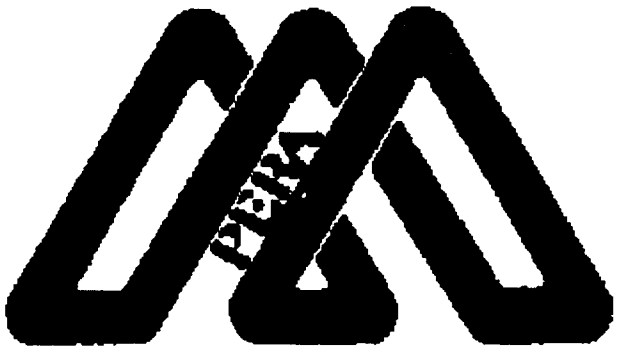
MINNESOTA PUBLIC EMPLOYEES RETIREMENT ASSOCIATION



ACTUARIAL PROJECTIONS

1997 - 2036

GRS
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Executive Summary

General

At your request we have developed a set of actuarial projections of the Public Employees Retirement Fund ("PERF").

An actuarial projection is a study in which the actual dynamic of a retirement system is projected forward in time. Based on projected populations and asset values, actuarial valuations are performed at the end of each year in the projection period. A review of the assets and actuarial liabilities as they emerge over time and the emerging relationships between these items develops information on future funding levels in the system, based on the underlying assumptions.

The specific projections performed and the pictures they paint of the funding of the system should provide additional perspective with which to interpret funding trends.

Assumptions

the specific projections produced in this study and the results of those projections are described below. Except where specifically noted, the assumptions used in these projections are as follows:

- Number of Active Members - Constant at 129,491
- Demographic Actuarial Assumptions - Those used in the latest actuarial valuation of the system, except that the retirement assumption is replaced by a set of rates at retireable ages.
- Investment Return - In the actuarial valuation process 8.5% is used. In the accumulation of assets, 8.5% unless otherwise specified.
- New Entrants - The age, sex, and pay characteristics of the new entrants inserted each year to maintain the desired number of active members are those of the entrants into PERF in the last three years.
- Pay Projections - The compensation of active members is assumed to increase each year in accordance with the salary increase assumption used in the latest actuarial valuation of PERF.

Projections

The projections (over the 40 year period 1997 - 2036) set out in this report are as follows:

Projection 1 - Base Line
This projection is based on all assumptions used in the latest actuarial valuation.

It shows that, at current rates of contribution, PERF will be funded in 2027. While this does not meet the current statutory standard, funding of the system in a period of 31 years is within normal actuarial tolerance.

Projection 2 - Investment Return at 9.5%
This is identical to Projection 1 except that the active life fund is assumed to earn 9.5% each year rather than 8.5%. (MPRIF is assumed to earn 8.5%.) This change of 1% in annual returns cuts 13 years for the time required to fund the system. Full funding occurs in 2014.

Projection 3 - Investment Return at 7.5%
This is identical to Projection 1 except that the active life fund is assumed to earn 7.5%. (MPRIF is assumed to earn 8.5%.) This reduction of returns of 1% per year results in a diminishing funding level for the 40 year period. On this basis the system would never be funded.

Projection 4 - Investment Cycle
This is identical to Projection 1 except that active fund returns are assumed to follow the pattern of actual market results in the period 1966 - 95. Since our projection period is 40 years, that pattern is assumed to recycle again, beginning in 2027. While this projection shows significant volatility the system becomes fully funded in 2020 and remains fully funded thereafter.

Projection 5 - 2% Growth
This is identical to Projection 1 except that the active member group is assumed to grow at 2% per year. In this scenario, PERF becomes fully funded in 2021 and stays fully funded through the remainder of the period.

Projection 6 - 2% Decline
This is identical to Projection 1 except that the active member group is assumed to decline at 2% per year. In this scenario, the funding level grows to a level of almost 93% in 2028 and tails off slightly after that point. The system does not reach full funding during the 40 year period under this scenario.

Projection 7 - Mortality Improvement
This projection is identical to Projection 1 except that allowance is made for the ongoing trend of greater longevity among retirees. We have assumed about a 1% improvement in longevity every 10 years. On this basis, while PERF is not fully funded during the 40 year period, steady progress is being made in this direction.

Detailed descriptions of these projections follow.

Introduction

General

Each year your actuaries produce actuarial valuations of PERA. The purposes of the actuarial valuation are to:

1. Determine the funding status of the system, and
2. Develop the "Required Contribution" to determine the on-going adequacy of the actual statutory contribution to the system.

The funding goal for PERA and for all other state sanctioned retirement systems in Minnesota is that assets equal or exceed the Actuarial Accrued Liability of the system by the year 2020.

An actuarial valuation is a statistical study which is based on the data reflecting the members of the system participating as of the valuation date and information on the value of assets as of that date. It starts with statistical projections of benefits to be paid to the current set of members. Those projected benefit flows are reduced to present value using an assumed rate of investment return. These present values are the building blocks of Normal Cost, Actuarial Accrued Liability, and other actuarial values. It is a reasonable and long accepted method of measuring the value of pension obligations and determining appropriate levels of contribution to be made to defined benefit retirement systems.

Each year the demographic characteristics of the covered group of members change. Some active members terminate their participation in the system, some die, some retire, and new members replace them. Each year benefits are paid, new contributions are received and investment returns earned. Another actuarial valuation is produced, taking into account all of the flows of population and assets since the last valuation.

An actuarial projection simulates this dynamic. In an actuarial projection:

1. Covered members of the system are projected forward from year to year.
   a. Active member characteristics, including pay, are projected
   b. Retired member characteristics, including benefit amounts, are projected
2. Assets are projected forward from year to year, and
3. Actuarial valuations are performed on the projected data.

This cycle can be repeated for as many years as is necessary.

This process presents a view of the funding of the system as future experience emerges. This process can show whether or not, under certain assumptions, the plan will be funded as scheduled. By varying assumptions relative to investment earnings, retirement patterns, or other key factors, we can see the effects such changes have on the ultimate funding of the system.

At your request, we have developed a series of actuarial projections of the Public Employees Retirement Fund ("PERF"). The purpose of this project is to determine whether or not the current statutory contribution level is likely to fund the current benefits

At your request, we have developed a series of actuarial projections of the Public Employees Retirement Fund ("PERF"). The purpose of this project is to determine whether or not the current statutory contribution level is likely to fund the current benefits of the system in an appropriate manner, under the current valuation assumptions and the effect on funding of certain changes in those assumptions.

This report does not address the impact of any legislative proposal currently under consideration.

Assumptions

As with any statistical projections, these projections require a set of assumptions as to future retirement system experience. The key assumptions are:

1. **Active Membership**
   a. *Size* - As of June 30, 1996, there were 129,461 active members of PERF. One key assumption reflects, in the actuarial projection process, expected growth in this group.
   b. *Decrements* - In the actuarial valuation of PERF, there are a number of assumptions relative to the manner in which members leave active status. The assumptions used in the latest valuation reflecting active life mortality, turnover, and disability are used in the actuarial projection process.
   c. *Retirement* - The exception is the retirement decrement. In the actuarial valuation process, unless eligible for the Rule of 90, each person is assumed to retire at age 64. In fact, members retire at various ages. For the actuarial projections, we have used an assumed retirement pattern which better reflects the actual experience.
   d. *New Entrants* - Unlike the actuarial valuation process, there is an assumption as to new members entering each year. After decrements, sufficient new entrants are incorporated into the process to provide the desired active member group size. For example, if we assume constant group size, enough new entrants are added to exactly replace those assumed to leave. The age and sex characteristics of these new entrants reflect those of the last three years of actual new entrants into PERF.
   e. *Pay* - Benefits and contributions are based on compensation levels. Thus, the assumed future pay increases are an important ingredient in this process. The pay increase assumption used in the actuarial valuation were used in these projections.
   f. *Basic vs. Coordinated* - One complication is that about 1% of the active members in PERF still participate in the Basic Plan. As current Basic Plan members are assumed to retire in this process, they are replaced by new members entering the Coordinated Plan.
2. **Assets** - The Actuarial Value of Assets is assumed to change as follows:

c. *Investment Returns* - Except where variation are specified, the actuarial valuation rate of return assumption of 8.5% is assumed for each year of these projections.
d. *Cash Flow Timing* - Contributions and benefits are assumed to occur uniformly throughout each year.

Projections

Per your request, projections have been developed on a number of bases.

