IOWA PUBLIC EMPLOYEES' RETIREMENT SYSTEM

2003 Asset/Liability Study

A MILLIMAN GLOBAL FIRM

Milliman USA

Consultants and Actuaries

A MILLIMAN GLOBAL FIRM

Milliman USA
Consultants and Actuaries

1120 South 101st Street, Suite 400
Omaha, NE 68124-1088
Phone: (402) 393-9400
Fax: (402) 393-1037
www.milliman.com

September 15, 2003

Investment Board
Iowa Public Employees' Retirement System
7401 Register Drive
Des Moines, IA 50321

Re: Asset/Liability Projection Study

Dear Board Members:

Incorporated within this report are the results of our actuarial asset/liability projection analysis of the Iowa Public Employees' Retirement System. We have relied without audit on the basic employee data as submitted for the June 30, 2002 valuation. The estimated return on assets as of June 30, 2003 of 5.0% has been incorporated. To the extent that the employee data and asset figures are incomplete or inaccurate, the results of this study will be changed.

The slides in Section II of the report are intended to demonstrate the potential range of results on a probabilistic basis as opposed to the single point estimates of a traditional deterministic actuarial valuation. We believe that these graphs provide an informative picture of the potential variability and associated risk for IPERS.

In addition to the slides in Section II, we also include a description of the assumptions and methods used to produce the projection results in the Appendix. As is true with any projection, the assumptions used will play a significant role in the final results. If actual experience is different from what is assumed, the results of this study will not match the ultimate results realized by IPERS.

We stand ready to answer any further questions you or other interested parties may have.

Respectfully submitted,
MILLIMAN USA, INC.

Patrice Beckham

Patrice A. Beckham, F.S.A.
Consulting Actuary

Brent A. Banister

Brent A. Banister, F.S.A.
Actuary

Alan H Perry

Alan H. Perry, A.S.A.
Investment Consultant

Enclosure

TABLE OF CONTENTS

Letter of Transmittal

Table of Contents

		Page
SECTION I:	BOARD SUMMARY	A - 1
A.	Scope and Variables	1
B.	Asset/Liability Projection Methodology	2
C.	Projection Assumptions	3
D.	Projection Study Results	4
E.	Limitations	11
F.	Conclusions	11
G.	Charts	12
SECTION II:	PROJECTION RESULTS	B - 1
APPENDICES:		C - 1
A.	Capital Market Assumptions	
B.	Assumed Rebalancing to Current Target mix	
C.	Asset Modeling Methods	
D.	Limitations of Asset/Liability Modeling	
E.	New Entrant Profile	

SECTION I

BOARD SUMMARY

A. Scope and Variables

Milliman was asked to perform this asset/liability study to help the Board, IPERS staff, and other interested parties address three primary issues:

- What is the System's expected funding progress over the coming years? Are current contribution rates expected to support current benefit levels?
- Anticipating the System may have a long term funding concern, what is the expected impact of changes to benefit levels and/or contribution rates?
- What are the expected opportunities and risks from changes to the System's long-term asset allocation policy?

As we reported in the June 30, 2002 valuation, the funded status of the System has been adversely affected by the recent negative market experience. Due to the use of an asset smoothing method, there is a significant difference between the actuarial value of assets (used in the valuation process) and the market value of assets. This difference is referred to as "unrecognized actuarial investment losses". Absent investment returns well in excess of the 7.5% assumed rate of return in the short term, the unrecognized actuarial investment losses will be recognized in the asset smoothing method over the next several years. Additionally, the normal cost rate has increased due to assumption changes and changes in the demographic composition of the membership over the years to a point where there is a small difference in the statutory contribution rate and the normal cost rate. This is relevant because this difference, when applied to the covered payroll of the System, determines the amount of contributions available to pay the unfunded actuarial liability. As of June 30, 2002, the current amount of contributions payable toward the unfunded actuarial liability is not sufficient to finance the unfunded actuarial liability. As the amount of the unfunded actuarial liability increases over the next few years due to recognition of the difference between the actuarial and market values of assets, the current funded status will decline.

The System periodically performs asset/liability studies, with the last study completed in 2000. Milliman recommended that an asset/liability study be performed in conjunction with the evaluation of the long term funding of the System. Typically, an asset/liability study focuses on the impact that potential changes in the asset allocation will have on the System's funding. While this facet of a typical asset/liability study was included in this study, the current funded status demanded there be a heavy focus on the System's liabilities, including modeling of potential changes to the contribution rate and/or benefit structure.

Asset/liability studies are intended to examine the range of results in the future, given reasonable assumptions, and to help decision-makers determine the possible impact of different courses of action. While the modeling in the study developed many plausible scenarios for the future, they are primarily designed for comparison rather than prediction. Actual experience in the coming years will almost certainly differ from the results shown herein, so the usefulness lies in comparing the different impacts of various courses of action over a wide range of possible scenarios.

