the ability to pool risk across individuals and over time, with the employer serving as guarantor, DB pensions feature key efficiencies that make it possible to offer significantly higher income compared to a DC plan, assuming equal funding. These include:

1. A long time horizon that allows the plan to maintain a higher level of exposure to risky investments compared to individuals, who need to de-risk as they age.[25]
2. Longevity risk pooling and employer guarantees that allow the plan to offer annuities at significantly higher interest rates than insurance companies.
3. Professional management of asset allocation and investments, avoiding many of the investment mistakes common among individual investors.

Based on a longer investment horizon and employer-backed longevity risk pooling , DB pensions provide benefits at a lower cost compared to an idealized DC plan. Based on these two factors plus professional investment management, DB pensions have an even greater cost advantage compared to an individually-directed DC plan.[26] That is, DB pensions are able to generate higher retirement compared to DC plans for a given contribution rate.

These fundamentals have been validated in studies that rely on rigorous, apples-to-apples benefit model comparisons.[27] While there have been several studies contesting the finding that DB plans are more efficient, none have included a rigorous comparison of outcomes based on equal cost.[28]

DISTRIBUTIONAL ISSUES

Back-loaded benefits in traditional DB pensions are widely recognized, but in retirement income terms, DC plans are markedly front-loaded (**Table 1**). A plan that appears to treat older and younger employees equally in one sense—e.g., the same percentage of pay is contributed by the employer—may treat them in a radically different manner, when the value of the benefit is calculated in terms of retirement income. That is, each dollar contributed to a 401(k) or credited to a CB plan on behalf of a 60-year-old employee will yield significantly less income than the same amount contributed on behalf of a 30-year-old employee, assuming that the contributions are invested in the same investment portfolio. This is particularly true in CB plans, because the employer continues to carry risk on behalf of employees after they separate from service.

DB pensions offer the best opportunity to give employees roughly equivalent retirement income benefits, as a percentage of pay, no matter when they enter or leave the system. This can be accomplished with either a final average salary formula in which final pay is indexed to inflation until normal retirement age, or a lifetime average salary formula in which each year's pay is indexed to inflation.

Ultimately, distributional issues need to be considered side by side with efficiency and benefit adequacy.

Table 1

Illustration of Front-loaded Benefits in 401(k) and Cash Balance Plans

	Year 1 (Age 30)	Year 31 (Age 60)
Salary (A)	$40,000	$100,000
10% Contribution	$4,000	$10,000
Real value of contribution at age 65, after investment earnings and inflation (B)	$14,891	$11,870
% of Salary (B/A)	37%	12%

Note: *Assumes 7% compound annual investment return. Values are inflation adjusted.*

EMPIRICAL EVIDENCE ON TEACHER PREFERENCES

Few states have offered teachers a choice between DB and alternative retirement benefits. Washington and Ohio are the only two states in the US that currently offer teachers a choice between a DB plan and a hybrid plan consisting of both a DB and DC component funded by mandatory contributions. In addition, West Virginia offered the choice to switch from a DC plan to a DB plan more than a decade ago. The evidence favors the view that teachers prefer the secure retirement income provided by DB pensions over the potential upside in a DC plan. In addition, there is evidence that in DC plans, teachers—like all workers—are vulnerable to financial market conditions that can negatively affect their retirement income security.

In the Washington case, the state offered substantial financial incentives for existing teachers to switch to the hybrid and made the hybrid plan the default choice for new hires.[29] In addition, the DC component allows teachers to annuitize their DC account balances at rates that are higher than what they would normally receive from an insurance company.[30] Three-quarters of existing teachers agreed to switch to the hybrid when it was first introduced in 2007, and there is some indication that the introduction of the hybrid plan in the context of bull market conditions leading up to 2007 may have influenced teacher choice. However, in light of the subsequent financial crisis and recession, preferences among new hires seem to have tipped back towards the DB pension. The share of new hires actively choosing the DB plan increased from 39% in 2007 to 55% in 2013.[31]

Ohio introduced choice between a DB plan, DC plan, or a DB/DC hybrid in 2001, establishing the traditional DB plan as the default. Ohio provided no financial incentives to switch to a particular plan, but the DB plan comes with retiree health benefits while the DC plan does not. Between 2002 and 2014, about three-quarters of teachers stayed with the DB default, 13% elected the DB plan, 9% elected the DC plan, and 4% elected the hybrid.[32]

In 1991, West Virginia closed its Teacher Retirement System, a DB pension plan, to new teachers. It established a DC plan as the primary retirement benefit for new teachers and allowed existing members to switch into it. By 2003, the state recognized that older teachers who had switched into the DC plan had inadequate resources to retire after the financial bubble burst in 2001. Despite a combined employer/employee contribution rate of 12%, only 6% of teachers over age 60 had balances greater than $100,000. West Virginia started bringing new hires into the DB plan, partly to increase teacher retirement income security and partly to restore funding levels in the Teacher Retirement System, which had plummeted after closure. Offered the choice, 79% of existing teachers in the DC plan chose to switch to the DB plan, including 75% of teachers under 45.[33]

In choosing DB plans over DC plans, are teachers being irrational? A more plausible explanation is that risk aversion probably plays a strong role in teacher choice. Teachers likely place a high value on the guaranteed retirement income provided by traditional pensions, compared to 401(k)-style accounts in which they must bear investment risk. Put another way, teachers appear to discount 401(k) benefits more steeply than they do traditional pension benefits, given the differences in risk between the two plans. Thus, even though a new teacher knows she might fare better with a 401(k) under average market conditions, she also knows that there is a significant possibility of loss, and a nontrivial chance of catastrophic loss, given recent historical experience.

In the next section, we demonstrate that in both financial value and income security terms, the CalSTRS DB pension offers the best value to California teachers.

III. TURNOVER AND TENURE AMONG CALIFORNIA TEACHERS

> We find that the vast majority of classroom teaching in California is performed by teachers who are well positioned to benefit from a traditional pension because they work a full career, or work mid-to-late-career in the state.

In order to understand the implications of pension design for California educators, it is critical to determine the extent to which teaching is performed by those who start early in their career and leave too soon to fully benefit from the CalSTRS pension, versus those who stay at least until early retirement age when the pension's back-loaded benefit structure begins to work to their advantage. As we illustrated in the introduction, two hypothetical employers with identical turnover can have very different tenure profiles among current workers. Where turnover is high in the early months or years of employment, but relatively low in subsequent years, the majority of positions are filled by workers who stay for the long haul. Furthermore, where a retirement system covers multiple employers—such as CalSTRS does across California school districts—system-level retention rates are much higher than would be indicated by school- or district-level turnover.

In this section, we analyze the age and accrued service profile of the state's teaching workforce, and then apply CalSTRS actuarial assumptions regarding age- and service-specific turnover rates to project the age at which each teacher will leave, and the number of years of service they will have accrued by then. We find that the vast majority of classroom teaching in California is performed by teachers who are well-positioned to benefit from a traditional pension because they work a full career, or work mid-to-late-career in the state.

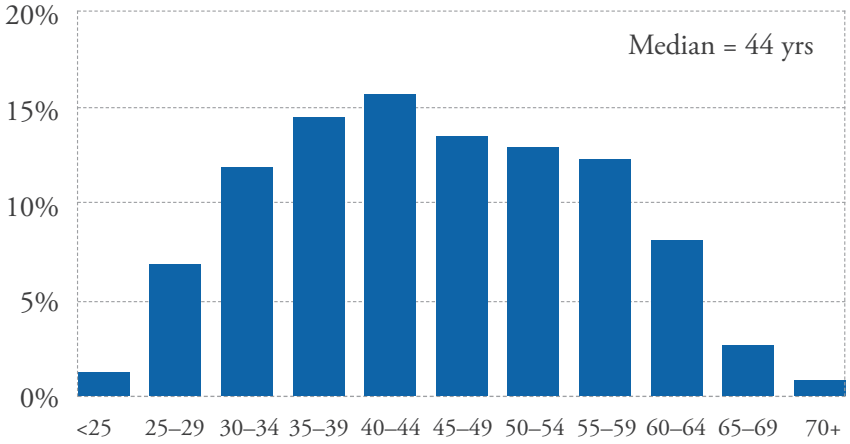
1. The current median age for new hires is 29, and the mean is 33. Half of new teachers fall between ages 25 and 37. Thus most new hires in California schools are significantly older than the 25-year-old illustrated in recent studies to emphasize the disadvantages of final average salary defined benefit (DB) pensions.
2. The median projected exit age for active CalSTRS members is 61. The vast majority of California teachers (84%) will separate from service when they are at least 55 years old, having vested.
3. Half of active teachers (49%) will retire with a full career's worth of pension credits under their belt, 30 or more years of service.[34] Another quarter (26%) will have been covered by CalSTRS for at least 20 years by the time they separate or retire. In total, three-quarters (75%) of active teachers will serve at least 20 years.

In other words, most California teachers are on track to have a full career, or end their careers in California public schools. As we will see in the next section on benefit modeling results, this has significant bearing on how most teachers fare in the CalSTRS pension plan compared to rigorously modeled outcomes for alternative retirement plans.

PROFILE OF THE CALIFORNIA TEACHING WORKFORCE

Figure 1

Age Distribution of California Teachers

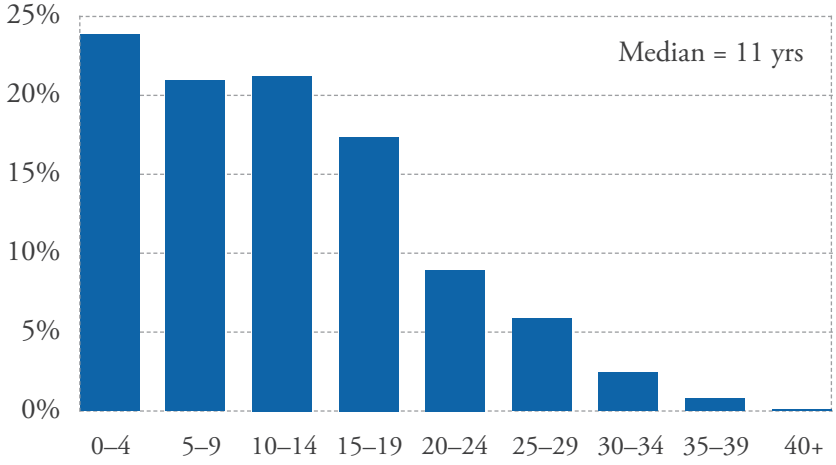


Note: *Authors' analysis of CalSTRS active membership data as of June 30, 2014.*

The California teaching workforce is distributed relatively evenly across the age spectrum, with a median age of 44 years (**Figure 1**). This pattern is roughly in line with the state's college-educated labor force.[35] It also reflects overall population aging; during the 1970s, the teaching workforce was more heavily skewed toward younger ages.[36]

Figure 2

Accrued Service among California Teachers



Note: *Authors' analysis of CalSTRS active membership data as of June 30, 2014.*

Half of active teachers have 11 full years of service or less in California schools (**Figure 2**). Given the even age distribution revealed above, this indicates that a significant share of teachers in this state started their career relatively young, or are older teachers who arrived mid- or late-career.

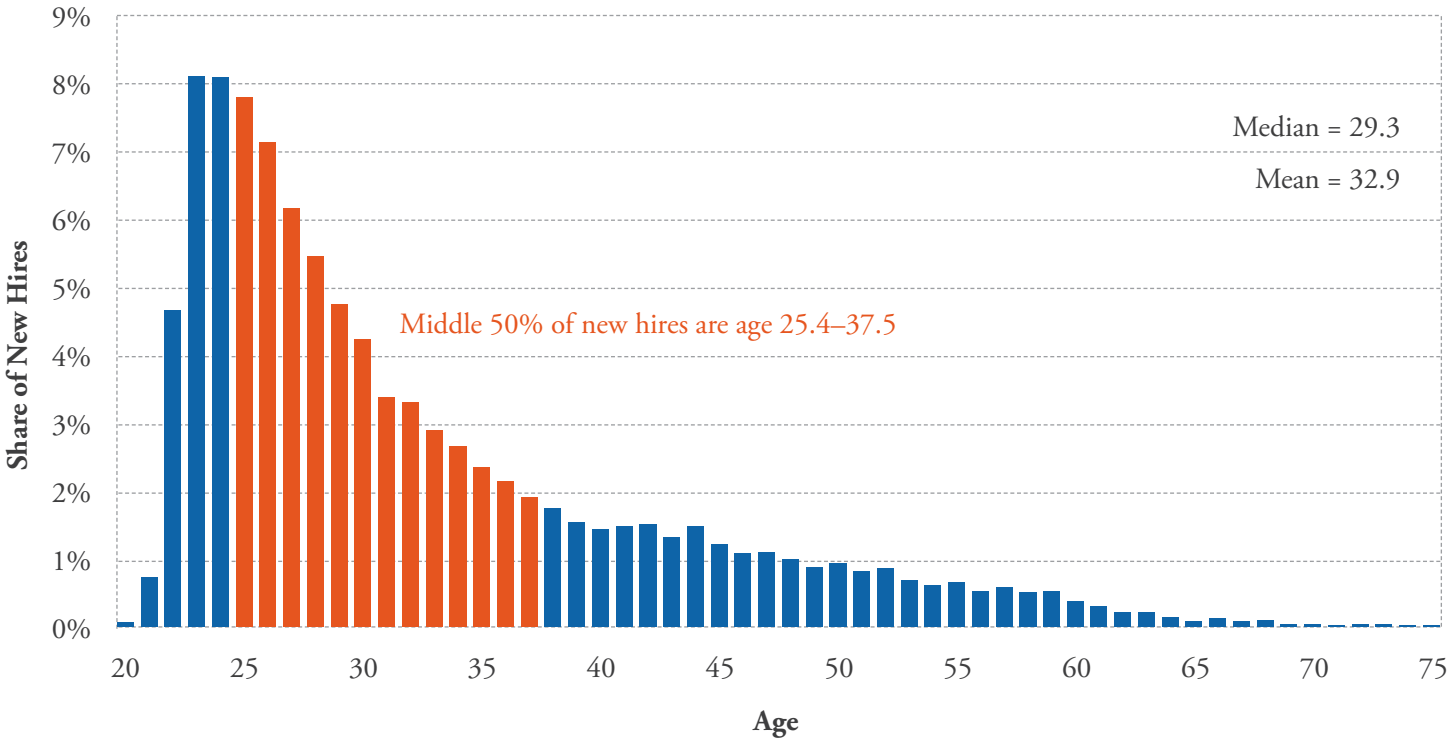
In stark contrast to studies that highlight 25-year-old entrants as representative of new hires, most new-hire teachers in California are significantly older (**Figure 3**). While the distribution of new-hire teachers is indeed skewed toward younger ages compared to the current teaching population, the median age of a new-hire teacher in California is 29.3 years, and the mean is 32.9. The middle half (50%) of entering teachers are between ages 25.4 and 37.5 years old. This means that one-quarter are 25.3 years and younger, and one-quarter are 33.0 years and older.