1. **Base Line** - A projection developed assuming
   a. *Constant Population* - The active group stays constant at 129,461.
   b. *Investment Return* - 8.5% each year.
   c. *Demographics / New Entrants* - as described in 1. a. through e. above.
2. **Rate of Return 9.5%** - Same as the Base Line projection, except investment return is assumed to be 9.5% per year.
3. **Rate of Return 7.5%** - Same as the Base Line projection, except investment return is assumed to be 7.5% per year.
4. **Investment Cycle** - Same as the Base Line projection, except that the investment market conditions of the period 1966 - 95 are assumed to be precisely reproduced in the period 1997 - 2026.
5. **Population Growth of 2% per year** - Same as the Base Line projection, except that the group of active employees is assumed to grow by 2% per year.
6. **Population Decline of 2% per year** - Same as the Base Line projection except that the group of active employees is assumed to shrink by 2% per year.
7. **Mortality** - Same as the Base Line except modified to reflect improvement in mortality in the future.

Each projection will be discussed separately in its own section.

Projection 1
Base Line

The projection characterized as our Base Line is just that. It is a projection based on the following assumptions:

1. All of the actuarial assumptions used in the latest actuarial valuation of PERF (except for the change in retirement assumption previously discussed).
2. The active group was assumed to remain constant at 129,491.
3. The rate of return in the fund, net of expenses, was assumed to be 8.5% each year.

The projection period is a 40 year period, from the plan year commencing July 1, 1997 through the plan year ending June 30, 2036.

The basic results of this projection are set out in Table 1 on the next page. There are a number of facets of this table worth noting:

1. **Valuation Payroll** - While the size of the covered group is constant, the payroll of the active members of PERF was projected to grow from about $2.9 billion per year to nearly $17 billion over the 40 year projection period.
2. **Contributions** - Over the period the employee contribution goes from 4.58% of pay to 4.48% of pay over the first 10 years of the period, reflecting the attrition of the remaining Basic Plan members. Employee contributions exhibit the same trend.
3. **Benefits** - Benefit payments grow from about $330 million in 1997 to over $3.3 billion in 2036. While this is substantial growth, it is tempered by the fact that about 64% of benefits in 1996 were under the Basic Plan, while projected benefits in 2036 are substantially Coordinated Plan benefits. Offsetting that effect are the benefit adjustments, assumed to be 3.5% per year, provided by the Minnesota Post Retirement Investment Fund ("MPRIF").
4. **Actuarial Value of Assets** - While the benefits paid each year exceed the contributions for each year, the assets grow steadily throughout the period. The investment return at 8.5% per year, ensures this growth.
5. **Actuarial Accrued Liability** - While the AAL grew through the period, it does not grow as rapidly as do assets and benefit payments. This, again, is due to the dominance of the Coordinated Plan.

Chart 1 shows, graphically, the relationship between the emerging value of assets and the AAL. This chart shows that the value of assets exceeds the AAL for the first time in 2027. Thus, while the current statutory contribution level does not fund the AAL by 2020, it does so in 2027.

Chart 1-2 shows the progress of the ratio of these items, reaching 100% in 2027.

Table 1
PERA Projections
Base Line
($ in millions)

Year	Valuation Payroll	Employer Contributions $	Employer Contributions % of Pay	Employee Contributions $	Employee Contributions % of Pay	Total Statutory Contributions	Total Benefits and Refunds	Net Non-Investment Cash Flow	Actuarial Value of Assets	Actuarial Accrued Liabilities
1996	2,924.530								5,786.398	7,149.674
1997	3,052.959	139.826	4.58%	130.118	4.26%	269.943	329.922	(59.979)	6,215.765	7,648.220
1998	3,184.344	145.525	4.57%	135.592	4.26%	281.117	346.713	(65.596)	6,675.778	8,176.155
1999	3,321.871	151.477	4.56%	141.346	4.26%	292.823	364.115	(71.292)	7,168.959	8,733.073
2000	3,466.035	157.705	4.55%	147.395	4.25%	305.100	382.203	(77.103)	7,698.007	9,322.114
2001	3,616.451	164.187	4.54%	153.720	4.25%	317.907	401.396	(83.488)	8,265.374	9,946.794
2002	3,773.665	170.947	4.53%	160.341	4.25%	331.288	422.147	(90.859)	8,873.289	10,609.169
2003	3,937.914	177.994	4.52%	167.266	4.25%	345.260	444.998	(99.738)	9,523.627	11,310.520
2004	4,108.943	185.313	4.51%	174.483	4.25%	359.797	470.448	(110.651)	10,217.878	12,051.328
2005	4,287.118	192.920	4.50%	182.007	4.25%	374.927	498.545	(123.618)	10,957.633	12,832.902
2006	4,473.460	200.411	4.48%	189.869	4.24%	390.280	529.639	(139.359)	11,743.870	13,657.005
2007	4,667.428	209.101	4.48%	198.072	4.24%	407.172	564.381	(157.209)	12,578.345	14,522.539
2008	4,868.936	218.128	4.48%	206.595	4.24%	424.724	603.772	(179.048)	13,461.002	15,428.857
2009	5,077.323	227.464	4.48%	215.412	4.24%	442.876	648.616	(205.741)	14,390.881	16,371.816
2010	5,294.090	237.175	4.48%	224.584	4.24%	461.759	698.633	(236.874)	15,367.370	17,351.669
2011	5,520.414	247.315	4.48%	234.161	4.24%	481.476	754.199	(272.724)	16,389.518	18,366.558
2012	5,755.233	257.834	4.48%	244.099	4.24%	501.934	817.772	(315.838)	17,453.640	19,409.377
2013	6,000.204	268.809	4.48%	254.468	4.24%	523.278	886.656	(363.378)	18,558.692	20,481.271
2014	6,256.674	280.299	4.48%	265.325	4.24%	545.624	961.190	(415.566)	19,703.314	21,580.292
2015	6,526.100	292.369	4.48%	276.730	4.24%	569.099	1,041.090	(471.991)	20,886.454	22,706.369
2016	6,807.210	304.963	4.48%	288.631	4.24%	593.594	1,128.320	(534.727)	22,104.813	23,850.261
2017	7,101.738	318.158	4.48%	301.099	4.24%	619.257	1,220.706	(601.449)	23,357.233	25,014.814
2018	7,413.281	332.115	4.48%	314.289	4.24%	646.404	1,316.343	(669.939)	24,644.767	26,203.282
2019	7,741.435	346.816	4.48%	328.182	4.24%	674.998	1,415.579	(740.581)	25,968.159	27,413.723
2020	8,086.925	362.294	4.48%	342.808	4.24%	705.103	1,519.012	(813.910)	27,327.657	28,643.695
2021	8,450.274	378.572	4.48%	358.192	4.24%	736.764	1,625.682	(888.918)	28,724.581	29,894.719
2022	8,835.047	395.810	4.48%	374.481	4.24%	770.291	1,734.729	(964.437)	30,161.580	31,169.268
2023	9,239.668	413.937	4.48%	391.612	4.24%	805.549	1,844.442	(1,038.893)	31,643.169	32,471.094
2024	9,665.342	433.007	4.48%	409.631	4.24%	842.638	1,955.531	(1,112.893)	33,173.612	33,799.362
2025	10,114.012	453.108	4.48%	428.618	4.24%	881.726	2,072.272	(1,190.546)	34,753.256	35,153.227
2026	10,587.130	474.303	4.48%	448.640	4.24%	922.943	2,186.136	(1,263.192)	36,391.500	36,539.464
2027	11,085.187	496.616	4.48%	469.713	4.24%	966.329	2,302.412	(1,336.083)	38,093.069	37,957.232
2028	11,609.904	520.124	4.48%	491.908	4.24%	1,012.032	2,420.264	(1,408.232)	39,864.118	39,409.087
2029	12,164.140	544.953	4.48%	515.347	4.24%	1,060.301	2,538.597	(1,478.297)	41,712.725	40,903.582
2030	12,749.032	571.157	4.48%	540.078	4.24%	1,111.235	2,657.445	(1,546.210)	43,647.723	42,445.088
2031	13,365.000	598.752	4.48%	566.116	4.24%	1,164.868	2,775.618	(1,610.750)	45,679.969	44,044.048
2032	14,015.337	627.887	4.48%	593.600	4.24%	1,221.487	2,892.989	(1,671.502)	47,821.674	45,706.305
2033	14,701.613	658.632	4.48%	622.590	4.23%	1,281.223	3,010.982	(1,729.759)	50,084.741	47,438.778
2034	15,424.735	691.028	4.48%	653.135	4.23%	1,344.163	3,127.599	(1,783.436)	52,484.258	49,255.076
2035	16,186.518	725.156	4.48%	685.314	4.23%	1,410.470	3,244.970	(1,834.501)	55,034.542	51,161.518
2036	16,990.331	761.167	4.48%	719.257	4.23%	1,480.424	3,361.049	(1,880.626)	57,753.556	53,171.700