This asset/liability study was a collaborative effort between Wilshire Associates, Inc. (IPERS investment consultant), Milliman USA (IPERS actuary), and IPERS staff. Wilshire developed the capital market assumptions and the alternative portfolios studied. Milliman provided the liability projections and the model to link the investment returns and liabilities to develop contribution rates and funded status. IPERS staff provided critical input and guidance during all phases of the study.

B. Asset/Liability Projection Methodology

The asset/liability model projects the financial status of the retirement system for each of the next thirty years. As opposed to an actuarial valuation, which is a projection of assets and liabilities based on a single set of actuarial assumptions as of some specified date, an asset/liability study provides additional dimensions by introducing a time element and a probabilistic element.

The economic environment and capital markets are projected forward one year at a time. At the end of each year, the model reflects the effect of current economic conditions on an actuarial valuation (e.g., contributions and liabilities, etc.). We will use the term projection assumptions to indicate those assumptions that are used to project from one valuation date to the next, and the term valuation assumptions to indicate those assumptions that are applicable at that valuation date.

Each year the model generates returns for each asset class. These returns are correlated with the other economic variables, such as changes in interest rates and inflation. All of the economic and capital market variables are stochastic, meaning they are described by a probability distribution. For each asset class and inflation, the mean and standard deviation of the annual rate of return are inputs. The model also requires the correlation coefficients between each pair of asset classes, as well as between each asset class and inflation.

One thousand iterations of the model are generated. Each iteration produces one possible multiple-year projection. All the iterations are assumed to be equally likely. For each year, liabilities and assets are tracked to produce distributions of possible outcomes. The results are presented as a range of possible outcomes along with the likelihood of each outcome. By comparing the ranges of outcomes for these key plan obligations, the model provides information about potential variability, thus demonstrating the "risk" associated with various changes.

In determining costs to be incurred by a pension plan in future years, it is necessary to provide valuation assumptions relating to future events beyond the projection date. These valuation assumptions may be classified into three different categories.

The first category involves the economic assumptions. These assumptions include assumed investment return, salary increases, and cost-of-living increases on plan benefits. These assumptions are characterized as economic because they generally tend to be affected by interrelated factors that also affect economic growth.

The second category relates to demographic assumptions which affect the expected working lifetime (and retired lifetime) of a member and the number of members covered by the system. These assumptions include mortality rates, disability rates, rates of separation due to other causes (including retirement), and rates of population change over time.

The third category relates to miscellaneous assumptions that are needed to accommodate special plan provisions that are not adequately covered in the first two categories. These assumptions would include (but are not limited to) items such as assumed family composition, plan expenses, election to specific benefit forms, etc. These assumptions need to be monitored so that they remain consistent with the plan provisions that are in effect.

Another tool used in completing this project was a "deterministic" projection model, which is based on a single scenario of how the future will unfold over the long term. The annual actuarial valuation projection is a deterministic model because it is based on a single "best estimate" scenario of future experience. Each approach has it's usefulness and both types of modeling were used in completing the project. A deterministic projection model was used in the early stages of the study to narrow the benefit options to be considered in the more complicated stochastic study and to estimate the contribution rates needed to meet the goal of complying with IPERS' target of a 30-year amortization of the unfunded actuarial liability by 2014. This report presents the stochastic analysis of a limited set of alternatives selected after reviewing a broader set of options using the deterministic model.

The decision by IPERS staff to look for options that met this goal was based on a realization that the challenges confronting the System are long-term in nature and can be addressed with a corresponding long-term perspective. Further, changes that attempt to solve the problem quickly lead to plan designs that soon result in funding levels that would be typically considered excessive. Likewise, waiting too long to reach actuarial soundness exposes the System to more risk of serious – perhaps unrecoverable - troubles. The target of reaching a 30-year amortization by 2014 is a reasonable goal, recognizing the issues involved.

C. Projection Assumptions

Capital Market Assumptions

These are the basic economic assumptions that underlie the projection of fund assets. Furthermore, the System liabilities are adjusted to reflect the difference between projected inflation and the basic inflation component of the salary increase valuation assumption. The Capital Market Assumptions, which are specified in Chart 1 at the end of this section, provide the basis for creating a reasonable distribution of possible future experience.

Current Member Data Projection

Starting from the June 30, 2002 actuarial valuation data, the member census data is projected according to the current actuarial assumptions, with one exception. The projected salary is adjusted to reflect the modeled actual inflation that occurs between June 30, 2002 and each future valuation date. The salary valuation assumption, however, remains unchanged.