The exact reasons for the significant presence of mid-career teachers among new hires are unclear, but we suspect two possible factors. One is in-migration of experienced teachers from out of state. While there is no reliable data on inter-state migration of experienced teachers, the fact that approximately 22% of new certifications in 2011–2013 were awarded to teachers trained in other states provides some indication that California is hiring many teachers from out of state.[37]

The other possible factor contributing to the large number of older new hires is teaching as a second career. A proxy for this is the share of initial teaching credentials issued to individuals graduating from alternative programs, relative to traditional programs (e.g., Baccalaureate or Master's programs.) Of the credentials issued to teachers with in-state preparation in 2013, 17% had completed alternative programs and 83% had completed traditional programs. The share of alternative credentials tends to rise during hiring booms, and decline during layoffs. Accordingly, the share of new credentials to those prepared in alternative programs has fallen faster than those prepared in traditional programs since the Great Recession.[38]

Figure 3

Age Distribution of California New Hire Teachers



Note: *Authors' analysis of CalSTRS active membership data as of June 30, 2014.*

TENURE PATTERNS AMONG THE CALIFORNIA TEACHING WORKFORCE

Turnover and Tenure Analysis Methodology

We obtained two tables from CalSTRS: active member counts grouped by age and years of service for fiscal year ended June 30, 2014, and actuarial assumptions—annual rates of separation, retirement, disability, and mortality by age and/or years of service. Both these data sources are granular down to the single-year level, in contrast to data published in actuarial valuations which are aggregated in five-year intervals for age and service.

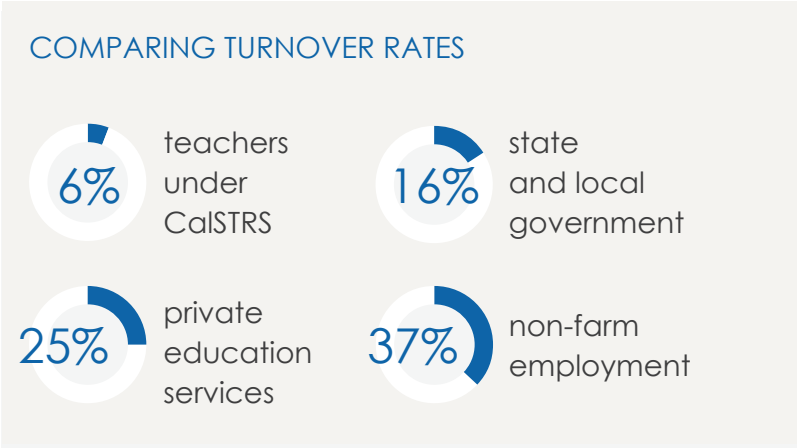
The actuarial assumptions were based on CalSTRS' study of turnover and retirement experience in 2006–2010.[39] Notably, despite the Great Recession, we see no evidence that turnover rates have changed significantly compared to the previous study.[40]

We combined the separation, retirement, disability, and mortality rates to construct a matrix of annual turnover rates contingent on age and accrued number of service years. For instance, we estimated that a 44-year-old female teacher with 21 years of service has a 0.608% chance of separating, dying, or becoming disabled over the next year, and a 0.578% chance during the subsequent year. Using these rates, we constructed survival curves for each age/service cohort in the active membership table, and progressed the active membership counts in each cohort forward until age 75, when CalSTRS actuaries assume all surviving teachers will retire. We assumed that teachers who are currently age 75 or older will retire immediately.

Finally, for the purposes of the retirement benefit analysis in Section IV, we isolated the miniscule share of teachers who are projected to die or become disabled before retirement age from the tenure distribution, in order to count only those who would collect pension benefits.

Turnover Findings

To begin, teachers have a high degree of mobility across school districts, especially during early career. However, due to the portability of CalSTRS benefits across the largest state in the nation, the aggregate turnover rate for teachers under CalSTRS, counting all ages, is approximately 6%.[41] In comparison, the annual turnover rate was 16% for state and local government employment, 25% for private educational services, and 37% for non-farm employment in 2012.[42]



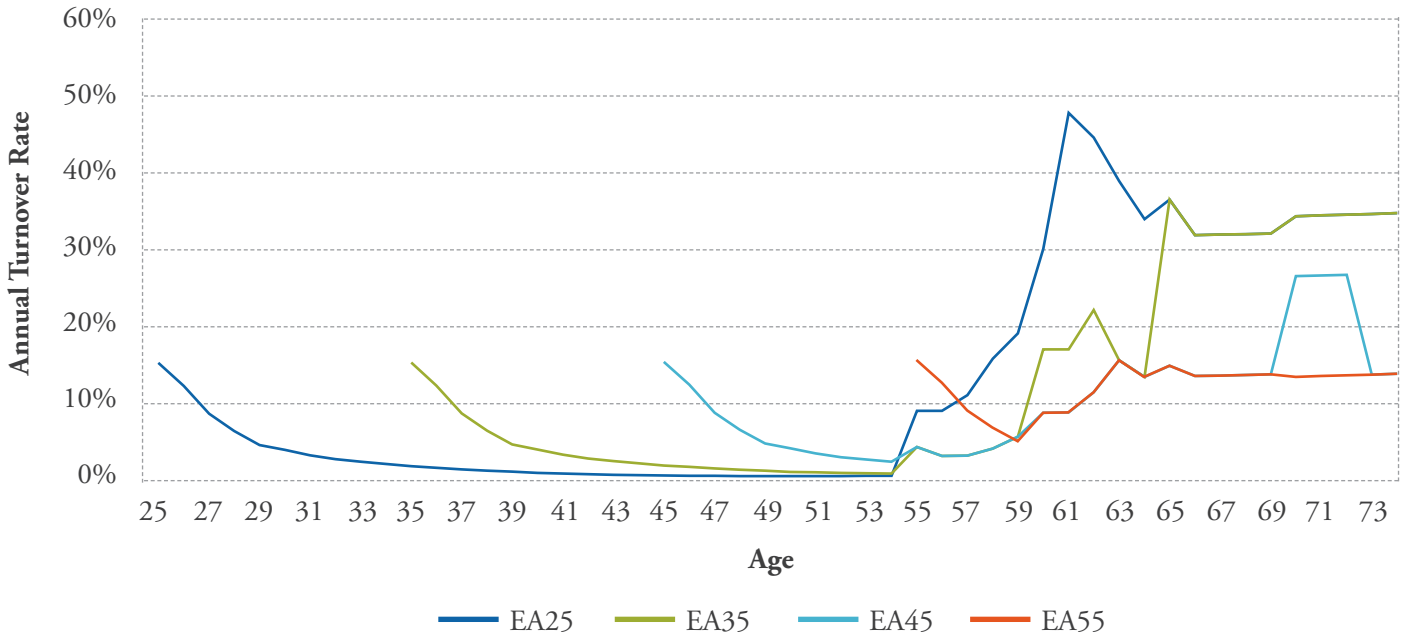
CalSTRS' teacher turnover rate is roughly consistent with national statistics, when portability is taken into account. The National Center for Education Statistics (NCES), which administers the Schools & Staffing Survey/Teacher Follow-Up Survey, reported a 15.6% separation rate in 2008–2009 among public school teachers. About half (7.6% of all teachers) moved to another school, and the rest (8%) were "leavers" who left the profession entirely.[43] Data for 2004–2005 were roughly similar. In a large teaching labor market like California, which encompasses 1,700 school districts, community college districts, county offices of education, Regional Occupational Centers and Programs, and select state agencies and more than 400,000 teaching jobs, most "movers" who switch to another school district would still be covered by CalSTRS. Assuming that only a small percentage of movers leaves the state, the 6% overall annual separation rate among CalSTRS members is somewhat lower than the 8% national "leaver" rate.

Conversely, retention of California teachers within the state as a whole—as reflected by CalSTRS active membership—is remarkably high after the initial churn of the pre-vesting years. California teachers who vest into CalSTRS pension benefits stay in the state, and stay for a long time. **Figure 4** illustrates turnover by entry age. Turnover is highest in the first three to four years after hire, and then decreases dramatically until early retirement age. Indeed, for teachers hired at age 25, the turnover rate for most years between vesting and age 55, when they become eligible for early retirement, is under 1%.

For teachers hired at age 25, the turnover rate for most years between vesting and age 55, when they become eligible for early retirement, is under 1%.

Figure 4

Age-Specific Turnover Rates, by Entry Age



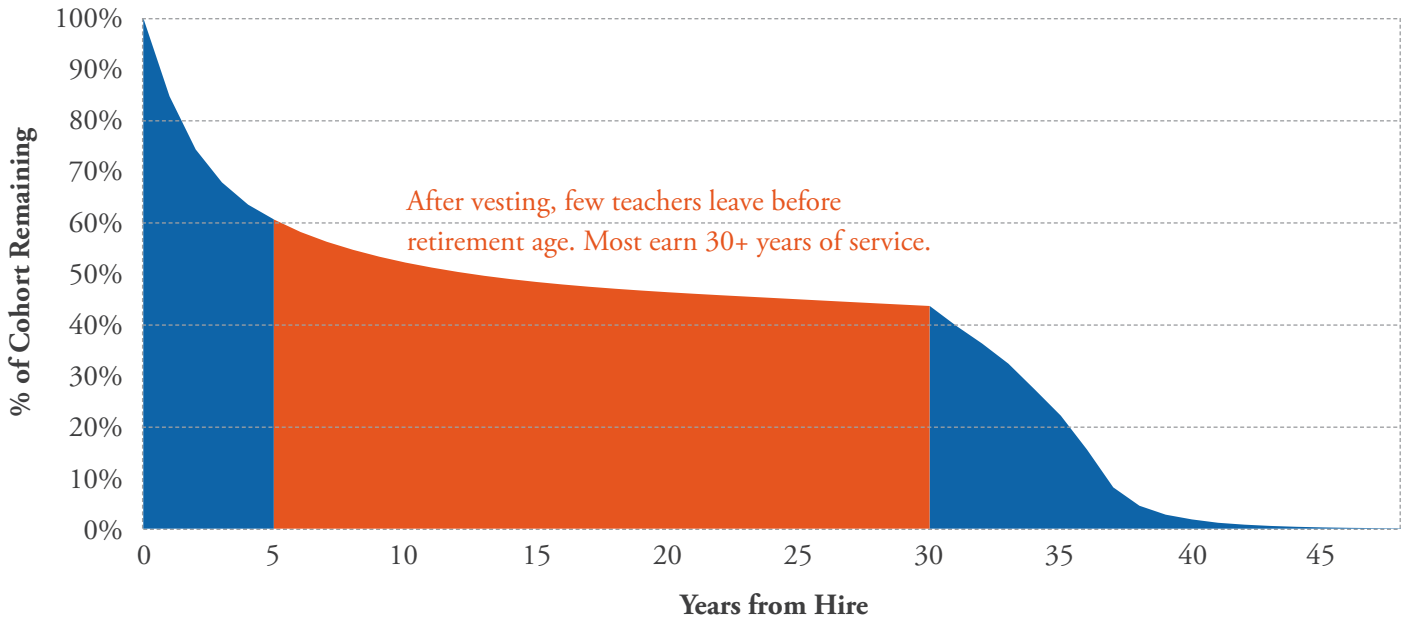
Note: *Authors' analysis of CalSTRS actuarial assumptions. Data reflect weighted average of male and female turnover rates.*

As demonstrated in **Figure 3** above, the majority of actual new entrants are significantly older than 25. But in California, even 25-year-old hires have a significant likelihood of staying for a full career (**Figure 5**). As expected, early turnover is high: two out of every five new hires brought on at age 25 will leave before they can vest at five years of service. Most of this attrition is concentrated in the first three years, when 3 out of 10 original hires will leave. Subsequently, attrition rates continue to drop so that only a small share of teachers leave between their vesting date and the year that they first become eligible to start receiving retirement benefits (five years of service at age 55). In fact, of the teachers who make it to the five-year vesting mark, 72% can expect to retire with at least 30 years of service. This is equal to 44% of the original cohort. According to our turnover and tenure analysis, this pattern—high turnover before vesting, and low turnover until retirement eligibility—applies to new hires across the age spectrum.

[Of] the teachers who make it to the five-year vesting mark, 72% can expect to retire with at least 30 years of service.