Chart 1-1
PERA Projections
Base Line

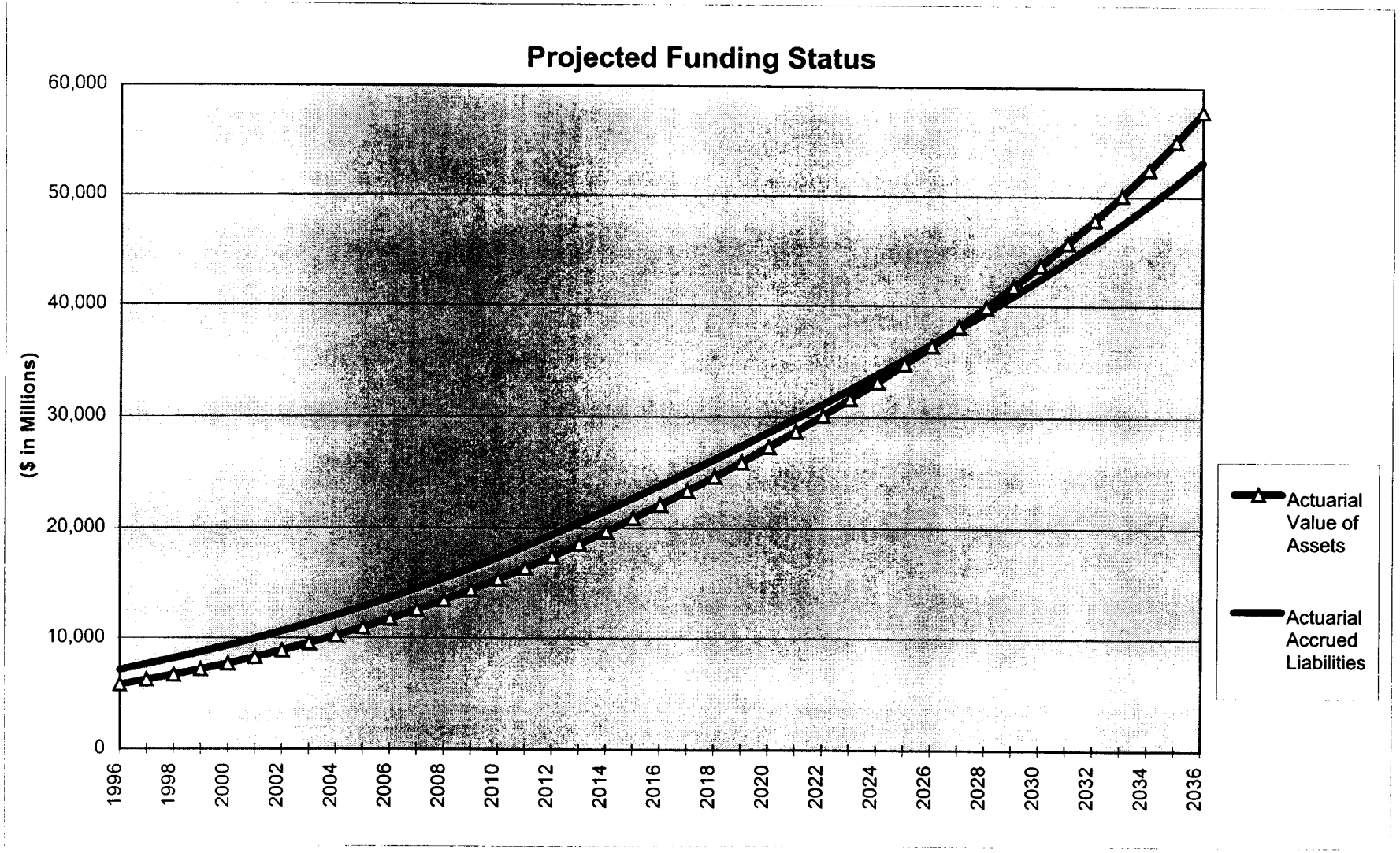
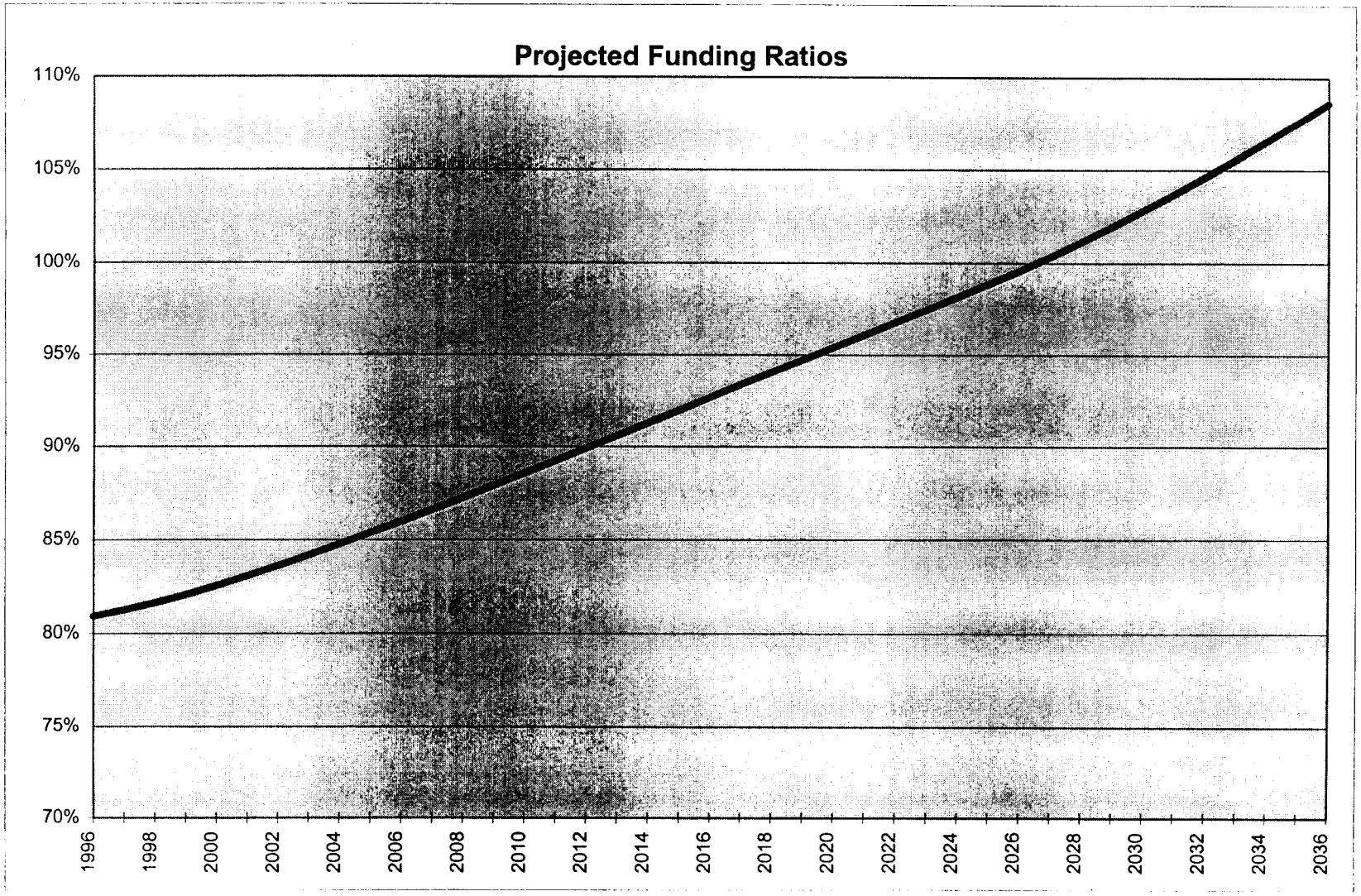


Chart 1-2
PERA Projections
Base Line



Projection 2
Rate of Return 9.5%

This projection is identical to the Base Line, except that the return on assets in the fund - other than MPRIF - is 9.5%. MPRIF is assumed to earn 8.5%. This is consistent with our assumption that benefit increases were 3.5% each year.

Table 2 sets out all the pertinent values. We should note that all values in this projection are identical to those in the Base Line, except for the asset value.

The additional 100 basis points of return on the non-MPRIF portion of PERF assets generates an asset value after 40 years which is 42% greater than that of the Base Line.

Under this scenario, the asset value of the fund first exceeds the AAL in 2014, well ahead of the funding goal of 2020.