New Entrant Data Projection

At each future valuation date, the projected membership count is determined according to the population growth assumption. The population growth assumption for this study is that the active member population remains level throughout the 30-year study period.

The projected active member count is compared to the number of members who are projected to remain as active members at the valuation date. New members are assumed to be hired each year to bring the total membership count to the projected active member count. The new members are assumed to have the composition as displayed in the new entrant profile in Chart 2 at the end of this section. Finally, the salary of the new entrant profile is adjusted to reflect the modeled actual inflation that occurs between June 30, 2002 and each future valuation date.

Valuation Assumptions

The June 30, 2002 actuarial valuation for purposes of the projection study is based on the set of assumptions adopted effective June 30, 2002. Demographic and miscellaneous assumptions remain unchanged after June 30, 2002, except that the retirement rates for new entrants were modified when the alternate benefit designs modified retirement eligibility. This modification was needed because changes in retirement eligibility will have an impact on when members will elect to retire.

D. Projection Study Results

Baseline (No change in benefits or contributions)

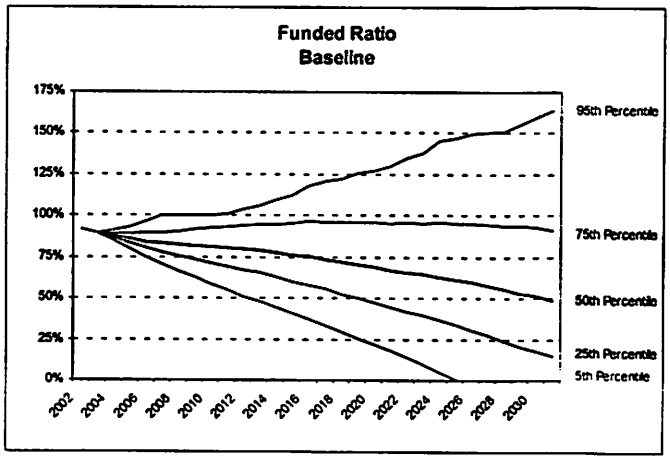
The first step in the Study was to model the funded status of the System as it is currently designed (current benefit structure and contribution rates) over the next 30 years. This is referred to in the study as the "Baseline" scenario. The June 30, 2002 valuation indicated that the current contribution rate structure was not sufficient to meet the normal cost and amortize the unfunded actuarial liability. However, due to the actuarial valuation process, these measurements occurred at a single point in time, raising the question as to what projected results might be. We started by modeling the System funding under the "baseline" scenario, i.e. no changes to the asset allocation, the benefit structure, or contribution rates. The results indicate that there is a long-term funding concern for the IPERS.

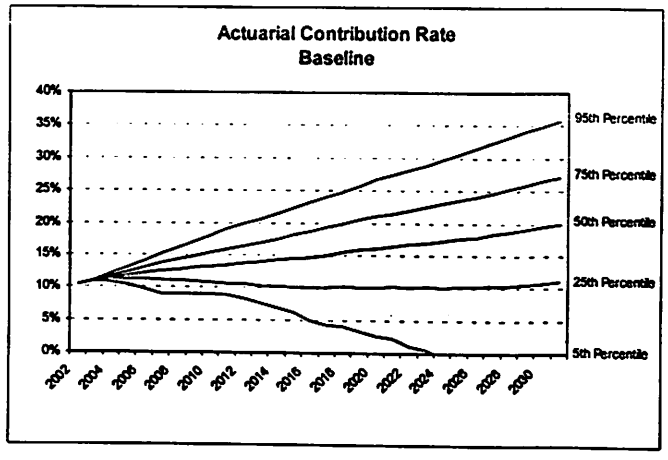
For each of the 1,000 iterations of the baseline projection, the model calculates output measures as of each valuation date from 2002 to 2031. At each valuation date, a distribution of valuation results in generated. This distribution is represented on each chart with five point estimates:

- 5th percentile is the point at which 5 percent of the trials are lower than this result and 95 percent are higher;
- 25th percentile is the point at which 25 percent of the trials are lower than this result and 75 percent are higher;
- 50th percentile is the median result;
- 75th percentile is the point at which 75 percent of the trials are lower than this result and 25 percent are higher; and
- 95th percentile is the point at which 95 percent of the trials are lower than this result and 5 percent are higher.

Even though the points are connected from year-to-year, the reader is cautioned to remember that the five lines do not represent five unique trials, but only indicate the representative position among the distribution of all results at each point in time.

The funded ratio graph shows that the current funded position of IPERS is most likely to get dramatically worse in the future. The median line shows that the funded ratio is likely to continue to decline each year, reaching 80.3% by 2011, 57.8% by 2021 and 48.8% in 2031. The 75th percentile line shows a fairly stable funded ratio over the 30-year study period. The 95th percentile line does show that there are a few economic scenarios that could play out so that IPERS funded ratio would exceed 100%, but the probability of those combinations of events happening is small.