Figure 5

Cumulative Retention for Teachers Hired at Age 25



Note: *Authors' analysis of CalSTRS actuarial assumptions. Data reflect weighted average of male and female survival rates.*

Research indicates that early career turnover among teachers is primarily driven by non-economic issues such as career fit and school-level working conditions.[44] In addition, non-tenured teachers face greater job insecurity. New teachers are first in line to receive layoff notices at the end of the school year when the school budget is uncertain, and this may prompt some to seek other employment. Thus it is not clear the extent to which the five-year vesting cliff happens to mirror the point at which teacher attrition stabilizes for reasons not related to pension benefit structure. However, there is a clear link between retirement plan design and employee tenure over the long term: workers in DB plans are more likely to stay until retirement age than workers in 401(k)-style defined contribution (DC) plans.[45]

Tenure Findings

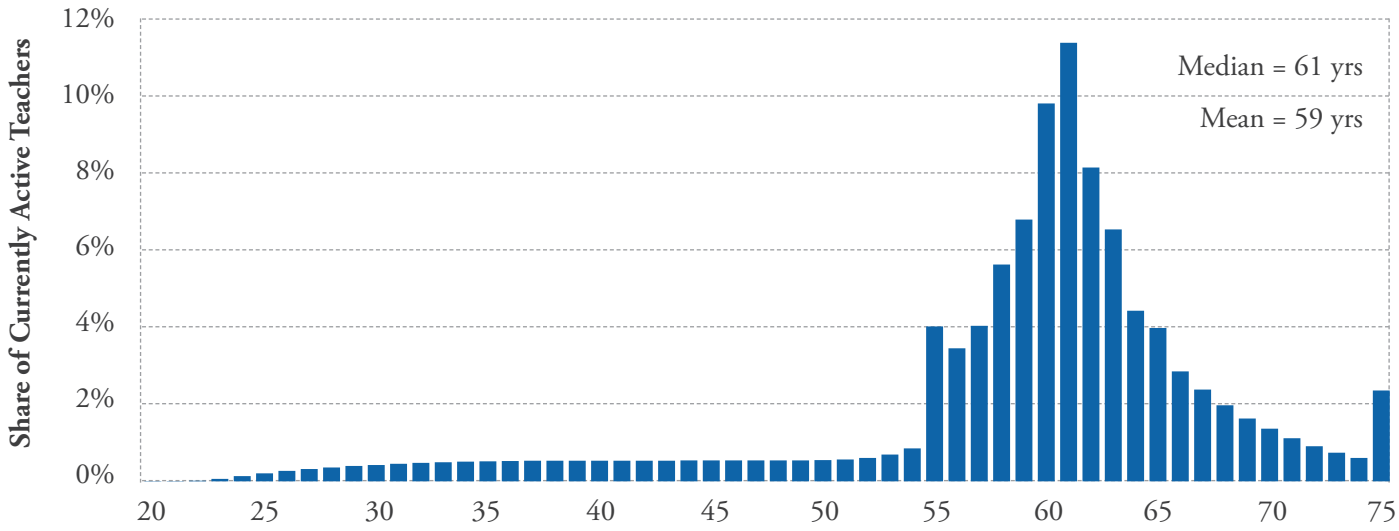
When the career trajectories of the entire active teaching workforce in California are considered, a pattern emerges that has very different implications for the evaluation of retirement benefits than one based solely on new, young hires. To begin, **Figure 6** illustrates the distribution of exit ages among currently active teachers. Before age 55, the shares of the current teaching workforce that will leave each year (as a percentage of the current total) are miniscule—well under 1% annually. The attrition rate jumps to 4% at age 55, the earliest age to collect retirement benefits, and increases to a peak of nearly 12% at age 61—the median age of separation from service. Thereafter, retirement rates accelerate. The vast majority of California teachers (84%) will leave when they are at least 55 years old, with vested benefits.

84%

of California teachers will leave when they are at least 55 years old, with vested benefits.

Figure 6

Projected Age at Exit Among Current California Teachers



Note: *Authors' analysis based on CalSTRS active membership data and actuarial assumptions as of June 30, 2014.*

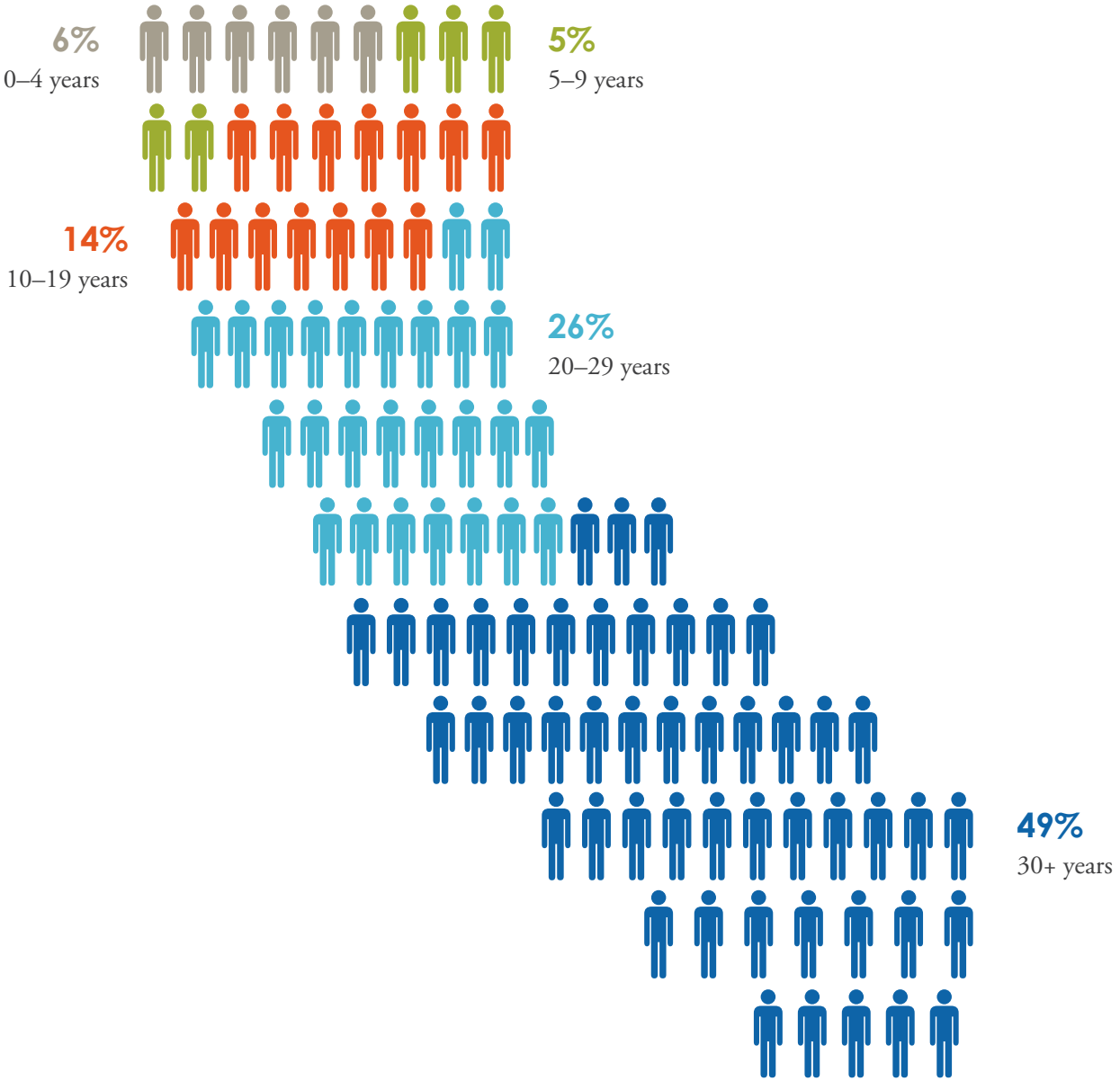
We also analyzed the total years of service that California teachers will have accrued by the time they leave. About half (49%) of the teaching workforce will have earned at least 30 years of service by the time they leave the California schools (**Figure 7**). One-quarter (26%) will leave with 20 to 29 years of service. These add up to 75% of teachers staying at least 20 years. Only 6% will leave without vesting, and 19% will leave with 5–19 years of service.

In summary, a large majority of teaching positions in California public schools are occupied by long-career teachers, not short-term teachers. Most teaching work in California is performed by full-career teachers and those who finish their teaching careers in the state. Only a small percentage of teaching positions are occupied by those who leave before accumulating substantial service, or leave well before retirement age. This has profound implications for the evaluation of alternative retirement benefits in relation to the CalSTRS DB pension, as we demonstrate in the next section.

Most teaching work in California is performed by full-career teachers and those who finish their teaching careers in the state. Only a small percentage of teaching positions are occupied by those who leave before accumulating substantial service, or leave well before retirement age.

Figure 7

Projected Tenure of Current California Teachers



Note: *Authors' analysis based on CalSTRS active membership data and actuarial assumptions as of June 30, 2014.*

IV. MODELING OUTCOMES FROM ALTERNATIVE RETIREMENT BENEFITS

> Six out of seven teachers in California (86%) are better off with the CalSTRS pension than an idealized 401(k).

In this section, we evaluate how defined contribution (DC) or cash balance (CB) plan outcomes for California teachers compare to the CalSTRS defined benefit (DB) pension. The first part of this analysis consists of rigorous benefit modeling that compares benefit outcomes under the three plans, using the same contribution rate. The second part consists of estimating the share of California teachers who are better off in the DB pension, based on the projected exit age and service year accrual, compared to the other plans.

We find that six out of seven teachers in California (86%) are better off with the CalSTRS pension than an idealized 401(k). In addition, four out of five (79%) are better off with the CalSTRS pension than a generously structured cash balance plan.

1. In terms of annual retirement income and total financial value, CalSTRS pension benefits exceed those of an idealized DC plan at age 51 for teachers who have vested by then. The CalSTRS pension exceeds the benefits of a generously structured CB plan at age 56. These cutoffs apply to those hired at younger ages, and occur sooner for those hired at older ages.
2. While it is widely acknowledged that traditional DB pensions generate inequality based on entry and exit dates, with later entrants receiving a proportionally larger benefit, account-based plans tend to generate inequality in the opposite direction. In addition, the investment risk in 401(k)s exposes participants to large-scale, arbitrary inequalities in retirement benefits between teachers with the exact same career trajectory.
3. Indexing final salary to inflation in the DB pension will mitigate the potential loss in benefit, compared to the DC plan, for the small share of teachers who vest but leave before age 52. This is a more elegant solution than a wholesale switch to an account-based plan that would reduce the retirement incomes of most teachers currently teaching in California schools.

BENEFIT MODELING METHODOLOGY

We modeled DC and CB outcomes based on a fixed contribution rate of 14.42% of pay, equal to the current normal cost of the retirement benefits and withdrawal benefits provided under CalSTRS. We also modeled DC benefits based solely on the PEPRA new employee contribution rate of 9.205%, in order to calculate the "break-even" point for employee contributions to the DB plan compared to the DC plan.[46] We used CalSTRS' internal assumptions regarding increases in salary and post-retirement longevity. We also assumed a minimum retirement age of 60. That is, teachers wait until age 60 to start collecting benefits if they separate earlier, and those separating at age 60 or older retire immediately. Finally, retirement benefits in all three plans are taken as a lifetime income equivalent to the CalSTRS pension retirement annuity, which includes a 2% fixed annual cost-of-living adjustment. Further details can be found in Appendix A.

For the DC plan, we used a generous set of financial and behavioral assumptions, and assumed that the employer bears no investment or longevity risk:

Asset allocation and investment returns

All funds are invested in a Target Date Fund, which gradually shifts asset allocation from mostly stocks to mostly bonds as a worker approaches retirement age. The asset allocation glide path that we modeled represents a typical private market Target Date Fund, and the resulting portfolio is aggressive, translating into relatively high returns. We calculated the geometric mean (dollar-weighted) portfolio returns based on the projected average returns and volatility.

Fees

We assumed a low "all-in" expense ratio of 0.25% (25 basis points) for combined investment and administrative costs. This is in line with the average for very large, well-managed plans, but considerably lower than the fees paid by California teachers under the current voluntary 403(b) system.

Participant behavior

In the baseline (idealized) scenario, participants exercise perfect discipline, maintaining the target asset allocation and committing none of the common mistakes made by individual investors, such as pre-retirement loans and withdrawals, chasing returns, and selling off assets during market downturns. For the less optimistic scenario, we assumed a one percentage point reduction in net returns in addition to fees. This is a conservative estimate given that an average of 1.5% of DC plan assets leak out each year, and that individual investor level returns trail the asset classes in which they are invested by an estimated 0.9 to 4 percentage points.[47]

Annuitization

In order to facilitate an apples-to-apples comparison with the DB plan, we assumed that the entire account balance at retirement is used to purchase a private insurance immediate annuity equivalent to the lifetime income stream provided by CalSTRS. In this way, we incorporate the value of the longevity insurance that is one of the key benefits of a DB pension.[48] We assumed a generous interest rate of 5%, which aligns with historical and projected long-term averages, but which significantly exceeds market interest rates in the low-interest, low-inflation financial environment that has persisted since 2008.

For the CB plan, we also assumed a generous guaranteed interest rate of 7%. The employer bears all the investment and longevity risk, but the benefit accrual pattern is similar to a 401(k). That is, a compound annual interest rate of 7% was applied to contributions. We assumed that the plan offered in-plan annuitization at a generous rate of 7%, on terms identical to the CalSTRS pension annuity. (See sidebar, "About Cash Balance Plans," for an explanation of CB plans.)

In the CalSTRS DB plan, the employer bears all investment and longevity risk, and benefit accrual is tied to number of service years, age, and final average salary. We identified the maximum benefit available to teachers upon separation—whether an employee contribution refund with interest, lump sum cash-out, or the pension annuity. Teachers who leave before vesting are eligible only for employee contribution refunds with interest. We assumed that refunds and cash-outs are immediately rolled over into the same Target Date Fund that we modeled for the DC plan.

In addition, we had to create an apples-to-apples measure of retirement benefit value across these three plans for comparison purposes. DB plans express benefits in terms of income replacement—lifetime monthly income as a percentage of final pay—while DC plans and CB plans express benefits as lump sum account balances. In addition, the same account balance will generate different income streams in a DC plan compared to the CB plan that we modeled, because the latter offers a higher interest rate on annuities.

Given that the DC plan is the only plan in which there is an immediate cash value for individual participants, we converted the DB and CB plan benefits to 401(k)-equivalent values. For each year of separation, we identified the projected annuity benefit for the DB plan, and calculated the balance that would be required to fund the same benefit through the DC plan. We repeated the same procedure for the CB plan. In the cases where an employee contribution refund or lump-sum cash-out had the greatest value, we simply used those cash values without adjustment.

Finally, we also calculated replacement rates—retirement income as a percentage of final pay.

ABOUT CASH BALANCE PLANS

Cash balance (CB) plans are retirement plans that combine some of the features of 401(k)s and DB pensions. Like traditional pensions, the employer guarantees benefits, but—unlike a traditional DB pension—those benefits are expressed as lump sum balances rather than a retirement income stream. Furthermore, most CB plans are designed to reduce cost and risk to the employer, resulting in significantly less generous guarantees compared to a traditional pension. Features include the following:

- **Notional accounts**
  Account balances represent funds promised to the employee by the employer, rather than actual assets.
- **Pooled investments**
  Investments are managed by professionals in a pooled trust rather than in individually controlled accounts.
- **Shared risk**
  Investment risk is typically spread between employers and employees, though in some cases the employer bears all the risk. In most cases, the employer guarantees a modest minimum interest rate—usually tied to a market interest index, such as Treasury bonds. Sometimes, additional credits are awarded to employee accounts depending on plan investment performance. In the public sector, the most generous plans offer a guaranteed 7% interest rate until retirement, and 7% interest on an annuity.[49]

The CB plan modeled in this study—which assumes 7% guaranteed interest and 7% interest rate on a life annuity at retirement—is significantly more generous than most real-world plans of this type, and thus presents much better outcomes for teachers than we would expect if teachers currently in CalSTRS were switched to a CB plan. We chose to illustrate the impact of a plan in which the employer bears all the risk, but in which the benefit accrual pattern is similar to a 401(k). However, in most state policy debates regarding pension benefits, CB plans and combined DB/DC hybrid plans are proposed as a way to reduce both the risk and cost to the state, translating into lower benefits.