Chart 2-1 shows the relative assets and AAL over the projection period. Chart 2-2 shows the steady growth of the funding ratio, reaching 100% in 2014 and continuing to improve from that point.

Table 2
PERA Projections
Rate of Return - 9.5%
($ in millions)

Year	Valuation Payroll	Employer Contributions $	Employer Contributions % of Pay	Employee Contributions $	Employee Contributions % of Pay	Total Statutory Contributions	Total Benefits and Refunds	Net Non-Investment Cash Flow	Actuarial Value of Assets	Actuarial Accrued Liabilities
1996	2,924.530								5,786.398	7,149.674
1997	3,052.959	139.826	4.58%	130.118	4.26%	269.943	329.922	(59.979)	6,239.875	7,648.220
1998	3,184.344	145.525	4.57%	135.592	4.26%	281.117	346.713	(65.596)	6,729.466	8,176.155
1999	3,321.871	151.477	4.56%	141.346	4.26%	292.823	364.115	(71.292)	7,258.525	8,733.073
2000	3,466.035	157.705	4.55%	147.395	4.25%	305.100	382.203	(77.103)	7,830.499	9,322.114
2001	3,616.451	164.187	4.54%	153.720	4.25%	317.907	401.396	(83.488)	8,448.654	9,946.794
2002	3,773.665	170.947	4.53%	160.341	4.25%	331.288	422.147	(90.859)	9,116.135	10,609.169
2003	3,937.914	177.994	4.52%	167.266	4.25%	345.260	444.998	(99.738)	9,835.791	11,310.520
2004	4,108.943	185.313	4.51%	174.483	4.25%	359.797	470.448	(110.651)	10,610.146	12,051.328
2005	4,287.118	192.920	4.50%	182.007	4.25%	374.927	498.545	(123.618)	11,441.884	12,832.902
2006	4,473.460	200.411	4.48%	189.869	4.24%	390.280	529.639	(139.359)	12,333.183	13,657.005
2007	4,667.428	209.101	4.48%	198.072	4.24%	407.172	564.381	(157.209)	13,287.138	14,522.539
2008	4,868.936	218.128	4.48%	206.595	4.24%	424.724	603.772	(179.048)	14,305.074	15,428.857
2009	5,077.323	227.464	4.48%	215.412	4.24%	442.876	648.616	(205.741)	15,387.517	16,371.816
2010	5,294.090	237.175	4.48%	224.584	4.24%	461.759	698.633	(236.874)	16,535.363	17,351.669
2011	5,520.414	247.315	4.48%	234.161	4.24%	481.476	754.199	(272.724)	17,749.413	18,366.558
2012	5,755.233	257.834	4.48%	244.099	4.24%	501.934	817.772	(315.838)	19,027.863	19,409.377
2013	6,000.204	268.809	4.48%	254.468	4.24%	523.278	886.656	(363.378)	20,371.606	20,481.271
2014	6,256.674	280.299	4.48%	265.325	4.24%	545.624	961.190	(415.566)	21,781.554	21,580.292
2015	6,526.100	292.369	4.48%	276.730	4.24%	569.099	1,041.090	(471.991)	23,259.168	22,706.369
2016	6,807.210	304.963	4.48%	288.631	4.24%	593.594	1,128.320	(534.727)	24,803.993	23,850.261
2017	7,101.738	318.158	4.48%	301.099	4.24%	619.257	1,220.706	(601.449)	26,417.754	25,014.814
2018	7,413.281	332.115	4.48%	314.289	4.24%	646.404	1,316.343	(669.939)	28,104.931	26,203.282
2019	7,741.435	346.816	4.48%	328.182	4.24%	674.998	1,415.579	(740.581)	29,870.216	27,413.723
2020	8,086.925	362.294	4.48%	342.808	4.24%	705.103	1,519.012	(813.910)	31,718.104	28,643.695
2021	8,450.274	378.572	4.48%	358.192	4.24%	736.764	1,625.682	(888.918)	33,654.541	29,894.719
2022	8,835.047	395.810	4.48%	374.481	4.24%	770.291	1,734.729	(964.437)	35,687.355	31,169.268
2023	9,239.668	413.937	4.48%	391.612	4.24%	805.549	1,844.442	(1,038.893)	37,826.886	32,471.094
2024	9,665.342	433.007	4.48%	409.631	4.24%	842.638	1,955.531	(1,112.893)	40,083.860	33,799.362
2025	10,114.012	453.108	4.48%	428.618	4.24%	881.726	2,072.272	(1,190.546)	42,465.535	35,153.227
2026	10,587.130	474.303	4.48%	448.640	4.24%	922.943	2,186.136	(1,263.192)	44,989.002	36,539.464
2027	11,085.187	496.616	4.48%	469.713	4.24%	966.329	2,302.412	(1,336.083)	47,667.441	37,957.232
2028	11,609.904	520.124	4.48%	491.908	4.24%	1,012.032	2,420.264	(1,408.232)	50,516.178	39,409.087
2029	12,164.140	544.953	4.48%	515.347	4.24%	1,060.301	2,538.597	(1,478.297)	53,553.381	40,903.582
2030	12,749.032	571.157	4.48%	540.078	4.24%	1,111.235	2,657.445	(1,546.210)	56,799.182	42,445.088
2031	13,365.000	598.752	4.48%	566.116	4.24%	1,164.868	2,775.618	(1,610.750)	60,276.845	44,044.048
2032	14,015.337	627.887	4.48%	593.600	4.24%	1,221.487	2,892.989	(1,671.502)	64,012.408	45,706.305
2033	14,701.613	658.632	4.48%	622.590	4.23%	1,281.223	3,010.982	(1,729.759)	68,032.892	47,438.778
2034	15,424.735	691.028	4.48%	653.135	4.23%	1,344.163	3,127.599	(1,783.436)	72,370.017	49,255.076
2035	16,186.518	725.156	4.48%	685.314	4.23%	1,410.470	3,244.970	(1,834.501)	77,056.575	51,161.518
2036	16,990.331	761.167	4.48%	719.257	4.23%	1,480.424	3,361.049	(1,880.626)	82,130.750	53,171.700