The actuarial contribution rate graph illustrates this same point in a different manner. The actuarial contribution rate includes the normal cost plus the amount needed to amortize the unfunded actuarial liability (UAL) over 30 years. Any time this rate exceeds the fixed contribution rate, IPERS' funding goal is not met. Anytime this rate is less than the fixed contribution rate, the UAL is amortized more rapidly than 30 years.

Based on the capital market assumptions used in our study, these results indicate a serious, long term funding problem facing the System.

Approaches to theProblem

The fundamental financing formula for pension plans is as follows:

$$C + I = B + E$$

Where C = contributions
I = investment earnings
B = benefits paid
E = expenses

Assuming that expenses have been minimized and are therefore not a source of additional funds, the long term funding problem will require a change to one or more of the remaining elements in the above formula: the benefits being paid out, the amount of contributions coming in, or the earnings generated by the trust fund. Each of these options and some combinations of these options will be considered in the following discussion.

Changes in Benefit Structure

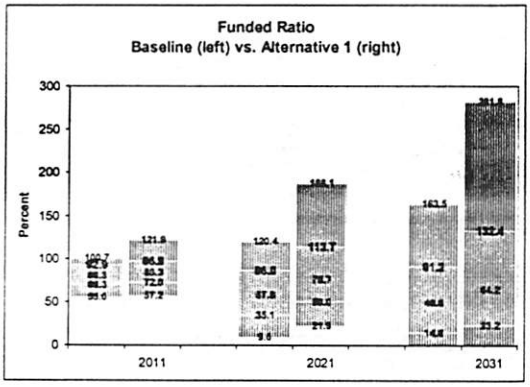
The possibilities are unlimited when considering changes in the benefit structure and contribution rates. Because of the substantial time and expense involved in considering each option, Milliman requested that only two alternatives be considered. After development of the deterministic model and consultation with IPERS staff, the options were narrowed to the two alternative benefit structures described below, in addition to the current benefit structure.

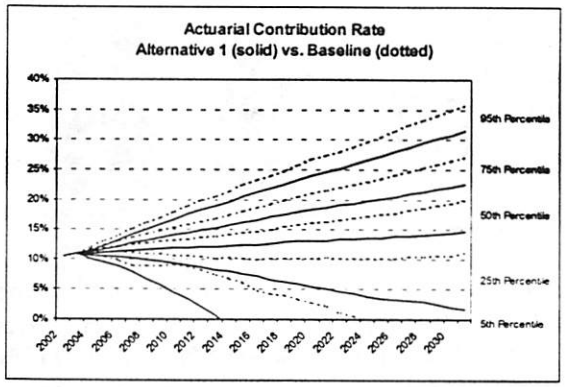
A summary of the current benefit structure and the alternatives included in the Study is shown below:

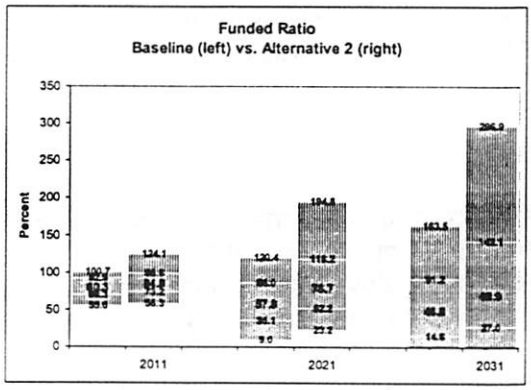
Plan Provision	Current Provisions	Alternative 1	Alternative 2
Benefit Multiplier	2% for first 30 years plus 1% for next 5	1.9% for first 30 years plus 1% for next 5*	1.8% for first 30 years plus 1% for next 5*
Final Average Earnings	High 3 years	High 5 years	High 5 years
Unreduced Retirement Age	Age 65 or age 62 with 20 YOS or Rule of 88	Age 65 or age 62 with 20 YOS	Age 65 or age 62 with 20 YOS
Early Retirement Age	Age 55	Age 55	Age 55
Early Retirement Reduction for Benefit	3% per year	Actuarial equivalent	Actuarial equivalent*
FED Reserve	Current reserve stays in FED	50% of FED reserve transferred back to IPERS Trust Fund	50% of FED reserve transferred back to IPERS Trust Fund