BENEFIT MODEL FINDINGS

In order to simplify findings across entry ages and plan types, **Figure 8** provides a schematic illustration of benefit accumulation under the DC plan and the CalSTRS DB pension, and the share of current teachers that fall on each side of the crossover point between the two plans. (As we illustrate below, the CB plan follows a similar accrual pattern to the DC plan.)

When benefit accrual patterns are considered in conjunction with projected tenure, we find that six out of seven California teachers will receive higher retirement benefits from the CalSTRS DB pension than they would from an idealized DC plan, taking into account both retirement wealth and retirement income.

Three critical findings contribute to this conclusion:

1. Vested DB pension benefits exceed idealized DC plan benefits at age 51 for teachers who entered at age 25, and earlier for mid-career entrants.
2. Vested DB pension benefits exceed those of a generously structured CB plan at age 56 for teachers hired at age 25, and earlier for mid-career entrants.
3. Based on the tenure analysis described in the previous section, 86% of current teachers will stay until at least age 51—the point at which the DB pension becomes more valuable than an idealized DC plan--with vested benefits. Similarly, 79% will stay until at least age 56, when the DB pension exceeds a generous CB plan or later with vested benefits.

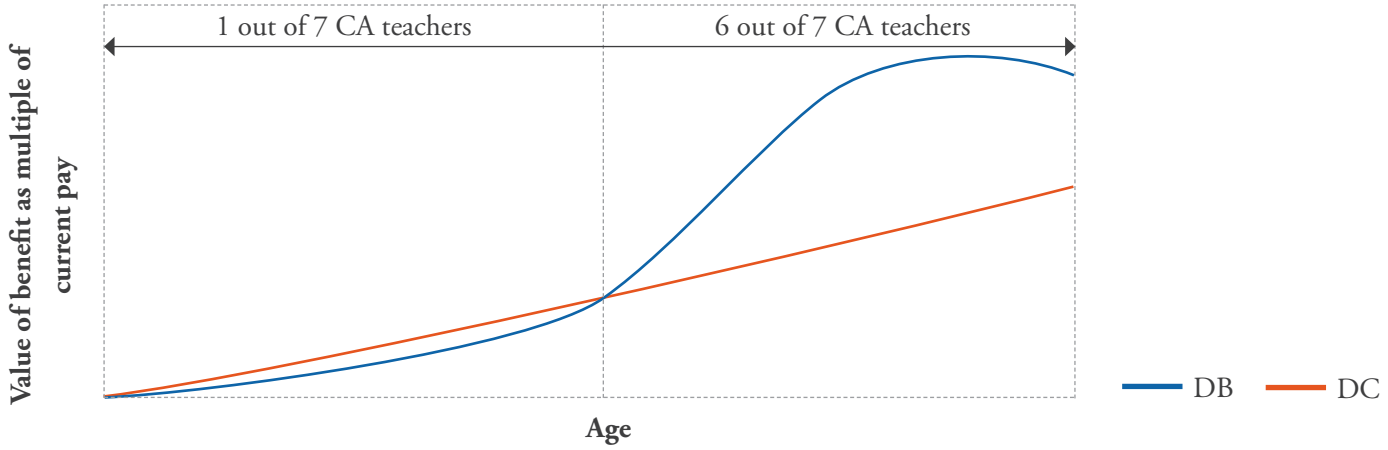
Under the CalSTRS pension, like most plans of its kind, teachers in the beginning of their career accumulate benefits more slowly than they would in a DC plan. Pension accrual begins to accelerate mid-career—e.g., during the early 40s for someone starting at age 25 or 30—so that the annual rate of gain in benefit value exceeds that of the DC plan. That is, the slope of the DB benefit curve becomes steeper than the slope of the DC benefit curve. The total accumulated benefit for the DB plan surpasses the DC plan at age 51 for age 25 hires, and somewhat earlier for those hired at later ages.

Finally, after age 65—the age at which the pension benefit multiplier peaks—the growth of pension benefits as a multiple of current pay flattens out and in some cases becomes negative. Although benefits continue to grow in absolute terms in tandem with salary growth and accumulated service years, this is outstripped by the decrease in the number of years of benefit payments.

As **Figure 8** shows, DC benefits appear to accrue at a steady pace throughout the career. However, as we demonstrate elsewhere in this study, the retirement income purchasing power of each year's contributions is greatest for young workers and smallest for those on the cusp of retirement, even when the contribution rate remains fixed.

Figure 8

Benefit Accumulation under CalSTRS Defined Benefit Pension vs. Idealized Defined Contribution Plan



Benefit accrual comparisons for female teachers entering at age 25, 35, and 45 are illustrated in **Figure 9**, **Figure 10**, and **Figure 11**, respectively. The value of benefits as a multiple of current salary is represented for the DB pension, the idealized DC plan, and the CB plan. In addition, "DC-EE" represents the employee share of retirement contributions, assuming investment in a DC plan.

Data for entry ages in five-year increments from 25 to 45, for both men and women, can be found in Appendix B. While men—who make up 28% of CalSTRS active membership—can expect slightly higher retirement income from a 401(k) compared to women because the former has shorter life expectancy, the fundamental findings remain the same.

Comparing the three charts, three patterns emerge:

- The CalSTRS DB pension becomes more valuable than the idealized DC plan at age 51 for teachers hired at age 25. This transition occurs at age 49 for those hired at age 35 and at age 50 for those hired at age 45.
- The CalSTRS DB pension becomes more valuable than the CB plan somewhat later—at age 56 for those hired at age 25.
- After the crossover points, the DB plan offers significantly higher benefits compared to the idealized DC plan during the years that current teachers are most likely to exit.
- The break-even point on employee contributions—when CalSTRS pension benefits equal or exceed the account value that would have been accrued in the idealized 401(k) if employee contributions were invested in the DC plan—occurs after 20 years of service for age 25 hires, nine years of service for 35-year-old hires, and five years of service for 45-year-old hires.

Figure 9

Value of Benefit—Defined Benefit, Defined Contribution, and Cash Balance Plans

Entry Age 25—Female

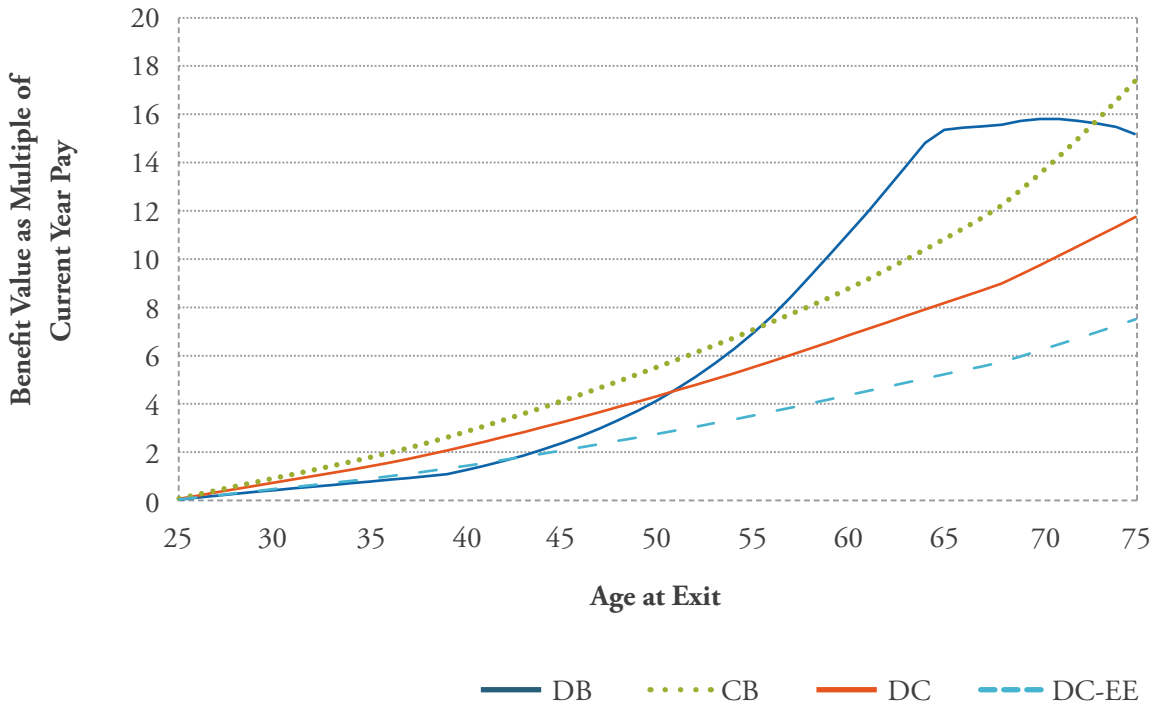


Figure 10

Value of Benefit – Defined Benefit, Defined Contribution, and Cash Balance Plans

Entry Age 35—Female

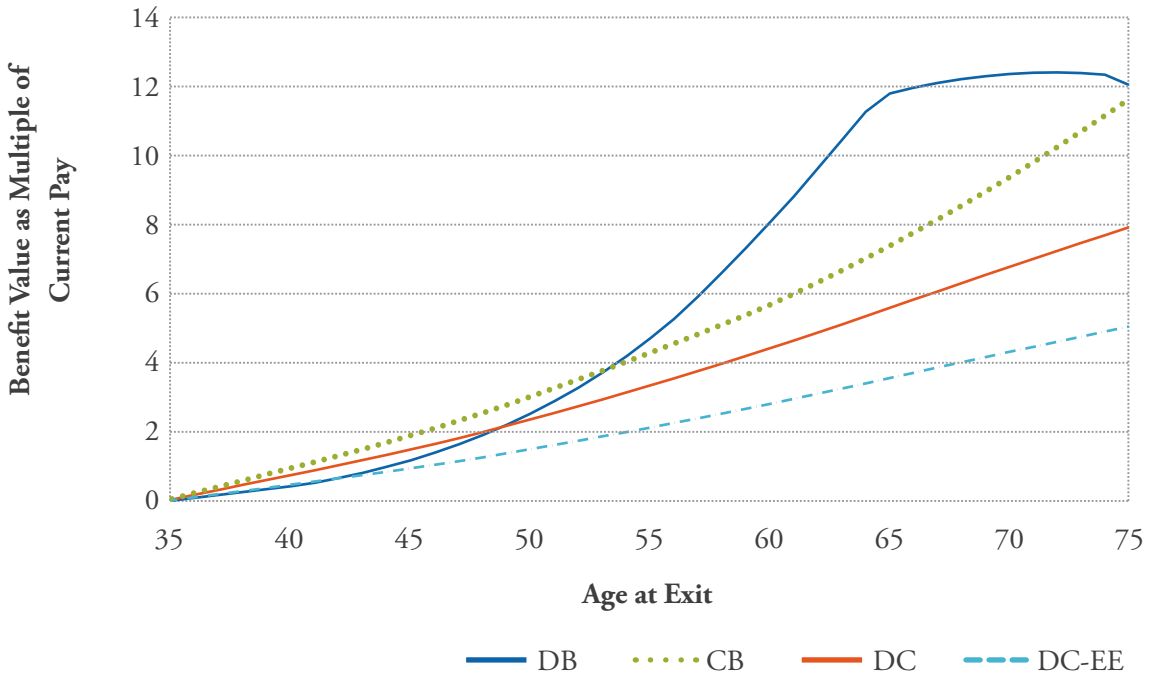


Figure 11

Value of Benefit – Defined Benefit, Defined Contribution, and Cash Balance Plans

Entry Age 45—Female

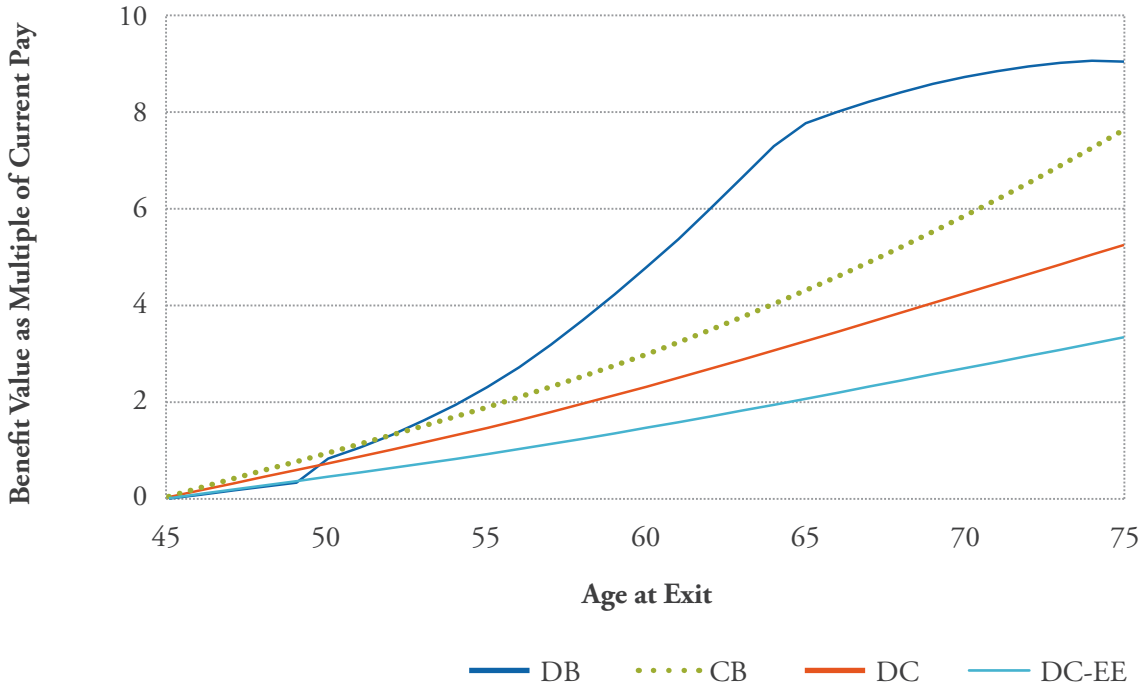


Table 2 summarizes the findings for entry ages 25 to 45 in five-year increments, indicating the age at which the DB plan value exceeds the value of the DC account, and the age at which the DB value exceeds the benefit that would be earned if employees invested their share of contributions in a DC plan. Data are provided for the baseline scenario which assumes that investors gain full projected market returns in the idealized DC plan, as well as a more realistic scenario in which typical individual behavior leads to 1% reduction of annual investment returns due to a combination of pre-retirement withdrawals and adverse investment behavior.