Chart 2-1
PERA Projections
Rate of Return - 9.5%

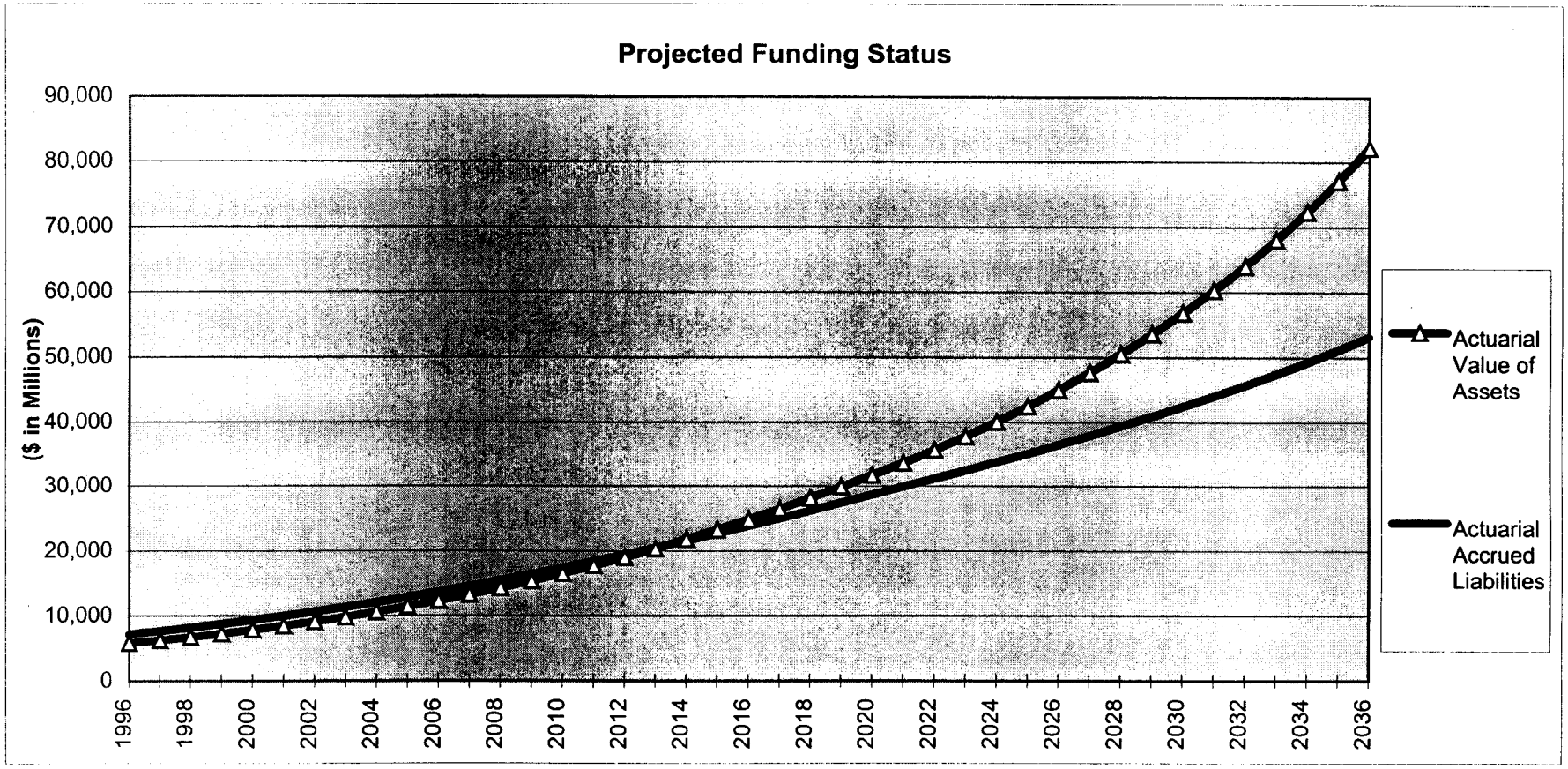


Chart 2-2
PERA Projections
Rate of Return - 9.5%

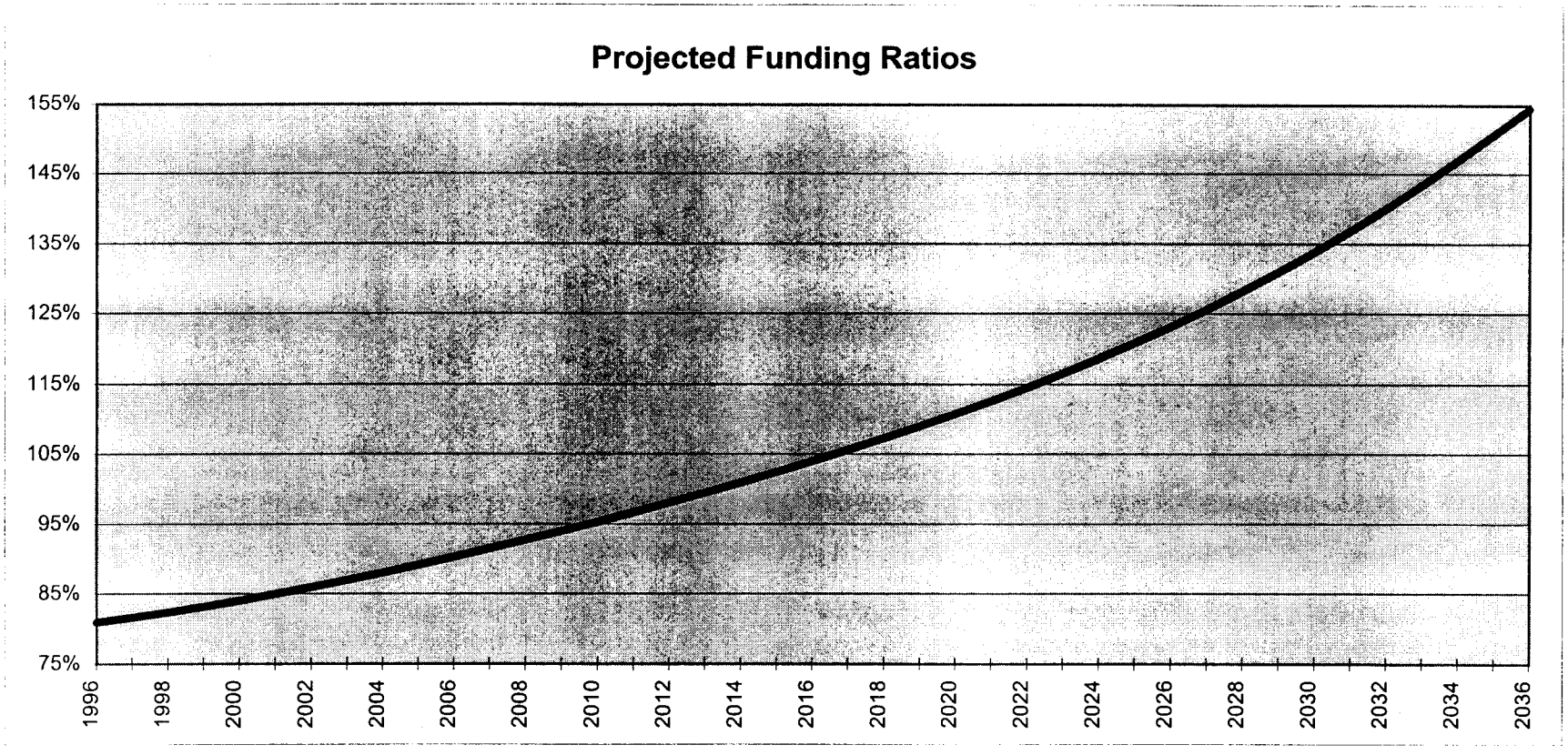


Chart 7-1

PERA Projections
Projected Mortality Improvement

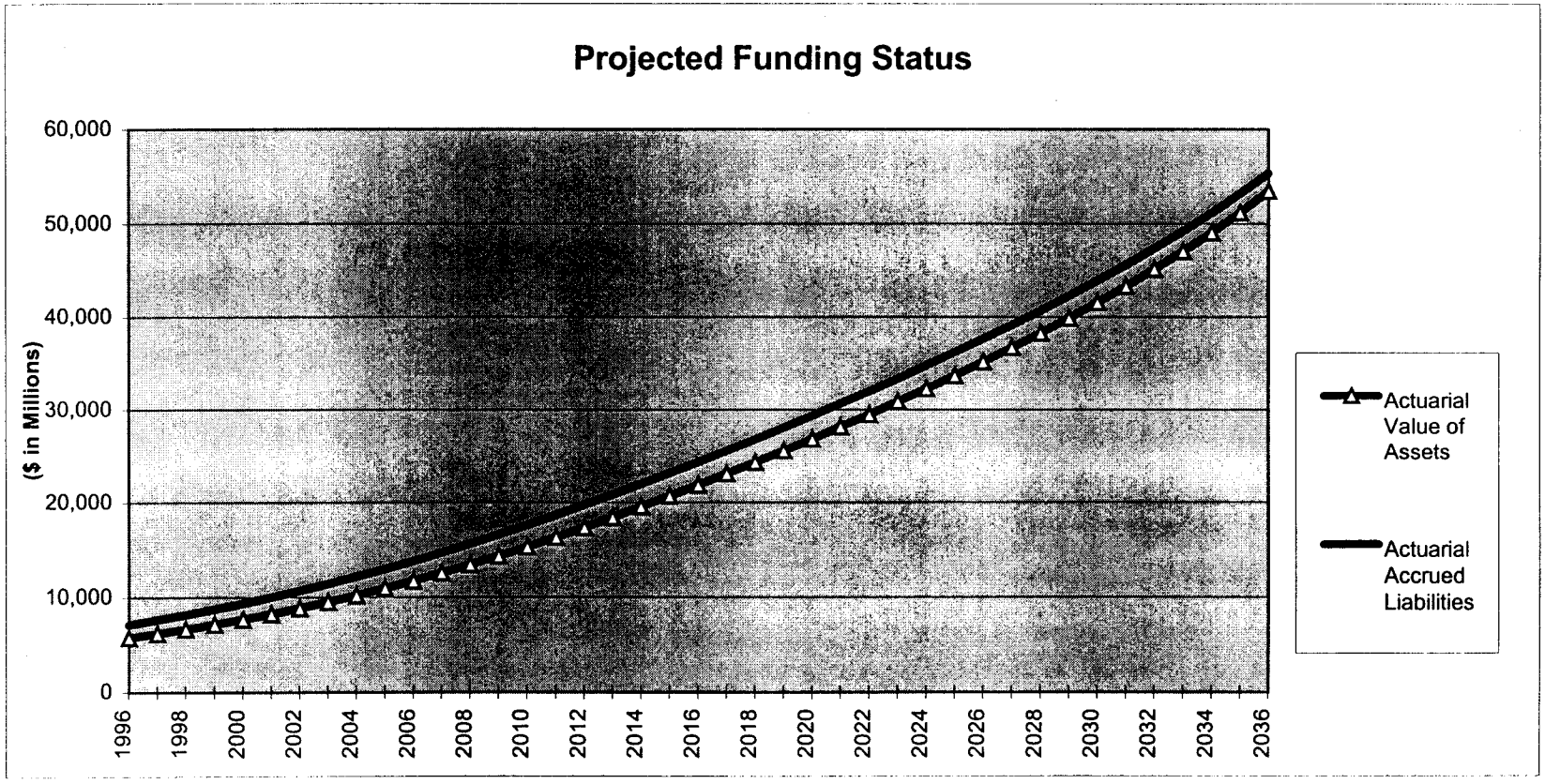
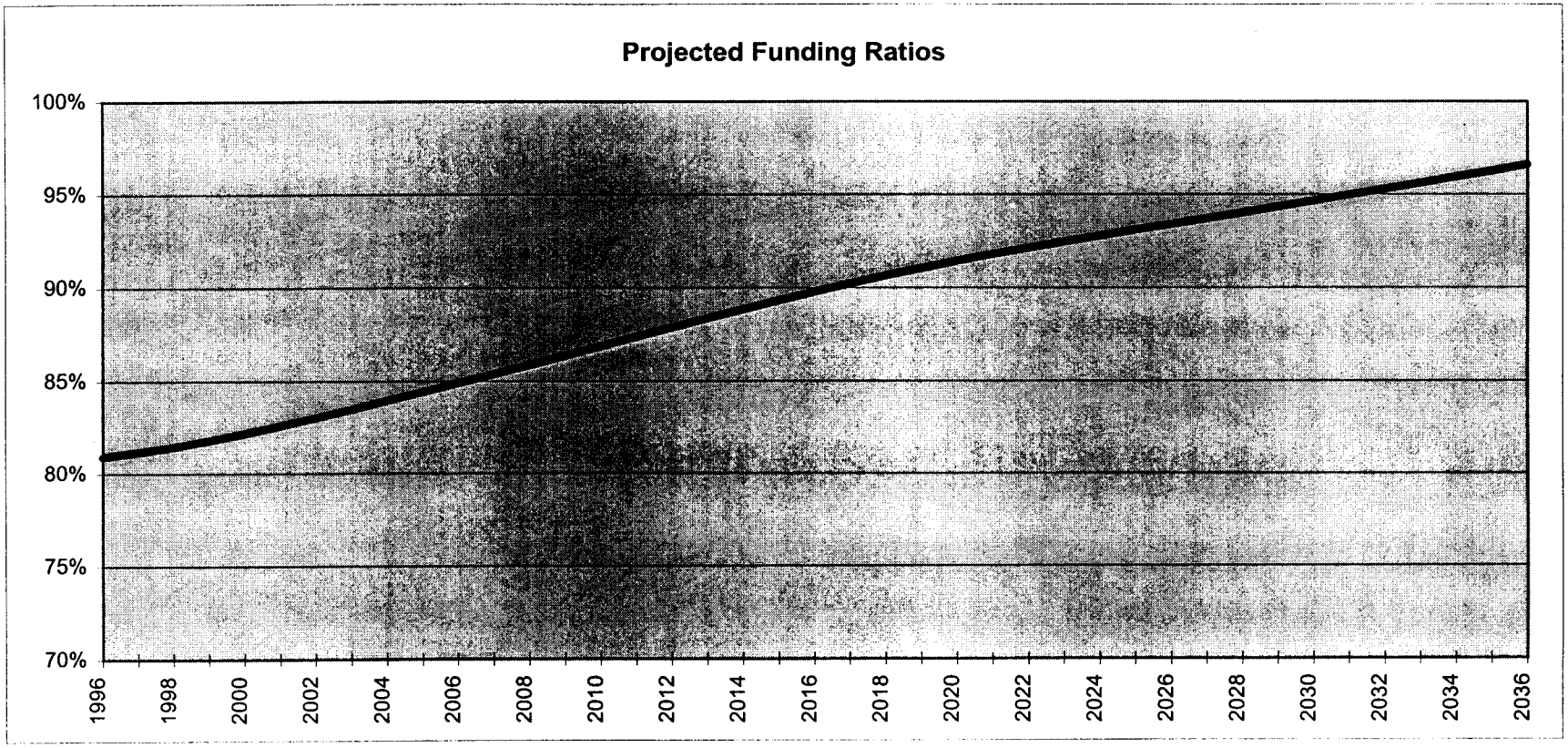


Chart 7-2

PERA Projections
Projected Mortality Improvement



Projection 3
Rate of Return - 7.5%

This projection is identical to the Base Line, except the return on the assets of the fund - other than the PERF share of MPRIF - is 7.5%. Again, MPRIF is assumed to earn 8.5%.

Table 3 sets out the results of this projection. As in Projection 2, all values are identical to the Base Line except for the asset values.

A drop of 100 basis points from that assumed for non-MPRIF assets produces an asset value which is 28% lower than the Base Line after 40 years. In addition, this asset value is about half that generated by the 9.5% projection.

Table 3 and Charts 3-1 and 3-2 show that the assets value of PERF doesn't reach the level of the AAL over 40 years. In fact, with the passage of time the gap widens, both in absolute terms (Chart 3-1) and in ratio (Chart 3-2).

This projection indicates that, at this level of return investment and the current contribution levels, PERF would never be fully funded.

Table 3
PERA Projections
Rate of Return - 7.5%
($ in millions)

Year	Valuation Payroll	Employer Contributions $	Employer Contributions % of Pay	Employee Contributions $	Employee Contributions % of Pay	Total Statutory Contributions	Total Benefits and Refunds	Net Non-Investment Cash Flow	Actuarial Value of Assets	Actuarial Accrued Liabilities
1996	2,924.530								5,786.398	7,149.674
1997	3,052.959	139.826	4.58%	130.118	4.26%	269.943	329.922	(59.979)	6,191.657	7,648.220
1998	3,184.344	145.525	4.57%	135.592	4.26%	281.117	346.713	(65.596)	6,622.575	8,176.155
1999	3,321.871	151.477	4.56%	141.346	4.26%	292.823	364.115	(71.292)	7,080.990	8,733.073
2000	3,466.035	157.705	4.55%	147.395	4.25%	305.100	382.203	(77.103)	7,569.026	9,322.114
2001	3,616.451	164.187	4.54%	153.720	4.25%	317.907	401.396	(83.488)	8,088.518	9,946.794
2002	3,773.665	170.947	4.53%	160.341	4.25%	331.288	422.147	(90.859)	8,641.016	10,609.169
2003	3,937.914	177.994	4.52%	167.266	4.25%	345.260	444.998	(99.738)	9,227.690	11,310.520
2004	4,108.943	185.313	4.51%	174.483	4.25%	359.797	470.448	(110.651)	9,849.298	12,051.328
2005	4,287.118	192.920	4.50%	182.007	4.25%	374.927	498.545	(123.618)	10,506.695	12,832.902
2006	4,473.460	200.411	4.48%	189.869	4.24%	390.280	529.639	(139.359)	11,200.058	13,657.005
2007	4,667.428	209.101	4.48%	198.072	4.24%	407.172	564.381	(157.209)	11,930.255	14,522.539