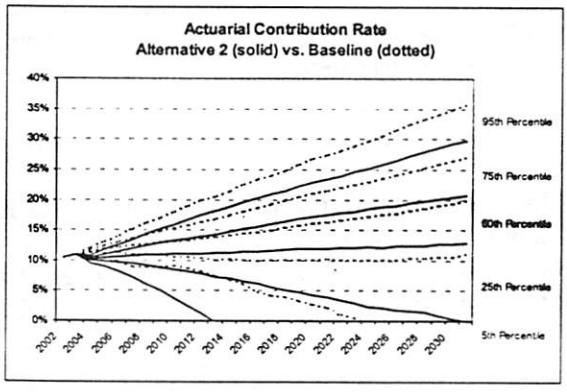
* Under alternative benefit structures 1 and 2, the change in the multiplier applies prospectively to future years of service for current active members. In addition, for alternative 2, the change in the early retirement reduction factors is phased-in on a pro rata basis, using service to date of change over all years of service, for current members.

The following graphs show the projection of the actuarial contribution rate and funded ratio for the two Alternative Benefit Designs, with no change in the current contribution rate. Neither option alone appears to be a reasonable alternative to resolve the System's long term funding. Even with a change in the benefit structure, an increase in the contribution rate is necessary to restore the actuarial soundness of the System.









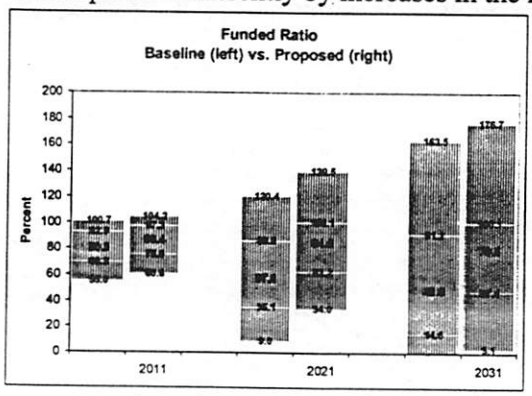
Increase in Contribution Rates

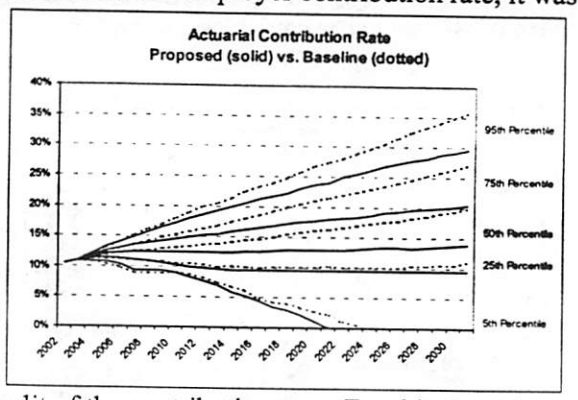
For the baseline scenario and both alternatives 1 and 2, an increase from the current 9.45% contribution rate was developed using the deterministic model and an assumed rate of return of 7.5% for each future year. The contribution rates were selected in order to meet the funding goal of 30-year amortization of the unfunded actuarial liability by 2014.

With changes in the demographics of members and changes in benefit provisions (under alternatives 1 and 2), the normal cost rate is expected to vary in future years. In addition, IPERS' current funded status requires substantial contributions toward the unfunded actuarial liability, particularly when trying to meet the funding goal by 2014. Consequently, the fixed contribution rate selected for modeling purposes may be higher or lower than the actuarial contribution rate (based on 30 year amortization of the UAL) over the study period. The model assumes that the contribution rate is fixed throughout the 30 year study period. In reality the System's funding, including contribution rates, will be evaluated periodically and adjustments could be made at that time.

Baseline with Increased Contribution Rate

To meet the funding goal, the contribution rate was determined to be 13.25%. Because liabilities are impacted differently by increases in the member versus the employer contribution rate, it was