As expected for a traditional pension, younger entrants have to work longer than older entrants until they receive benefits under the CalSTRS DB pension that are greater than what they could earn in an idealized DC plan. Those who start at age 30—close to the average age for new teacher hires—need to work 13 years to recover the value of their contributions and 21 years to surpass potential benefits in a DC plan, *assuming that participants place no additional value on the employer guarantee offered by a traditional pension.* But the greater the value placed by teachers on guaranteed benefits relative to the income provided by a volatile DC plan, the shorter the break-even horizon.

Adding realistic individual savings and investment behavior reduces the number of years that it takes for the DB plan to "break even" with the DC plan, to age 47 for teachers hired at age 25. This also reduces the number of years to recover the full value of their contributions vis-à-vis the DC plan to 13. Again, this assumes that teachers place no value on the guaranteed nature of DB pension benefits.

Table 2

Age When Value of CalSTRS Defined Benefit Pension Exceeds Value of Alternative Plans for Female Teachers, by Entry Age

	ENTRY AGE				
	25	**30**	**35**	**40**	**45**
DC Plan					
Baseline	51	51	49	49	50
Realistic (1% drag on returns from individual investor behavior)	47	48	46	49	50
DC Plan—EE Contributions Only					
Baseline	43	43	42	45	50
Realistic (1% drag on returns from individual investor behavior)	38	39	40	45	50
CB Plan	56	55	54	53	52

Note: *Women make up 72% of CalSTRS active membership. For entry ages 25, 30, and 35, DB value exceeds DC and CB values one year later for male teachers than for female teachers. For entry ages 40 and older, the crossover point is the same for both genders.*

Based on age 25 cutoffs for when the DB value exceeds the value of alternate plans, 86% of active teachers will earn greater retirement benefits from the CalSTRS DB pension than they could expect from an ideal DC plan (**Figure 12**). Similarly, 79% of active teachers are better off with the CalSTRS pension than with a generous CB plan.

Figure 12

Share of California Teachers Who Are Better Off With CalSTRS Defined Benefit Pension

86%

Compared to Idealized Defined Contribution Plan

79%

Compared to Generous Cash Balance Plan

Comparing Retirement Income Outcomes

Table 3 quantifies the magnitude of the difference in replacement rates—benefits as a percentage of final single year pay—for various career trajectories, assuming that everyone begins collecting retirement benefits at age 60.[50] Teachers hired at age 25 who withdraw after 30 years at age 55 and begin collecting DB pension benefits at age 60 will have 40% of their pre-retirement income replaced by CalSTRS, assuming that they found another job with the exact same pay trajectory. Teachers hired at age 30 who withdraw after 30 years and immediately collect their pension at age 60 will have a replacement rate of 50% from CalSTRS. While there is indeed a disparity between the two groups of teachers, even teachers who started at age 25 and withdraw at age 55 would receive pension benefits from CalSTRS that are 21% greater than the benefit they could expect to earn under the DC plan (40% versus 33%). Furthermore, the CalSTRS pension benefit is guaranteed, while the DC plan benefit is not.

Moreover, for the educators who account for the vast majority of teaching positions, the DB plan offers a strong advantage.

Even teachers who started at age 25 and withdraw at age 55 would receive pension benefits from CalSTRS that are 21% greater than the benefit they could expect to earn under the DC plan.

Table 3

Income Replacement at Age 60 for CalSTRS Defined Benefit Pension and Idealized Defined Contribution Plan

			REPLACEMENT RATES	
Entry Age	Exit Age	# Svce Yrs	DB	DC
25	30	5	3%	**6%**
25	45	20	17%	**23%**
25	55	30	**40%**	33%
25	60	35	**63%**	38%
30	40	10	6%	**11%**
30	45	15	12%	**17%**
30	55	25	**34%**	28%
30	60	30	**50%**	31%
40	45	5	3%	**5%**
40	50	10	**10%**	9%
40	55	15	**20%**	14%
40	60	20	**34%**	18%
45	50	5	4%	4%
45	55	10	**13%**	8%
45	60	15	**25%**	12%

Highlighted cells indicate groups that make up part of the 86% of active teachers who will leave at age 51 or later and will receive higher income from DB than DC.

Note: *Income replacement rates are annual retirement income as a percentage of final year's salary, assuming uniform pay growth for all teachers. In cases where cashing out of CalSTRS provides higher value than the pension benefit, such as younger hires leaving soon after vesting, the lump sum is assumed to be rolled over into a DC plan. DC account balances at age 60 are converted to an immediate life annuity with 2% simple COLA, similar to the CalSTRS pension benefit. The greater replacement rate value between DB and DC is bolded for each career type.*

Notably, given that California teachers do not receive Social Security, the replacement rates in **Table 3** for full career teachers fall short of the 70% to 85% recommended by financial experts to maintain their standard of living.[51] Thus the California teacher retirement benefit system requires teachers to accumulate substantial assets on their own, through the voluntary DC plan, private savings, or other employment.

ACCOUNTING FOR INVESTMENT RISK AND MARKET VOLATILITY

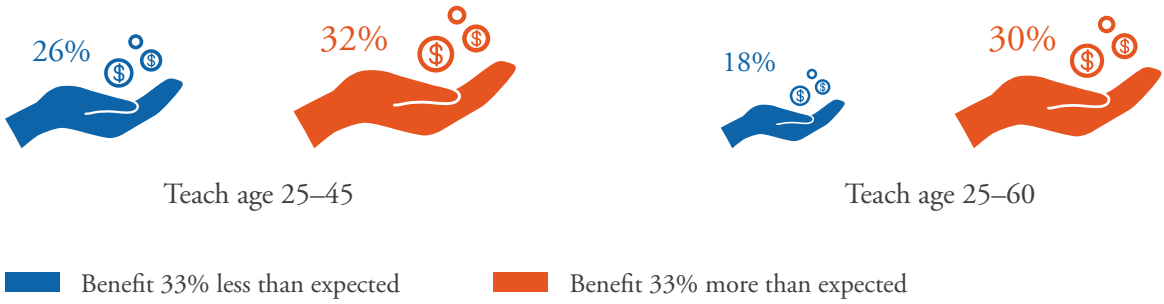
The benefit projections presented above assumed that there was no investment risk or volatility in the DC plan, that is, that every teacher experienced the same investment returns for each asset class. But in the real world, retirement income outcomes vary wildly with financial market swings. In order to measure investment risk and variability of benefits in the DC plan, we ran Monte Carlo simulations of investment returns and applied them to the Target Date Fund portfolio. Monte Carlo simulations involve using statistical parameters from a probability distribution—in this case, the average return and volatility for each asset class such as stocks and bonds, and the correlations between asset class returns—and then drawing a large number of random samples based on these parameters to see which outcomes are the most likely.

The results demonstrate that DC plans entail a wide dispersion of outcomes, such that there are large arbitrary differences among teachers with the exact same career profile. Sample results are shown for 25-year-old hires for two different scenarios in **Figure 13**. In the benefit modeling above, teachers who begin at age 25, exit at age 45, and wait until age 60 to retire are theoretically better off in the idealized DC plan. Our simulations show that they might realize even greater upside: there is a one-in-three chance (32%) that they will have retirement income that is one-third more than expected. On the downside, however, **there is a one-in-four chance that a teacher who starts at age 25 and leaves after 20 years will see a replacement rate of 15% or less from an idealized DC plan. This is less than the 17% guaranteed replacement rate currently provided by the CalSTRS DB pension for this teacher.**

For teachers who start at age 25 and stay until age 60 and retire immediately, the chance of reduced retirement income is smaller (18% chance of having one-third less retirement income than expected from the DC plan). They also have a 30% chance of receiving retirement benefits that are one-third higher than expected. However, for these teachers the guaranteed retirement benefit from CalSTRS is 64% greater (60% replacement rate from DB versus 37% replacement rate expected from DC).[52]

Figure 13

Retirement Income Volatility in a 401(k) Plan



Note: *Simulations based on a typical Target Date Fund and fixed contribution rate. Assume teachers retire at age 60.*

V. CONCLUSION

> Ultimately, switching to an account-based retirement system—such as a 401(k) or cash balance plan—would reduce the overall retirement incomes of California teachers.

Recent studies that pit younger teachers against older teachers, and conclude that a better way to provide retirement benefits is through an account-based retirement plan, inaccurately represent the CalSTRS system on several counts.

First, it is simply misleading to use young, new-hire cohorts to represent the teaching workforce as a whole, without accounting for active teachers of all ages and experience levels. As this study shows, 75% of current California teachers will serve 20 or more years before they leave, and 49% of the total will serve 30 years or more. In addition, mid-career teachers, who stand to particularly benefit from a traditional pension, make up a significant share of new hires. The median projected age of separation or retirement for current teachers is 61.

Early career turnover and retention are serious educational workforce policy concerns that correlate with low compensation and inadequate institutional support, not pension benefit structure. Pitting teachers against each other makes for divisive politics, and does little to address structural challenges to public education that are rooted in the deep historical currents of socioeconomic inequality and deteriorating commitment to public funding for education. Furthermore, the CalSTRS DB pension is more likely to contribute to retention than an account-based plan such as a a defined contribution (DC) plan like a 401(k) or a cash balance (CB) plan.

Second, the statement that younger teachers are subsidizing the benefits of older teachers reflects a misunderstanding of pension funding practice—especially when full-career workers make up half of the California teaching workforce. To the extent that redistribution takes place within a final average salary DB pension, it is more accurate to say that the employer contribution portion of the plan's normal cost is allocated toward those who stay a long time within the same hire cohort. In addition, the DB pension provides all vested employees with guaranteed income as the main benefit, and empirical evidence in states that provide a choice between plan types suggests new hire teachers value a guaranteed pension over 401(k)-style and hybrid plans.

Ultimately, switching to an account-based retirement system—such as a 401(k) or cash balance plan—would reduce the overall retirement incomes of California teachers. Switching to a DC or CB plan would increase retirement benefits for teachers who account for a small portion of teaching positions, while causing sharp benefit decreases for the large majority responsible for educational labor (six out of seven for DC and four out of five for CB). A more equitable solution would be to inflation-index final pay for benefit calculation purposes, in order to mitigate the erosion in benefit currently experienced by those who leave before retirement age. Finally, given that CalSTRS members are not covered by Social Security, switching to a 401(k)-style plan would also mean the loss of teachers' only source of secure retirement income, with negative consequences for teachers across the age spectrum and added cost to societal safety nets for the low-income, elderly population.

[1] CalSTRS, 2015, "Fast Facts: Fiscal Year Ended June 30, 2014," CalSTRS, Sacramento, CA.

[2] See for example R.W. Johnson and B. Southgate, 2015 (Apr.), "Are California Teacher Pensions Distributed Fairly?," Urban Institute, Washinton, DC, http://www.urban.org/sites/default/files/alfresco/publication-pdfs/2000172-Are-California-Teacher-Pensions-Distributed-Fairly.pdf; J. McGee and M. Winters, 2013 (Sep), "Better Pay, Fairer Pensions: Reforming Teacher Compensation," Manhattan Institute, http://bellwethereducation.org/sites/default/files/BW_PensionPaper_031314.pdf; C. Aldeman and A.J. Rotherham, 2014, "Friends without Benefits: How States Systematically Shortchange Teachers' Retirement and Threaten Their Retirement Security," Bellwether Education Partners, http://bellwethereducation.org/sites/default/files/BW_PensionPaper_031314.pdf.

[3] Johnson & Southgate, op cit.; J. McGee and M. A. Winters, "Modernizing Teacher Pensions," *National Review*, n22, 2015, http://www.nationalaffairs.com/publications/detail/modernizing-teacher-pensions.

[4] R. Hanna and K. Pennington, 2015 (Jan. 8), "Despite Reports to the Contrary, New Teachers Are Staying in Their Jobs Longer," Center for American Progress, https://www.americanprogress.org/issues/education/news/2015/01/08/103421/despite-reports-to-the-contrary-new-teachers-are-staying-in-their-jobs-longer/.

[5] CalSTRS, n.d., "Retirement Benefits," http://www.calstrs.com/retirement-benefits, accessed November 5, 2015.

[6] Ibid.

[7] This portion of the total contribution rate excludes sick leave.

[8] CalSTRS, 2015 (Mar. 6), "CalSTRS Valuation Fact Sheet," http://www.calstrs.com/sites/main/files/file-attachments/2014_valuation_fact_sheet.pdf.

[9] CalSTRS, n.d., "CalSTRS 2014 Funding Plan: Overview of AB 1469," http://www.calstrs.com/sites/main/files/file-attachments/calstrs_2014_funding_plan.pdf, accessed November 5, 2015.

[10] Ibid.

[11] CalSTRS, n.d., "Defined Benefit Supplement Program," http://www.calstrs.com/defined-benefit-supplement-program, accessed November 5, 2015. Depending on the school district, part-time and temporary teachers can choose whether to contribute to a second cash balance plan operated by CalSTRS called the Cash Balance Benefit Program, Social Security, or the DB pension. The range of choices depends on the school district. Employee contributions, generally 4%, are matched by employers. CalSTRS, "Cash Balance Benefit Program," http://www.calstrs.com/cash-balance-benefit-program, accessed November 5, 2015.

[12] R.L Clark and D.P. Richardson, 2010 (Nov.), "Who's Watching the Door? How Controlling Provider Access Can Improve K–12 Teacher Retirement Outcomes," TIAA-CREF Institute Research Dialogue, no. 98.

[13] In 1954 the Social Security program was amended to make coverage available to public employees covered by a state plan, who were previously excluded from the program. The choice was up to the states, subject to a majority vote of the members of the plan. In 1955 the California Teachers Association held an every-member vote that resulted in the rejection of Social Security.

[14] A. Munnell, 2005 (Jun.), "Mandatory Social Security Coverage of State and Local Workers: A Perennial Hot Button," Issue in Brief No. 32, Center for Retirement Research at Boston College, Chestnut Hill, MA, http://crr.bc.edu/wp-content/uploads/2005/06/ib_32.pdf.

[15] Social Security Administration GPO Calculator, https://www.ssa.gov/planners/retire/gpo-calc.html.