2008	4,868.936	218.128	4.48%	206.595	4.24%	424.724	603.772	(179.048)	12,696.365	15,428.857
2009	5,077.323	227.464	4.48%	215.412	4.24%	442.876	648.616	(205.741)	13,496.523	16,371.816
2010	5,294.090	237.175	4.48%	224.584	4.24%	461.759	698.633	(236.874)	14,329.264	17,351.669
2011	5,520.414	247.315	4.48%	234.161	4.24%	481.476	754.199	(272.724)	15,192.618	18,366.558
2012	5,755.233	257.834	4.48%	244.099	4.24%	501.934	817.772	(315.838)	16,081.841	19,409.377
2013	6,000.204	268.809	4.48%	254.468	4.24%	523.278	886.656	(363.378)	16,994.877	20,481.271
2014	6,256.674	280.299	4.48%	265.325	4.24%	545.624	961.190	(415.566)	17,929.121	21,580.292
2015	6,526.100	292.369	4.48%	276.730	4.24%	569.099	1,041.090	(471.991)	18,882.167	22,706.369
2016	6,807.210	304.963	4.48%	288.631	4.24%	593.594	1,128.320	(534.727)	19,849.158	23,850.261
2017	7,101.738	318.158	4.48%	301.099	4.24%	619.257	1,220.706	(601.449)	20,827.499	25,014.814
2018	7,413.281	332.115	4.48%	314.289	4.24%	646.404	1,316.343	(669.939)	21,816.423	26,203.282
2019	7,741.435	346.816	4.48%	328.182	4.24%	674.998	1,415.579	(740.581)	22,814.529	27,413.723
2020	8,086.925	362.294	4.48%	342.808	4.24%	705.103	1,519.012	(813.910)	23,819.828	28,643.695
2021	8,450.274	378.572	4.48%	358.192	4.24%	736.764	1,625.682	(888.918)	24,831.265	29,894.719
2022	8,835.047	395.810	4.48%	374.481	4.24%	770.291	1,734.729	(964.437)	25,848.818	31,169.268
2023	9,239.668	413.937	4.48%	391.612	4.24%	805.549	1,844.442	(1,038.893)	26,873.979	32,471.094
2024	9,665.342	433.007	4.48%	409.631	4.24%	842.638	1,955.531	(1,112.893)	27,907.679	33,799.362
2025	10,114.012	453.108	4.48%	428.618	4.24%	881.726	2,072.272	(1,190.546)	28,946.848	35,153.227
2026	10,587.130	474.303	4.48%	448.640	4.24%	922.943	2,186.136	(1,263.192)	29,997.082	36,539.464
2027	11,085.187	496.616	4.48%	469.713	4.24%	966.329	2,302.412	(1,336.083)	31,058.992	37,957.232
2028	11,609.904	520.124	4.48%	491.908	4.24%	1,012.032	2,420.264	(1,408.232)	32,134.393	39,409.087
2029	12,164.140	544.953	4.48%	515.347	4.24%	1,060.301	2,538.597	(1,478.297)	33,226.653	40,903.582
2030	12,749.032	571.157	4.48%	540.078	4.24%	1,111.235	2,657.445	(1,546.210)	34,339.289	42,445.088
2031	13,365.000	598.752	4.48%	566.116	4.24%	1,164.868	2,775.618	(1,610.750)	35,477.409	44,044.048
2032	14,015.337	627.887	4.48%	593.600	4.24%	1,221.487	2,892.989	(1,671.502)	36,646.805	45,706.305
2033	14,701.613	658.632	4.48%	622.590	4.23%	1,281.223	3,010.982	(1,729.759)	37,852.499	47,438.778
2034	15,424.735	691.028	4.48%	653.135	4.23%	1,344.163	3,127.599	(1,783.436)	39,102.102	49,255.076
2035	16,186.518	725.156	4.48%	685.314	4.23%	1,410.470	3,244.970	(1,834.501)	40,401.641	51,161.518
2036	16,990.331	761.167	4.48%	719.257	4.23%	1,480.424	3,361.049	(1,880.626)	41,760.160	53,171.700