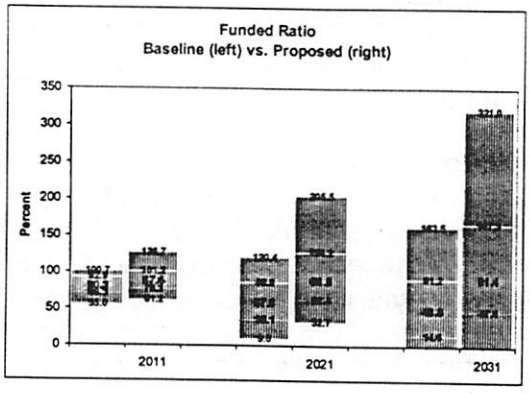


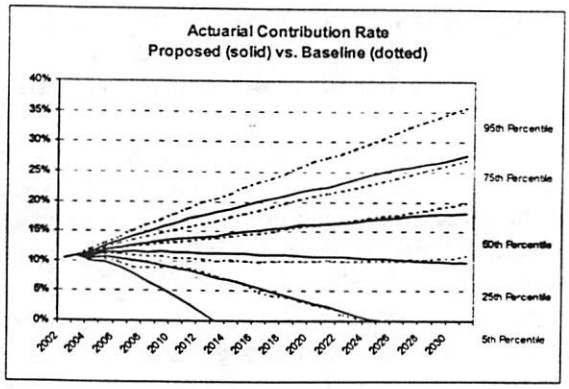
necessary to make an assumption regarding the split of the contribution rate. For this scenario, the split was 40% employee and 60% employer. As the graphs illustrate, there is nearly a 50% chance that the 13.25% contribution rate will be sufficient to fund the unfunded actuarial liability over 30 years (the basis used to calculate the actuarial contribution rate). The funded ratio under the 50th percentile in 2031 increases from about 49% under the baseline to 80% with increased contributions. The 50th percentile result for the actuarial contribution rate at 2031 is about 13.75%, indicating the unfunded actuarial liability is not amortized within 30 years (even though it was from 2014 until 2024).

Alternative 1 with Increased Contribution Rate

The contribution rate under this scenario was 12.0% of payroll. For purposes of modeling the liabilities, it was assumed the contributions were split 50% employee and 50% employer. While other allocations of the 12.0% rate between members and employers would impact the liabilities, it would not be material and would not change the trends indicated in this analysis.

As the graphs indicate, by both lowering benefits and increasing contribution rates, the System's funded status at 2031 is improved (from 49% to 91% at the 50th percentile). Likewise, the 50th percentile results for the actuarial contribution rate at 2031 is about 10% of pay, indicating the unfunded actuarial liability is being amortized in less than 30 years at that point.

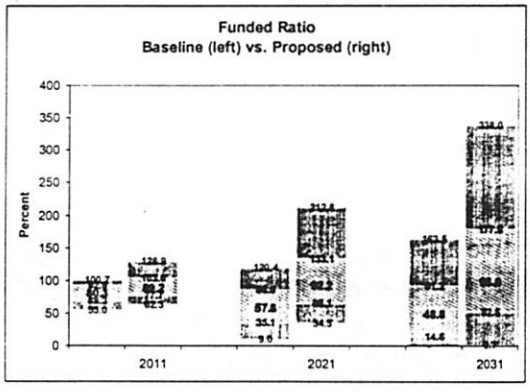


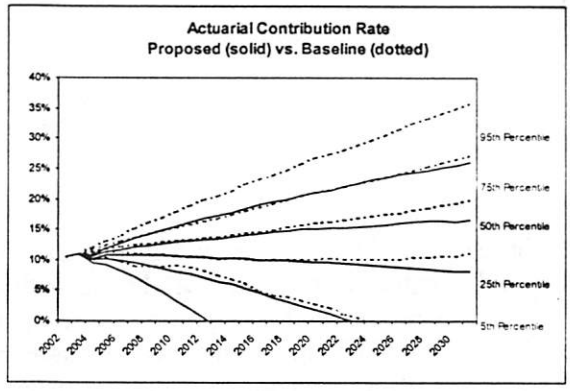


Alternative 2 with Increased Contribution Rate

The contribution rate under this scenario was 12.0% of payroll. As in Alternative 1, for purposes of modeling the liabilities, it was assumed the contributions were split 50% employee and 50% employer. Once again, the impact of other allocations of the contribution rate would not be material and would not change the trends indicated in this analysis.

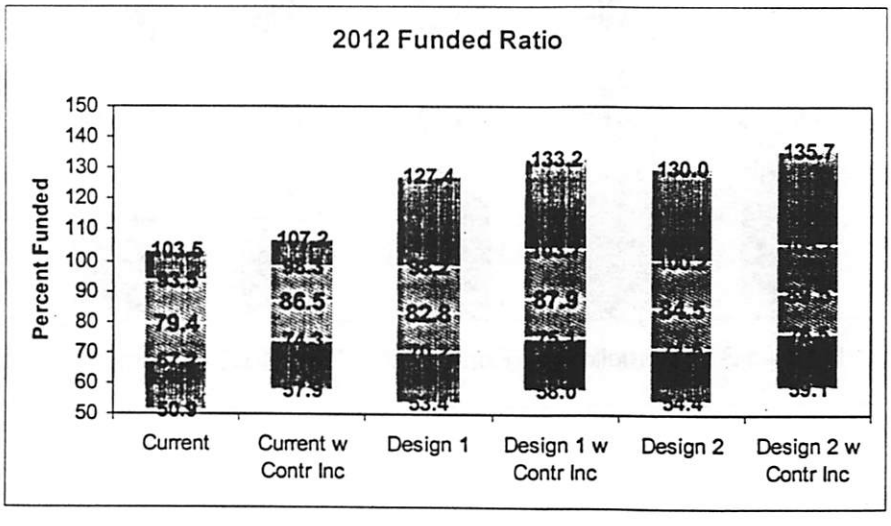
As the graphs indicate, by both lowering benefits and increasing contribution rates, the System's funded status at 2031 is improved (from 49% to 99% at the 50th percentile). Likewise, the 50th percentile results for the actuarial contribution rate at 2031 is about 8% of pay, indicating the unfunded actuarial liability is being amortized in less than 30 years.