[16] CalSTRS, "Fast Facts for Fiscal Year Ended June 30, 2014," January 2015, http://www.calstrs.com/sites/main/files/file-attachments/fastfacts_2014.pdf.

[17] J. Hacker, 2008, *The Great Risk Shift: The New Economic Insecurity and the Decline of the American Dream*, Oxford University Press, Oxford & New York; A. Munnell, 2004, *Coming Up Short: The Challenge of 401(k) Plans*, Brookings Institution Press, Washington, DC.

[18] R. Merton, 2014, "The Crisis in Retirement Planning," *Harvard Business Review* v92n7/8, pp. 43–50 .

[19] F. Porell and D. Oakley, 2012, "The Pension Factor 2012: The Role of Pensions in Reducing Elder Economic Hardships," National Institute on Retirement Security, Washington, DC, http://www.nirsonline.org/storage/nirs/documents/Pension%20Factor%202012/pensionfactor2012_final.pdf.

[20] Hacker, op. cit.; N. Sabadish and M. Morrissey, 2013 (Sep.), "Retirement Inequality Chartbook," Economic Policy Institute, Washington, DC, http://www.epi.org/publication/retirement-inequality-chartbook/; R. Hiltonsmith, 2010, "The Failure of the 401(k): How Individual Retirement Plans are a Costly Gamble for American Workers," Demos, New York, NY; K. Miller, D. Madland, and C. Weller, 2015 (Jan.), "The Reality of the Retirement Crisis," Center for American Progress, Washington, DC, https://cdn.americanprogress.org/wp-content/uploads/2015/01/RetirementCrisis1.pdf.

[21] See for example Merton, op cit.

[22] Hanna & Pennington, op cit.

[23] National Commission on Teaching and America's Future, 2007, "The High Cost of Teacher Turnover," http://nctaf.org/wp-content/uploads/NCTAFCostofTeacherTurnoverpolicybrief.pdf

[24] C. Weller, 2011 (Sep.), "Buyer Beware: The Risks to Teacher Effectiveness from Changing Retirement Benefits," Center for American Progress, Washington, DC, https://cdn.americanprogress.org/wp-content/uploads/issues/2011/09/pdf/buyer_beware.pdf

[25] As institutional investors that can tolerate less liquid investments, DB pensions also have access to alternate investments—such as private equity—that generate higher returns than public equities.

[26] See W.B. Fornia and N. Rhee, 2014 (Dec.), "Still a Better Bang for the Buck: Update on the Economic Efficiencies of Pensions," National Institute on Retirement Security, Washington, DC, http://www.nirsonline.org/storage/nirs/documents/Still%20a%20Better%20Bang/bangforbuck_2014.pdf.

[27] Fornia & Rhee, op cit.; Teacher Retirement System of Texas (TRS), 2012, "Pension Benefit Design Study," TRS, Houston, TX; Colorado Office of the Auditor/Gabriel Roeder Smith, 2015 (Jun.), Colorado Public Employees' Retirement Association Hybrid Defined Benefit Plan," GRS, Denver, CO.

[28] Two such reports include J. VanDerhei, 2015 (Oct.), "How Does the Probability of a "Successful" Retirement Differ Between Participants in Final-Average Defined Benefit Plans and Voluntary Enrollment 401(k) Plans?," EBRI Notes v36n10, pp. 9–23, https://www.ebri.org/pdf/notespdf/EBRI_Notes_10_Oct15_HlthSvgs_DB-DC.pdf; a report published by TIAA-CREF Institute in November 2013 titled "Equivalent Cost for Equivalent Benefits: Primary DC Plans in the Public Sector," which was pulled from their website following criticism about the report's flawed assumptions.

[29] D. Goldhaber and C. Grout, 2014, "Which Plan to Choose? The Determinants of Pension System Choice for Public School Teachers," CEDR Working Paper 2014-1, University of Washington, Seattle, WA,; and D. Goldhaber and C. Grout, 2014, "Finding Common Ground In Pension Reform: Lessons from the Washington State Pension System," Bellweather Education Partners, Sudbury, MA.

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[31] Oakley and Boivie, op cit.

[32] Oakley and Boivie, op cit.

[33] National Institute on Retirement Security, 2014 (Feb.), "Case Studies of State Pension Plans that Switched to Defined Contribution Plans," National Institute on Retirement Security, Washington, DC.

[34] This study does not distinguish between part-time and full-time service for the purposes of determining final tenure. For instance, a half time career over 30 years is still considered a 30 year career. However, our subsequent analysis of how teachers fare under the DB plan compared to alternative plans takes into account longer vesting for part-time teachers.

[35] Authors' analysis of U.S. Census Bureau/U.S. Bureau of Labor Statistics, Current Population Survey, from S. Flood, M. King, S. Ruggles, and J.R. Warren, 2014, Integrated Public Use Microdata Series, Current Population Survey: Version 4.0. [Machine-readable database], University of Minnesota, Minneapolis, MN.

[36] R. Ingersoll, L. Merrill, and D. Stuckey, 2014, "Seven Trends: The Transformation of the Teaching Force," CPRE Report #RR-80, Consortium for Policy Research in Education, Philadelphia, PA, http://www.cpre.org/sites/default/files/workingpapers/1506_7trendsapril2014.pdf.

[37] U.S. Department of Education, 2014, "2014 Title II Report," https://title2.ed.gov/Public/Home.aspx.

[38] See California Commission on Teacher Credentialing, 2014 (Oct.), "Annual Report Card: California Teacher Preparation Programs for the Academic Year 2012-2013 as Required by Title II of the Higher Education Act," http://www.ctc.ca.gov/commission/agendas/2014-10/2014-10-3d.pdf.

[39] We received detailed actuarial assumptions from Milliman based on the last experience study. Summary findings are available at N. Olleman, N. Collier, and J.D. Sorensen, 2012 (Feb. 12), "California State Teachers' Retirement System Experience Analysis, July 1, 2006 – June 30, 2010," Milliman, Seattle, WA, http://www.calstrs.com/sites/main/files/file-attachments/actuarial_experience_analysis_2010.pdf.

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[42] K.C. Hathaway, 2013(May), "Job openings continue to grow in 2012, hires and separations less so," *Monthly Labor Review*, pp.17–35, Table 6, http://www.bls.gov/opub/mlr/2013/05/art2full.pdf.

[43] National Center for Education Statistics, Schools & Staffing Survey, https://nces.ed.gov/surveys/sass/.

[44] Ingersoll, Merrill & Stuckey, op cit.

[45] A.H. Munnell, J.P. Aubrey, J. Hurwitz and L. Quinby, 2012 (Dec.), "How Retirement Provisions Affect Tenure of State and Local Workers," State and Local Pensions # 27, Center for Retirement Research at Boston College, Chestnut Hill, MA.

[46] Employee contributions were lower than 9.2% for the first two years, consistent with CalSTRS' benefit projections which reflect the phasing in of member rate increases starting 2014.

[47] See R. Kinnel, 2014 (Feb. 27), "Mind the Gap 2014," Morningstar Advisor, http://www.morningstar.com/advisor/t/88015528/mind-the-gap-2014.htm. For an overview of research on individual investor behavior and under-performance, see B. Barber and T. Odean, 2011 (Sep.). "The Behavior of Individual Investors," Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1872211. See also N. Tang, O. Mitchell, and S. Utkus, 2011, "Trading in 401(k) Plans During the Financial Crisis," PRC Working Paper 2011-11, Pension Research Council, Philadelphia, PA.

[48] If an individual were to forgo the annuity, they would still have to pace their annual withdrawals to last well past average life expectancy, or else run a large risk of running out of money.

[49] Texas County and District Retirement System offers 7% guaranteed interest during the accumulation phase and a 7% life annuity during the payout phase. Pew Charitable Trusts, 2014 (Feb.), "Public Cash Balance Plans: A Primer," Pew Charitable Trusts, Washinton, DC.

[50] We use the final (and highest) single year of salary as the denominator. As a result, our replacement rate estimates are lower than those that would result if we used the 2% at 62 benefit multipliers on the highest three years of pay, as CalSTRS does for teachers hired after 2012.

[51] Aon Consulting, 2008, "Replacement Ratio Study: A Measurement Tool for Retirement Planning," http://www.aon.com/about-aon/intellectual-capital/attachments/human-capital-consulting/RRStudy070308.pdf.

[52] There is also a small chance that teachers who vest and stay until at least age 51—the cutoff after which CalSTRS DB pension benefits exceed the expected value from the idealized DC plan—might be better off the DC plan under favorable market conditions. But it is doubtful that such teachers would trade their guaranteed benefits for a chance to "win big" in the market.

APPENDIX A: METHODOLOGY

BENEFIT MODELING

In order to compare Defined Benefit (DB) plans, Defined Contribution (DC) plans and Cash Balance (CB) plans, it is necessary to analyze them either in terms of retirement benefits provided or the value of those benefits. DC plans are "defined" in terms of the contribution made to a plan each year. This is the value of the pension benefit because at retirement, the DC account is used to purchase or pay oneself a retirement benefit. As an example, the annual DC contribution is 14.42% (to be discussed below) of pay, and the account balance grows each year with investment income plus annual contributions.

DB plans are "defined" in terms of benefits provided. For example, the annual benefit earned for a year of service might be 2% of average pay.

Because DB plans are defined in terms of benefits and DC plans are defined in terms of contributions, it is not straightforward to compare the two. Either a DB plan benefit must be converted into a present value or a DC plan account value must be converted into an annual benefit. Fortunately, actuarial science is designed to make such conversions. CB plans are best analyzed by converting the cash balance into an annual pension benefit, then converting that benefit back into a present value. Depending on how the CB plan is designed, the actual cash balance might be higher or lower than the necessary DC account balance necessary to purchase the annuity under the CB plan.

This research analyzes DB, DC, and CB both on an annual benefit basis and on a present value basis. The actuarial methodology is as follows.

General Projection Model Approach

Our analysis examined ten illustrative newly hired teachers. They were both male and female, hired at ages 25, 30, 35, 40 and 45. We used Milliman's (the CalSTRS consulting actuary) assumptions for increases in salary and for post-retirement longevity. These actuarial assumptions are identified later in this appendix.

For DC benefits, the accounts are assumed to grow at investment return rates based on various asset allocations which vary by age. Gross returns were decreased by 0.25% for administrative expenses. The annual DC and CB total contributions were calculated to be 14.42% of pay. This is based on the normal cost of the retirement benefits and withdrawal benefits provided under CalSTRS. The CB balance is assumed to grow with 7% investment credit each year.

DB Benefit Amounts

The CalSTRS DB plan provides retirement benefits under a formula. Our analysis simply applies this formula to the demographic characteristics of various illustrative participants. For illustrative members who terminate after age 60, the methodology is to simply calculate the benefit payable at retirement (termination). The CalSTRS formula at age 62 for those hired on or after January 1, 2013 is 2% of the highest three-year average compensation. For example, for someone hired at 25 who retires at 62 would have a pension benefit of 74% x their average compensation.

DC Values

The other key value which is calculated in a straightforward manner is the account balance under a DC plan. As discussed above, our methodology is simply to bring forward the account balance each year with anticipated investment return and additional 14.42% of pay contributions.

DC Benefit Amounts

Because DB and DC are defined in terms of benefits and contributions, respectively, it is necessary to actuarially translate account values into benefit amounts or benefit amounts into account values. To convert a DC account value into a benefit amount, we assumed that the account balance would be annuitized based on a 5% discount rate and the same CalSTRS specific mortality table upon which the normal cost was based. For termination dates prior to age 60, we assumed that the balance continued to grow at the specified interest rates and was converted at age 60. For termination ages 60 and later, we assumed that they were retiring immediately.

CB Benefit Amounts

The cash balance plan we modeled has the following characteristics:

- Cash Balance notional account accruals of 14.42% of pay, to match the DC contribution.
- Annual crediting rate of 7% on cash balance notional account.
- Conversion to annuity payment based on 7% and unisex mortality table based on CalSTRS-specific assumptions and approximately 71.7% female and 28.3% male, which matches the current CalSTRS active teacher population.

Based on these parameters, the CB account balance at the year of termination is projected forward to age 60 if under 60. Like DC, retirement is assumed to take place at the later of the date of termination or age 60. The CB account is then converted to an actuarially equivalent annuity as described above.

CB Values

To determine the value of future benefits under a CB plan, we did not simply use the CB notional account balance. Because of the favorable annuity conversion features under our CB plan, the value of future benefits is generally higher than the actual CB notional account balance. To calculate the value of the CB plan, the annuity determined above was converted back to a present value using the same methodology as used in converting DC present values (account values) into lifetime annuity benefits.

DB Values

Like CB, we calculated the value of the future DB annuity benefits based on the annuity conversion factors necessary to convert DC balances into lifetime annuity payments: 5% returns and CalSTRS-specific sex-distinct mortality tables.

Benefit Forms

In all calculations, we assumed the benefits were payable as a single life annuity with cost-of-living-adjustments (COLAs) similar to the CalSTRS DB procedure. The COLA is a 2% simple interest increase on September 1 following the first anniversary of retirement, applied to all continuing allowances.

STOCHASTIC ANALYSIS

At the authors' request, Milliman (the CalSTRS consulting actuary) ran 1,000 return simulations for each of the asset classes in the Target Date Fund (TDF) portfolio, spanning 50 years. The mean returns, standard deviations, and correlations between asset classes were based on the firm's latest capital market assumptions, and are generally consistent with the assumptions used by the CalSTRS pension plan.

We used the stochastic returns to simulate 1,000 portfolio returns for the DC plan using the TDF asset allocation glide path. We then calculated the median, 75th percentile, and 25th percentile outcomes for key entry and exit ages as an indication of investment risk, and of the potential inequality in outcomes across cohorts.

ACTUARIAL ASSUMPTIONS

Investment Return Assumptions

DB Plan net investment return: 7.5%

DC Plan gross investment return: Schedule based on asset allocation, which is based on hypothetical target date fund (TDF) based on age of member. The TDF asset allocation glidepath reflects a a composite of Vanguard and Fidelity target date fund series. Portfolio geometric mean returns were calculated from capital market assumptions provided by Milliman, consisting of arithemetic mean returns, volatility, and correlations between asset classes.

Sample rates are:

Age	Rate of Gross Investment Return
Age 36 and younger	7.55%
Age 41	7.47%
Age 46	7.36%
Age 51	7.16%
Age 56	6.92%
Age 61	6.67%
Age 66	6.30%
Age 71	5.86%

The DC net investment return rates are reduced from the gross rates shown above by 25 basis points (0.25%) to reflect efficient DC expenses.