Chart 3-1
PERA Projections
Rate of Return - 7.5%

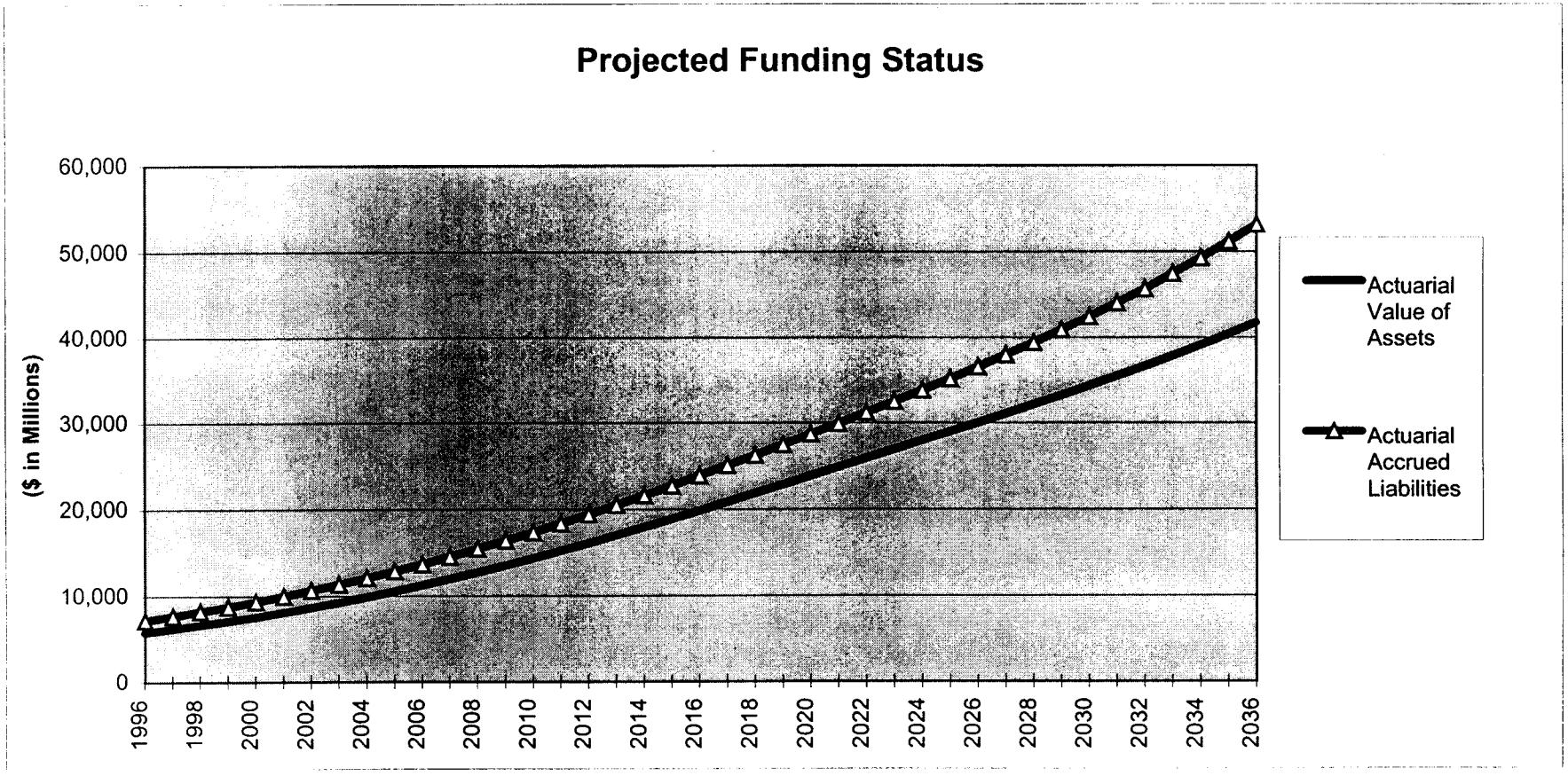
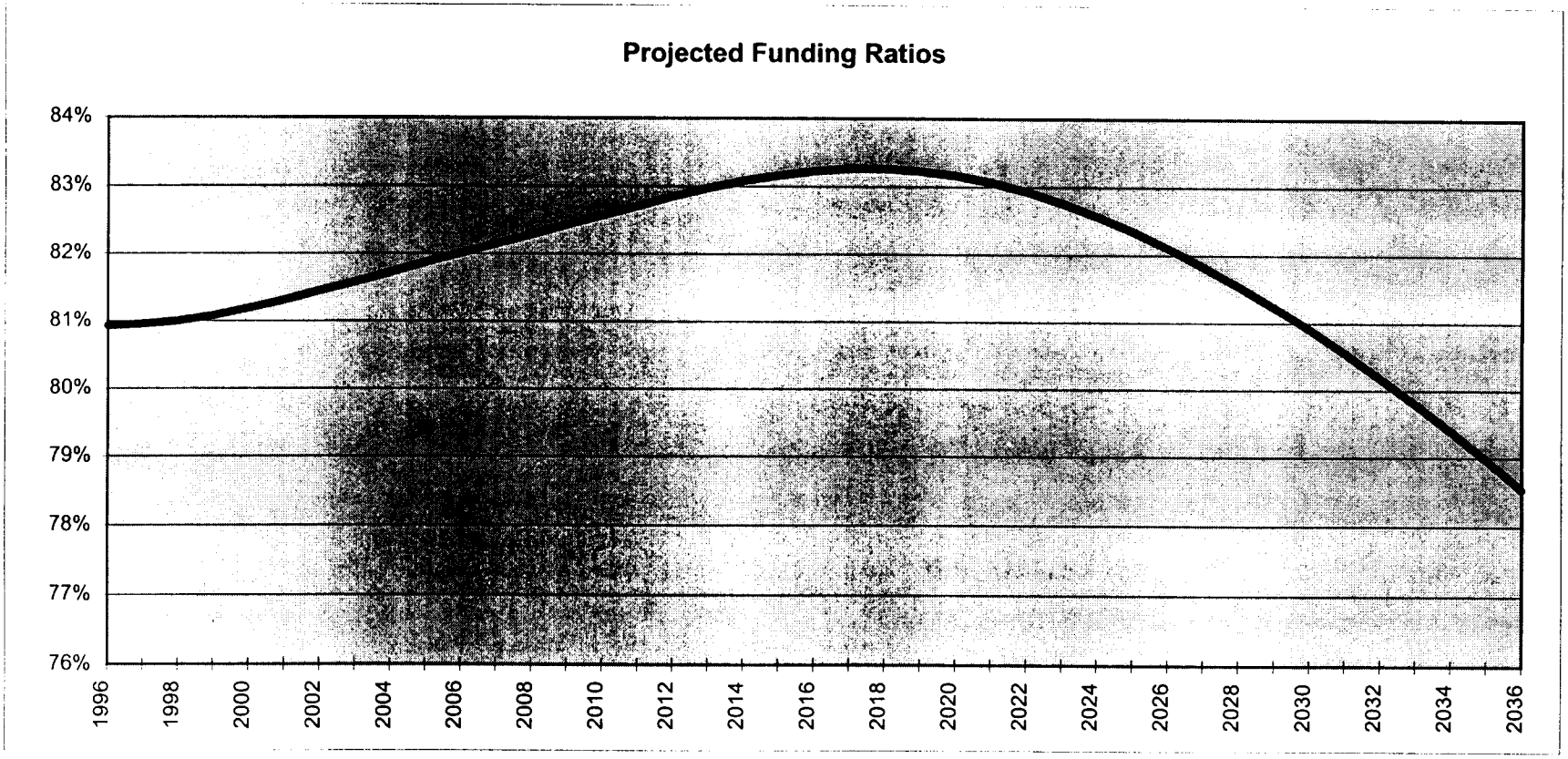