Because Alternative 2 provides lower benefits than Alternative 1 and yet has the same contributions, better long-term results are to be expected. Both alternatives have the same contribution rate in order to meet the requirements of the funding goal. This reflects the fact that the impact of changing future benefits takes time to make a meaningful difference in the total System liabilities.

Summary of Alternatives and Increased Contribution Rates



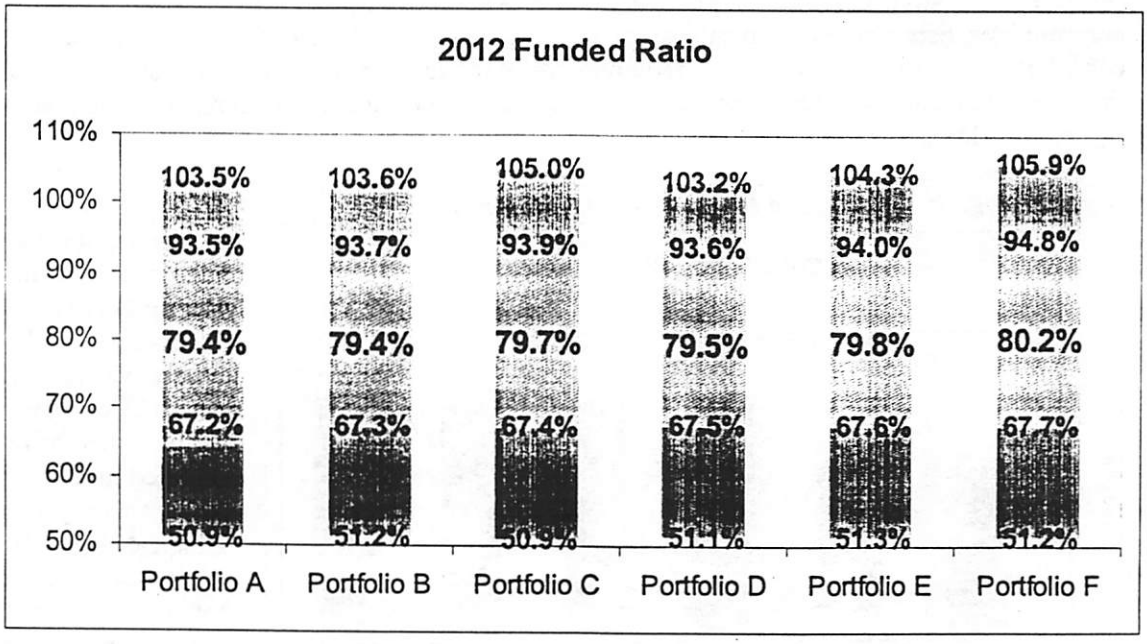
A summary of the funded ratio of the System at 2012 under each alternative studied is shown below: The specific alternatives modeled in this report are only a sample of possible approaches that could be considered and are meant to help provide a framework for future discussions.

Changes to the Asset Allocation

The final part of the asset/liability study included a comparison of five alternative asset allocations developed by Wilshire with input from IPERS staff. The five alternative portfolios, in addition to the current portfolio, are summarized below See Table 3 for details):

Asset Class	Current (Portfolio A)	Portfolio B	Portfolio C	Portfolio D	Portfolio E	Portfolio F
Total Equity	53	50	53	53	54	57
Real Estate	5	10	8	8	10	10
GTAA	5	5	5	0	0	0
Total Fixed Income	37	35	34	39	36	33
Return	7.79	7.80	7.86	7.81	7.89	7.97
Risk	11.04	10.78	11.16	10.77	10.97	11.38

In the asset/liability study, the potential impact of the five alternative asset allocations on the System's funded status and actuarial contribution rate over the next 10 years (the timeframe for Wilshire's capital market assumptions) was examined. The alternative asset allocations represent a relatively small change from the current asset mix. Consequently, the resulting funded ratios for the alternative allocations are not significantly different, as shown below.



E. Limitations

The outcomes from the projections in this report are dependent on the assumptions used. Differences between our projections and actual amounts depend on the extent to which future experience conforms to the assumptions made for this analysis. It is certain that actual experience will not conform exactly to the assumptions to be used in this analysis. Actual amounts will differ from projected amounts to the extent that actual experience is better or worse than expected. We would be happy to provide projections under alternative assumptions, if desired.