Mortality Assumptions

Motality assumptions are used for the conversion of an account value to annuity benefit. These are based on the CalSTRS standard mortality tables for retirees, which is based on historical experience studies. For cash balance plan conversions, which—unlike insurance companies—cannot vary the rate based on sex, we assume that the mortality rates were weighted 71.7% female and 28.3% male. The following table shows representative mortality rates:

Age	Male Annual Mortality Rate	Female Annual Mortality Rate
60	0.24%	0.18%
70	0.91%	0.68%
80	2.82%	2.14%
90	11.06%	8.82%
100	28.52%	21.84%
110	40.00%	33.74%
120	100.00%	40.00%

Salary Growth Assumptions

Salaries are assumed to grow at 3.75% (inflation plus 0.75%), plus a merit component based on age at hire and years of service. The merit based salary components are illustrated in the table below:

Year	Age at Hire					
	Under 25	25–29	30–34	35–39	40–44	45 & up
1	5.6%	5.3%	5.1%	4.8%	4.8%	3.5%
2	5.6%	5.1%	4.9%	4.7%	4.7%	3.3%
3	5.6%	5.0%	4.8%	4.6%	4.6%	3.0%
4	5.5%	4.8%	4.6%	4.4%	4.4%	2.9%
5	5.5%	4.8%	4.5%	3.8%	3.8%	2.6%
10	3.2%	3.0%	2.7%	2.3%	2.2%	1.6%
15	1.5%	1.5%	1.4%	1.1%	1.1%	0.8%
20	1.3%	1.1%	1.1%	0.8%	0.8%	0.6%
25	1.1%	0.9%	0.8%	0.5%	0.5%	NA
30	0.9%	0.7%	0.6%	0.5%	NA	NA
35	0.8%	0.7%	0.6%	NA	NA	NA
40	0.8%	0.6%	NA	NA	NA	NA
45	0.8%	NA	NA	NA	NA	NA

For example, a teacher hired at age 27 is assumed to have a salary increase of 3.75%+5.3%=9.05% in the first year, 8.85% in the second year, and 6.75% in the tenth year. Note that the underlying annual inflation rate is 3.00%, which is the same rate that is used to develop the nominal investment return rates of 7.50% for the DB plan and varying rates for the DC plan. The corresponding real salary increases are thus 6.05%, 5.85%, and 3.75%, respectively.

Other Actuarial Assumptions

In addition to the assumptions identified above, CalSTRS uses a variety of actuarial assumptions in order to determine the total Normal Cost for the DB plan. These are disclosed in various CalSTRS actuarial reports and while not explicitly used in our analysis, are fundamental in CalSTRS determination of 14.42% as the normal cost for retirement and withdrawal benefits, which is used as our DC and CB contribution.

APPENDIX B: SUPPLEMENTAL TABLES

PROJECTED BENEFIT VALUE AS MULTIPLE OF CURRENT SALARY

(All values are in DC-equivalent terms. Uniform contribution rate across plan types.)

ENTRY AGE 25

	FEMALE				MALE			
Age	DB	DC	CB	DC-EE	DB	DC	CB	DC-EE
25.5	0.04	0.06	0.08	0.04	0.04	0.06	0.07	0.04
26.5	0.12	0.20	0.25	0.13	0.12	0.20	0.24	0.13
27.5	0.20	0.34	0.42	0.22	0.20	0.34	0.41	0.22
28.5	0.28	0.48	0.59	0.31	0.28	0.48	0.57	0.31
29.5	0.36	0.61	0.76	0.39	0.36	0.61	0.73	0.39
30.5	0.43	0.74	0.93	0.47	0.43	0.74	0.89	0.47
31.5	0.50	0.87	1.09	0.56	0.50	0.87	1.05	0.56
32.5	0.57	1.01	1.26	0.64	0.57	1.01	1.21	0.64
33.5	0.64	1.14	1.43	0.73	0.64	1.14	1.37	0.73
34.5	0.71	1.28	1.60	0.82	0.71	1.28	1.54	0.82
35.5	0.79	1.42	1.79	0.91	0.79	1.42	1.71	0.91
36.5	0.86	1.57	1.98	1.00	0.86	1.57	1.90	1.00
37.5	0.93	1.73	2.18	1.10	0.93	1.73	2.09	1.10
38.5	1.01	1.90	2.39	1.21	1.01	1.90	2.29	1.21
39.5	1.10	2.07	2.62	1.32	1.10	2.07	2.51	1.32
40.5	1.26	2.26	2.85	1.44	1.21	2.26	2.73	1.44
41.5	1.44	2.44	3.09	1.56	1.38	2.44	2.97	1.56
42.5	1.64	2.63	3.34	1.68	1.57	2.63	3.20	1.68
43.5	1.86	2.83	3.59	1.81	1.78	2.83	3.45	1.81
44.5	2.10	3.03	3.85	1.94	2.02	3.03	3.69	1.94
45.5	2.37	3.24	4.12	2.07	2.27	3.24	3.95	2.07
46.5	2.67	3.45	4.39	2.20	2.56	3.45	4.21	2.20
47.5	2.99	3.66	4.67	2.34	2.87	3.66	4.48	2.34
48.5	3.34	3.88	4.95	2.48	3.20	3.88	4.75	2.48
49.5	3.73	4.10	5.24	2.62	3.58	4.10	5.02	2.62
50.5	4.15	4.33	5.53	2.76	3.98	4.33	5.30	2.76
51.5	4.62	4.56	5.83	2.91	4.43	4.56	5.59	2.91
52.5	5.12	4.79	6.13	3.06	4.91	4.79	5.87	3.06
53.5	5.67	5.03	6.43	3.21	5.44	5.03	6.17	3.21
54.5	6.27	5.27	6.74	3.36	6.01	5.27	6.46	3.36
55.5	6.93	5.52	7.06	3.52	6.64	5.52	6.77	3.52
56.5	7.64	5.78	7.39	3.69	7.33	5.78	7.09	3.69
57.5	8.45	6.04	7.73	3.85	8.13	6.04	7.41	3.85

ENTRY AGE 25

	FEMALE				MALE			
Age	DB	DC	CB	DC-EE	DB	DC	CB	DC-EE
58.5	9.31	6.30	8.07	4.02	8.95	6.30	7.74	4.02
59.5	10.18	6.57	8.41	4.19	9.77	6.57	8.06	4.19
60.5	11.06	6.84	8.77	4.36	10.60	6.84	8.41	4.36
61.5	11.95	7.11	9.17	4.54	11.43	7.11	8.79	4.54
62.5	12.90	7.38	9.57	4.71	12.32	7.38	9.17	4.71
63.5	13.86	7.65	9.98	4.88	13.19	7.65	9.57	4.88
64.5	14.80	7.91	10.40	5.05	14.06	7.91	9.97	5.05
65.5	15.36	8.18	10.83	5.22	14.55	8.18	10.39	5.22
66.5	15.44	8.45	11.27	5.39	14.58	8.45	10.81	5.39
67.5	15.50	8.71	11.73	5.56	14.60	8.71	11.24	5.56
68.5	15.56	8.99	12.22	5.74	14.62	8.99	11.72	5.74
69.5	15.72	9.36	12.86	5.97	14.72	9.36	12.33	5.97
70.5	15.81	9.75	13.54	6.22	14.76	9.75	12.99	6.22
71.5	15.80	10.14	14.25	6.47	14.71	10.14	13.67	6.47
72.5	15.73	10.54	14.99	6.72	14.60	10.54	14.38	6.72
73.5	15.62	10.94	15.76	6.98	14.44	10.94	15.12	6.98
74.5	15.48	11.34	16.56	7.24	14.25	11.34	15.88	7.24
75	15.17	11.75	17.39	7.50	13.94	11.75	16.68	7.50

ENTRY AGE 30

	FEMALE				MALE			
Age	DB	DC	CB	DC-EE	DB	DC	CB	DC-EE
30.5	0.04	0.06	0.07	0.04	0.04	0.06	0.07	0.04
31.5	0.12	0.20	0.24	0.13	0.12	0.20	0.23	0.13
32.5	0.20	0.34	0.40	0.22	0.20	0.34	0.39	0.22
33.5	0.28	0.48	0.57	0.31	0.28	0.48	0.54	0.31
34.5	0.36	0.62	0.73	0.39	0.36	0.62	0.70	0.39
35.5	0.44	0.75	0.89	0.48	0.44	0.75	0.85	0.48
36.5	0.51	0.89	1.05	0.57	0.51	0.89	1.01	0.57
37.5	0.58	1.02	1.21	0.65	0.58	1.02	1.16	0.65
38.5	0.66	1.16	1.38	0.74	0.66	1.16	1.32	0.74
39.5	0.73	1.30	1.55	0.83	0.73	1.30	1.48	0.83
40.5	0.80	1.45	1.72	0.93	0.80	1.45	1.65	0.93
41.5	0.92	1.61	1.91	1.02	0.88	1.61	1.83	1.02
42.5	1.08	1.77	2.10	1.13	1.03	1.77	2.02	1.13
43.5	1.25	1.94	2.31	1.24	1.20	1.94	2.21	1.24
44.5	1.45	2.11	2.52	1.35	1.39	2.11	2.42	1.35
45.5	1.67	2.29	2.74	1.46	1.60	2.29	2.63	1.46
46.5	1.90	2.48	2.97	1.58	1.83	2.48	2.85	1.58
47.5	2.17	2.67	3.20	1.71	2.08	2.67	3.07	1.71
48.5	2.46	2.87	3.44	1.83	2.35	2.87	3.30	1.83
49.5	2.77	3.07	3.69	1.96	2.66	3.07	3.53	1.96
50.5	3.12	3.27	3.94	2.09	2.99	3.27	3.77	2.09
51.5	3.50	3.48	4.19	2.22	3.36	3.48	4.02	2.22
52.5	3.92	3.69	4.45	2.36	3.76	3.69	4.27	2.36
53.5	4.38	3.91	4.71	2.49	4.20	3.91	4.52	2.49
54.5	4.88	4.13	4.98	2.63	4.68	4.13	4.77	2.63
55.5	5.64	4.35	5.25	2.78	5.45	4.35	5.04	2.78
56.5	6.38	4.58	5.53	2.92	6.15	4.58	5.30	2.92
57.5	7.13	4.81	5.81	3.07	6.87	4.81	5.57	3.07
58.5	7.91	5.05	6.10	3.22	7.60	5.05	5.85	3.22
59.5	8.70	5.29	6.39	3.38	8.35	5.29	6.13	3.38
60.5	9.51	5.54	6.71	3.53	9.11	5.54	6.43	3.53
61.5	10.32	5.79	7.50	3.69	9.87	5.79	7.19	3.69
62.5	11.20	6.04	7.87	3.86	10.69	6.04	7.55	3.86
63.5	12.07	6.29	8.25	4.02	11.50	6.29	7.91	4.02
64.5	12.95	6.55	8.64	4.18	12.30	6.55	8.29	4.18
65.5	13.48	6.80	9.04	4.34	12.77	6.80	8.67	4.34
66.5	13.60	7.05	9.45	4.50	12.85	7.05	9.06	4.50
67.5	13.70	7.30	9.87	4.66	12.90	7.30	9.46	4.66

ENTRY AGE 30

	FEMALE				MALE			
Age	DB	DC	CB	DC-EE	DB	DC	CB	DC-EE
68.5	13.77	7.55	10.30	4.82	12.93	7.55	9.87	4.82
69.5	13.81	7.79	10.74	4.97	12.94	7.79	10.29	4.97
70.5	13.83	8.03	11.19	5.12	12.92	8.03	10.73	5.12
71.5	13.82	8.26	11.65	5.27	12.87	8.26	11.17	5.27
72.5	13.79	8.50	12.12	5.42	12.80	8.50	11.62	5.42
73.5	13.73	8.73	12.60	5.57	12.69	8.73	12.09	5.57
74.5	13.64	8.96	13.10	5.72	12.56	8.96	12.56	5.72
75	13.29	9.19	13.61	5.86	12.21	9.19	13.05	5.86

ENTRY AGE 35

	FEMALE				MALE			
Age	DB	DC	CB	DC-EE	DB	DC	CB	DC-EE
35.5	0.04	0.06	0.08	0.04	0.04	0.06	0.07	0.04
36.5	0.12	0.20	0.26	0.13	0.12	0.20	0.25	0.13
37.5	0.20	0.34	0.43	0.22	0.20	0.34	0.42	0.22
38.5	0.28	0.48	0.61	0.31	0.28	0.48	0.58	0.31
39.5	0.36	0.62	0.78	0.40	0.36	0.62	0.75	0.40
40.5	0.44	0.76	0.96	0.48	0.44	0.76	0.92	0.48
41.5	0.54	0.90	1.13	0.57	0.52	0.90	1.09	0.57
42.5	0.68	1.04	1.32	0.66	0.65	1.04	1.26	0.66
43.5	0.82	1.18	1.50	0.76	0.79	1.18	1.44	0.76
44.5	0.99	1.33	1.69	0.85	0.95	1.33	1.62	0.85
45.5	1.18	1.48	1.88	0.95	1.13	1.48	1.81	0.95
46.5	1.39	1.64	2.09	1.05	1.34	1.64	2.00	1.05
47.5	1.63	1.81	2.30	1.15	1.56	1.81	2.21	1.15
48.5	1.89	1.98	2.52	1.26	1.82	1.98	2.42	1.26
49.5	2.18	2.16	2.75	1.38	2.09	2.16	2.64	1.38
50.5	2.50	2.34	2.99	1.49	2.40	2.34	2.87	1.49
51.5	2.85	2.53	3.23	1.61	2.74	2.53	3.10	1.61
52.5	3.24	2.71	3.47	1.73	3.11	2.71	3.33	1.73
53.5	3.66	2.91	3.72	1.86	3.51	2.91	3.57	1.86
54.5	4.13	3.10	3.97	1.98	3.96	3.10	3.81	1.98
55.5	4.63	3.30	4.23	2.11	4.44	3.30	4.06	2.11
56.5	5.19	3.50	4.49	2.24	4.98	3.50	4.31	2.24
57.5	5.82	3.71	4.76	2.37	5.61	3.71	4.57	2.37
58.5	6.51	3.92	5.03	2.50	6.26	3.92	4.83	2.50
59.5	7.21	4.14	5.30	2.64	6.92	4.14	5.09	2.64
60.5	7.93	4.36	5.59	2.78	7.60	4.36	5.37	2.78
61.5	8.67	4.58	5.90	2.92	8.29	4.58	5.67	2.92
62.5	9.46	4.80	6.23	3.07	9.03	4.80	5.98	3.07
63.5	10.26	5.03	6.56	3.21	9.77	5.03	6.30	3.21
64.5	11.07	5.26	6.90	3.36	10.51	5.26	6.63	3.36
65.5	11.58	5.50	7.26	3.51	10.97	5.50	6.97	3.51
66.5	11.75	5.73	7.63	3.66	11.10	5.73	7.33	3.66
67.5	11.89	5.97	8.01	3.81	11.19	5.97	7.69	3.81
68.5	12.00	6.20	8.40	3.96	11.27	6.20	8.07	3.96
69.5	12.08	6.43	8.80	4.11	11.31	6.43	8.45	4.11
70.5	12.14	6.66	9.21	4.25	11.34	6.66	8.84	4.25
71.5	12.18	6.89	9.63	4.40	11.34	6.89	9.25	4.40