Simulated investment performance results do not reflect actual trading and have certain inherent limitations. The actual financial results for the plan in future years may not be included among the outcomes presented in this report.

F. Conclusions

We appreciate the opportunity to participate in the completion of this study for IPERS. This study confirms the long term funding challenge that faces the System. There are numerous options which may bring the System into actuarial balance (current and future contributions equal the present value of future benefits). Several alternatives, including two possible changes to the benefit structure and increased contribution rates, were included in this Study. None of the alternatives included in the study are intended to be recommendations by either Milliman or IPERS' staff. The alternatives studied are only a small representation of the range of options that could be considered. The information resulting from this study is meant to provide a framework for future discussions regarding ways to address the long term funding of the System. However, regardless of what approach to the problem is ultimately selected, the sooner any action is taken the lower the ultimate contribution rate will be.

In reviewing the results of the asset/liability study, the reader should keep in mind that the results are intended for comparative purposes and are not intended to "predict" future valuation results (including contribution rates). This asset/liability study covers a very long period of time, during which factors that are modeled (such as investment return), assumed (such as member demographics), or ignored (such as geo-political issues) are very likely to vary from what is projected, with a resulting impact on the Systems funded ratio and actuarial contribution rate. The changes that are made to the System in the next several years to address the long term funding issues should continue to be evaluated periodically in the future, with adjustments made as necessary.

Milliman USA stands ready to assist IPERS, the Legislature, the membership and employers in analyzing the long term funding of the System and finding a reasonable solution acceptable to all parties.

Chart 1

Capital Market Assumptions

	Domestic Equities	International Equities	Private Equities	Fixed Income	High Yield	GTAA	Real Estate	Cash	CPI
Expected Annual Return	9.30%	9.78%	14.73%	5.37%	7.46%	7.66%	7.46%	3.00%	2.25%
Standard Deviation	17.00	20.00	30.00	5.00	10.00	12.00	10.00	1.00	1.30
Serial Correlation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.70
Correlation Coefficients:									
Domestic Equities	1.00	0.65	0.75	0.30	0.50	0.90	0.40	0.00	0.00
International Equities		1.00	0.50	0.20	0.30	0.60	0.35	-0.10	0.00
Private Equities			1.00	0.27	0.34	0.70	0.41	0.00	0.00
Fixed Income				1.00	0.40	0.50	0.30	0.10	0.00
High Yield					1.00	0.58	0.50	-0.10	0.00
GTAA						1.00	0.38	0.00	0.00
Real Estate							1.00	0.00	0.00
Cash								1.00	0.60
CPI									1.00

Serial correlation assumptions for CPI and Cash and cross-correlation assumptions for CPI developed by Milliman. All other capital market assumptions developed by Wilshire Consulting.

Chart 2

Profile of New Entrants During the 1998 – 2002 Fiscal Year

Milliman reviewed the new entrants from the five valuations performed from 1998 through 2002. From this data we built a profile of what a typical new entrant group would look like. This profile is summarized in the table below:

Age Range	Male		Female	
	Count	*Salary*	*Count*	*Salary*
Under 25	16.9%	$18,470	17.9%	$16,631
25-29	18.0%	23,450	16.1%	19,906
30-34	13.0%	25,510	13.1%	16,725
35-39	11.5%	24,910	15.2%	14,744
40-44	10.7%	23,808	13.7%	14,846
45-49	9.3%	23,500	9.8%	16,270
50-54	7.5%	23,543	6.4%	17,000
55-59	5.7%	24,558	4.1%	17,000
60-64	4.3%	19,512	2.3%	14,304
65 and up	3.1%	12,000	1.4%	8,786

Chart 3

Alternate Portfolios

Asset Class	Current (Portfolio A)	Portfolio B	Portfolio C	Portfolio D	Portfolio E	Portfolio F
Domestic Equities	28	25	28	28	25	27
Int'l Equities	15	15	15	15	19	20
Private Equities	10	10	10	10	10	10
Total Equity	53	50	53	53	54	57
Real Estate	5	10	8	8	10	10
GTAA	5	5	5	0	0	0
High Yield Bonds	3	3	4	5	5	5
Investment Grade Bonds	34	32	30	34	31	28
Total Fixed Income	37	35	34	39	36	33
Return	7.79	7.80	7.86	7.81	7.89	7.97
Risk	11.04	10.78	11.16	10.77	10.97	11.38
Return/Risk	0.71	0.72	0.70	0.73	0.72	0.70

Alternates portfolios were provided by Wilshire Consulting.