ENTRY AGE 35

	FEMALE				MALE			
Age	DB	DC	CB	DC-EE	DB	DC	CB	DC-EE
72.5	12.19	7.12	10.06	4.54	11.31	7.12	9.66	4.54
73.5	12.17	7.34	10.51	4.69	11.25	7.34	10.09	4.69
74.5	12.12	7.56	10.96	4.83	11.16	7.56	10.52	4.83
75	11.83	7.79	11.42	4.97	10.87	7.79	10.97	4.97

ENTRY AGE 40

	FEMALE				MALE			
Age	DB	DC	CB	DC-EE	DB	DC	CB	DC-EE
40.5	0.04	0.06	0.08	0.04	0.04	0.06	0.08	0.04
41.5	0.12	0.20	0.26	0.13	0.12	0.20	0.25	0.13
42.5	0.20	0.35	0.44	0.22	0.20	0.35	0.42	0.22
43.5	0.28	0.48	0.62	0.31	0.28	0.48	0.59	0.31
44.5	0.36	0.62	0.79	0.40	0.36	0.62	0.76	0.40
45.5	0.61	0.76	0.97	0.49	0.58	0.76	0.94	0.49
46.5	0.77	0.90	1.16	0.58	0.74	0.90	1.11	0.58
47.5	0.96	1.05	1.34	0.67	0.92	1.05	1.29	0.67
48.5	1.17	1.19	1.53	0.76	1.12	1.19	1.47	0.76
49.5	1.40	1.34	1.72	0.85	1.34	1.34	1.65	0.85
50.5	1.67	1.49	1.91	0.95	1.60	1.49	1.84	0.95
51.5	1.96	1.65	2.12	1.05	1.88	1.65	2.03	1.05
52.5	2.29	1.82	2.33	1.16	2.20	1.82	2.24	1.16
53.5	2.66	1.99	2.56	1.27	2.55	1.99	2.46	1.27
54.5	3.06	2.17	2.79	1.39	2.94	2.17	2.68	1.39
55.5	3.50	2.35	3.02	1.50	3.36	2.35	2.90	1.50
56.5	3.98	2.54	3.26	1.62	3.82	2.54	3.13	1.62
57.5	4.53	2.73	3.51	1.74	4.36	2.73	3.37	1.74
58.5	5.13	2.93	3.76	1.87	4.93	2.93	3.61	1.87
59.5	5.75	3.13	4.02	2.00	5.52	3.13	3.86	2.00
60.5	6.39	3.33	4.29	2.13	6.12	3.33	4.12	2.13
61.5	7.04	3.54	4.58	2.26	6.73	3.54	4.39	2.26
62.5	7.75	3.75	4.87	2.39	7.40	3.75	4.68	2.39
63.5	8.48	3.97	5.18	2.53	8.07	3.97	4.97	2.53
64.5	9.21	4.18	5.50	2.67	8.74	4.18	5.28	2.67
65.5	9.70	4.40	5.82	2.81	9.18	4.40	5.59	2.81
66.5	9.89	4.62	6.15	2.95	9.34	4.62	5.91	2.95
67.5	10.06	4.84	6.50	3.09	9.47	4.84	6.24	3.09
68.5	10.21	5.06	6.85	3.23	9.59	5.06	6.58	3.23
69.5	10.34	5.28	7.21	3.37	9.68	5.28	6.93	3.37
70.5	10.44	5.50	7.59	3.51	9.75	5.50	7.29	3.51
71.5	10.52	5.71	7.98	3.65	9.80	5.71	7.66	3.65
72.5	10.58	5.93	8.37	3.79	9.82	5.93	8.04	3.79
73.5	10.60	6.15	8.78	3.93	9.80	6.15	8.43	3.93
74.5	10.60	6.37	9.20	4.06	9.76	6.37	8.83	4.06
75	10.52	6.58	9.63	4.20	9.67	6.58	9.25	4.20

ENTRY AGE 45

	FEMALE				MALE			
Age	DB	DC	CB	DC-EE	DB	DC	CB	DC-EE
45.5	0.04	0.06	0.08	0.04	0.04	0.06	0.08	0.04
46.5	0.12	0.20	0.26	0.13	0.12	0.20	0.25	0.13
47.5	0.20	0.34	0.44	0.22	0.20	0.34	0.43	0.22
48.5	0.28	0.48	0.62	0.31	0.28	0.48	0.60	0.31
49.5	0.36	0.62	0.80	0.40	0.36	0.62	0.77	0.40
50.5	0.86	0.76	0.98	0.49	0.82	0.76	0.94	0.49
51.5	1.09	0.90	1.16	0.58	1.04	0.90	1.11	0.58
52.5	1.35	1.04	1.34	0.67	1.29	1.04	1.29	0.67
53.5	1.64	1.19	1.53	0.76	1.57	1.19	1.47	0.76
54.5	1.97	1.34	1.72	0.85	1.89	1.34	1.65	0.85
55.5	2.33	1.49	1.92	0.95	2.23	1.49	1.84	0.95
56.5	2.74	1.65	2.12	1.05	2.63	1.65	2.04	1.05
57.5	3.21	1.82	2.34	1.16	3.09	1.82	2.24	1.16
58.5	3.71	1.99	2.55	1.27	3.57	1.99	2.45	1.27
59.5	4.25	2.16	2.78	1.38	4.07	2.16	2.67	1.38
60.5	4.80	2.34	3.01	1.49	4.60	2.34	2.89	1.49
61.5	5.38	2.52	3.26	1.61	5.14	2.52	3.13	1.61
62.5	6.00	2.71	3.51	1.73	5.73	2.71	3.37	1.73
63.5	6.64	2.89	3.77	1.85	6.33	2.89	3.62	1.85
64.5	7.30	3.08	4.04	1.97	6.93	3.08	3.88	1.97
65.5	7.77	3.28	4.32	2.09	7.36	3.28	4.15	2.09
66.5	8.00	3.47	4.61	2.22	7.56	3.47	4.43	2.22
67.5	8.21	3.67	4.91	2.34	7.74	3.67	4.71	2.34
68.5	8.41	3.87	5.22	2.47	7.90	3.87	5.01	2.47
69.5	8.58	4.07	5.53	2.60	8.03	4.07	5.31	2.60
70.5	8.72	4.26	5.86	2.72	8.14	4.26	5.63	2.72
71.5	8.84	4.46	6.20	2.85	8.23	4.46	5.95	2.85
72.5	8.94	4.66	6.54	2.97	8.29	4.66	6.28	2.97
73.5	9.01	4.86	6.89	3.10	8.33	4.86	6.62	3.10
74.5	9.06	5.06	7.26	3.23	8.34	5.06	6.97	3.23
75	9.03	5.26	7.63	3.36	8.30	5.26	7.33	3.36

Note: *DB and CB benefit values are in DC-equivalent terms. Actual DB and CB plan balances per participant are lower than stated here because DB and DC plans have higher investment returns and/or higher interest rate on annuities than DC plans. The same DC balance buys higher private insurance annuity income for men (who make up fewer than 3 out of 10 CalSTRS members) than for women because of the former's shorter life expectancy. In contrast, DB and CB plan annuities treat men and women the same. Thus DB and CB plans convert into lower DC-equivalent values for men compared to women, even though they offer the annual same retirement income for both sexes. See Methdology in Appendix for further detail.*

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CALSTRS®

CALIFORNIA STATE TEACHERS' RETIREMENT SYSTEM

Fact Sheet

Are California Teachers Better Off with a Pension or a 401(k)?

Not only are California's educators better off with the CalSTRS Defined Benefit Program, but schools greatly benefit from the reduced workforce turnover. Created in 1913, the CalSTRS pension benefit structure was designed as a retention tool to reward full-career educators, as well as to provide retirement security to program participants. This superior design stands the test of time and complements the career trajectories of California's educators.

A recent UC Berkeley study, *Are California Teachers Better Off with a Pension or a 401(k)?*, shows the existing CalSTRS pension structure—which is designed to benefit teachers who stay until at least early retirement age—is better matched to meet the retirement needs of the teaching workforce than either a 401(k)-style or cash balance plan.

Study's Key Findings Show Pensions Benefit a Long-Term Educator Workforce

Three-quarters of classroom teaching in California is performed by long-term teachers

61
age at retirement with around 29 years of service

75%
of active educators will have worked at least 20 years

49%
of educators will retire with 30 or more years of service

26%
will have been covered by CalSTRS for 20–29 years

Misleading Information on Teacher Tenure Dominates Pension Studies

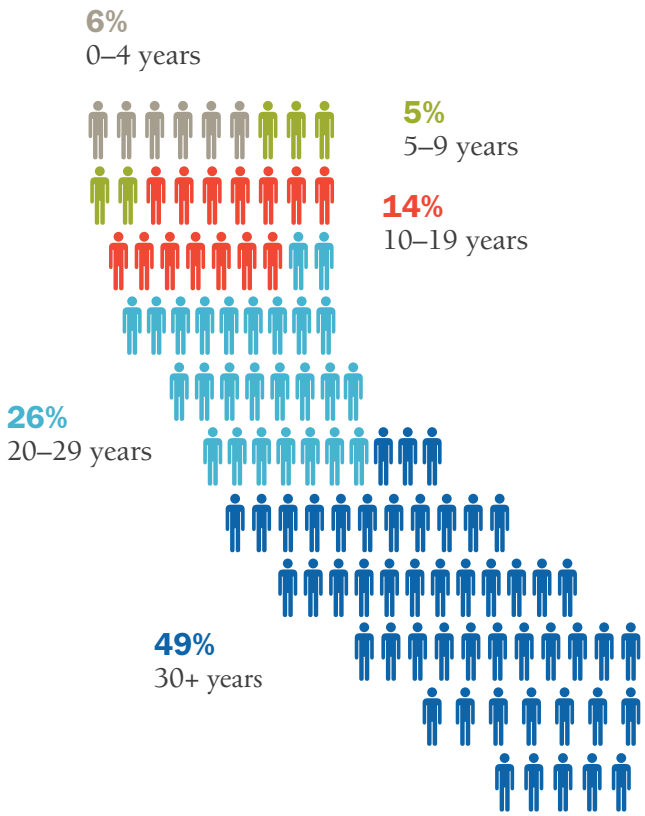
Several studies on 401(k) and cash balance plans for teachers wrongly suggest that new-hire attrition rates, or teacher turnover, should drive retirement plan design. While it is true that account-based retirement plans reward those who leave the education profession early, restructuring retirement benefits to advantage temporary teachers, at the expense of a large majority of educators, makes little sense. **Further, it is misleading to use young, new-hire turnover to represent the majority of the educational workforce as a whole.**

Similar to other professions, turnover is highest in the early years of teaching, with four out of 10 new hires leaving CalSTRS before the five-year vesting period in any given year. Many studies focus on this specific turnover rate to drive their recommendations; however, this misrepresents the active teaching workforce. In practice, the workforce population who leave during the five-year vesting period, represents only 6 percent of educators in California's classrooms today.

The vast majority of teaching in California is performed by educators who have remained, or will remain beyond the initial high-attrition years.

Once vested, few teachers leave before retirement age. Three-quarters earn 20 or more years of service.

Projected Tenure of Current California Teachers



Defined Benefit Pensions Aid Workforce Management

401(k) plans create stark inequalities between retirement cohorts because retirement income varies wildly with volatile financial markets.

Educators caught in this situation have a 50 percent chance of either exceeding their expected defined contribution outcomes by one-third or falling short by one-third.

- In contrast, the CalSTRS Defined Benefit pension provides guaranteed retirement income for vested members.
- Defined benefit pensions aid in retaining educators for the long haul, while encouraging them to exit in their 60s.
- Account based retirement plans however, would increase the incentive for young and mid-career teachers to leave and decrease the ability of older educators to retire.

Defined Benefit Pensions Reward California's Educators

Overall, the CalSTRS pension benefit structure is better matched to the needs of the active teaching workforce than 401(k) or cash balance plans. Under benefit models used in the study:

- For six out of seven teachers in California the CalSTRS Defined Benefit pension provides a greater, more secure retirement income compared to a 401(k)-style plan.
- The CalSTRS Defined Benefit pension becomes greater than an idealized 401(k) defined contribution account at age 51 and 86 percent of active educators stay in California schools until at least age 51.
- The CalSTRS Defined Benefit pension becomes greater than a generously structured cash balance plan at age 56, and 79 percent of active educators will stay on the job until age 56.

For those who commit to teaching as a profession, the CalSTRS defined benefit plan is a powerful retention tool that serves their retirement needs well, while offering portability throughout the largest education labor market in the US.

Age When Value of CalSTRS Defined Benefit Pension Exceeds Value of Alternative Plans for Female Teachers, by Entry Age

	ENTRY AGE				
	25	30	35	40	45
DC Plan					
Baseline	51	51	49	49	50
Realistic (1% drag on returns from individual investor behavior)	47	48	46	49	50
DC Plan—Employee Contributions Only					
Baseline	43	43	42	45	50
Realistic (1% drag on returns from individual investor behavior)	38	39	40	45	50
CB Plan	56	55	54	53	52

Note: *Women make up 72% of CalSTRS active membership. For entry ages 25, 30, and 35, DB value exceeds DC and CB values one year later for male teachers than for female teachers. For entry ages 40 and older, the crossover point is the same for both genders.*

Source: *Are California Teachers Better Off With a Pension or a 401(k)?, conducted by Nari Rhee, PhD, of the UC Berkeley Center for Labor Research and Education and William Fornia, FSA of Pension Trustee Advisors.*