Chart 3-2
PERA Projections
Rate of Return - 7.5%



Projection 4
Investment Cycle

Projection 4 is another variation on the investment return of non-MPRIF assets. The Base Line and Projections 2 and 3 assume the same level of investment return each year. Obviously, this is not the way the world works. The markets fluctuate, sometimes rather wildly, from year to year.

In order to simulate this effect, we have looked at returns in various markets over a long period of time. We have assumed for this projection that:

1. **The Markets** - The markets for all asset classes will precisely follow the pattern of the period 1966 - 95. Thus, 1997 will look like 1966, 1998 will look like 1967 and so forth. After 30 years, we assume that the markets will recycle themselves. Thus, 2027 will look like 1996, and so forth.
2. **Distribution of PERF Assets** - As of June 30, the PERF interest in MPRIF constituted almost 53% of the market value of the fund. Of the remainder, over 71% was invested in equities, 23% in fixed income investments, and the remaining 6% in cash and real estate. For the purpose of this projection, we have assumed that 70% of assets for the projection period will be invested in common stocks and the remainder in fixed income investments.
3. **Indices** - For the purpose of this projection, we have assumed that the S & P 500 Index represents the PERF equity portfolio and that the Lehman Brothers Long Term Corporate Bond Index represents the fixed income portfolio. The Lehman Brothers Index came into being in 1976. For the first 10 years of the period, the funds fixed income investments are represented by a long term government bond index.

The thirty year period selected starts with a 15 year period of mixed and somewhat negative results followed by a 15 year period of consistently excellent results.

Table 4 shows that this investment scenario, even with mixed results in the early years, produces asset values which grow to the level of the AAL in 2020. The asset values react in a volatile manner in the last 10 years of the period, but remain significantly in excess of the AAL after 2020. This volatility is shown in both Chart 4-1 and Chart 4-2.

Table 4

PERA Projections

Investment Return - Cyclical

($ in millions)

Year	Valuation Payroll	Employer Contributions $	Employer Contributions % of Pay	Employee Contributions $	Employee Contributions % of Pay	Total Statutory Contributions	Total Benefits and Refunds	Net Non-Investment Cash Flow	Actuarial Value of Assets	Actuarial Accrued Liabilities
1996	2,924.530								5,786.398	7,149.674
1997	3,052.959	139.826	4.58%	130.118	4.26%	269.943	329.922	(59.979)	6,071.619	7,648.220
1998	3,184.344	145.525	4.57%	135.592	4.26%	281.117	346.713	(65.596)	6,519.410	8,176.155
1999	3,321.871	151.477	4.56%	141.346	4.26%	292.823	364.115	(71.292)	7,056.470	8,733.073
2000	3,466.035	157.705	4.55%	147.395	4.25%	305.100	382.203	(77.103)	7,343.920	9,322.114
2001	3,616.451	164.187	4.54%	153.720	4.25%	317.907	401.396	(83.488)	7,135.261	9,946.794
2002	3,773.665	170.947	4.53%	160.341	4.25%	331.288	422.147	(90.859)	8,318.934	10,609.169
2003	3,937.914	177.994	4.52%	167.266	4.25%	345.260	444.998	(99.738)	9,002.317	11,310.520
2004	4,108.943	185.313	4.51%	174.483	4.25%	359.797	470.448	(110.651)	9,353.912	12,051.328
2005	4,287.118	192.920	4.50%	182.007	4.25%	374.927	498.545	(123.618)	9,268.296	12,832.902
2006	4,473.460	200.411	4.48%	189.869	4.24%	390.280	529.639	(139.359)	10,136.565	13,657.005
2007	4,667.428	209.101	4.48%	198.072	4.24%	407.172	564.381	(157.209)	10,940.675	14,522.539
2008	4,868.936	218.128	4.48%	206.595	4.24%	424.724	603.772	(179.048)	11,500.862	15,428.857
2009	5,077.323	227.464	4.48%	215.412	4.24%	442.876	648.616	(205.741)	11,887.371	16,371.816
2010	5,294.090	237.175	4.48%	224.584	4.24%	461.759	698.633	(236.874)	12,794.312	17,351.669
2011	5,520.414	247.315	4.48%	234.161	4.24%	481.476	754.199	(272.724)	13,799.429	18,366.558
2012	5,755.233	257.834	4.48%	244.099	4.24%	501.934	817.772	(315.838)	14,820.813	19,409.377
2013	6,000.204	268.809	4.48%	254.468	4.24%	523.278	886.656	(363.378)	15,061.047	20,481.271
2014	6,256.674	280.299	4.48%	265.325	4.24%	545.624	961.190	(415.566)	18,037.459	21,580.292
2015	6,526.100	292.369	4.48%	276.730	4.24%	569.099	1,041.090	(471.991)	18,278.145	22,706.369
2016	6,807.210	304.963	4.48%	288.631	4.24%	593.594	1,128.320	(534.727)	20,777.436	23,850.261
2017	7,101.738	318.158	4.48%	301.099	4.24%	619.257	1,220.706	(601.449)	23,776.751	25,014.814
2018	7,413.281	332.115	4.48%	314.289	4.24%	646.404	1,316.343	(669.939)	26,169.072	26,203.282
2019	7,741.435	346.816	4.48%	328.182	4.24%	674.998	1,415.579	(740.581)	26,352.227	27,413.723
2020	8,086.925	362.294	4.48%	342.808	4.24%	705.103	1,519.012	(813.910)	28,816.370	28,643.695
2021	8,450.274	378.572	4.48%	358.192	4.24%	736.764	1,625.682	(888.918)	31,009.003	29,894.719
2022	8,835.047	395.810	4.48%	374.481	4.24%	770.291	1,734.729	(964.437)	32,638.544	31,169.268
2023	9,239.668	413.937	4.48%	391.612	4.24%	805.549	1,844.442	(1,038.893)	35,132.549	32,471.094
2024	9,665.342	433.007	4.48%	409.631	4.24%	842.638	1,955.531	(1,112.893)	37,736.426	33,799.362
2025	10,114.012	453.108	4.48%	428.618	4.24%	881.726	2,072.272	(1,190.546)	38,156.312	35,153.227
2026	10,587.130	474.303	4.48%	448.640	4.24%	922.943	2,186.136	(1,263.192)	42,566.322	36,539.464
2027	11,085.187	496.616	4.48%	469.713	4.24%	966.329	2,302.412	(1,336.083)	47,775.388	37,957.232
2028	11,609.904	520.124	4.48%	491.908	4.24%	1,012.032	2,420.264	(1,408.232)	48,722.956	39,409.087
2029	12,164.140	544.953	4.48%	515.347	4.24%	1,060.301	2,538.597	(1,478.297)	51,324.905	40,903.582
2030	12,749.032	571.157	4.48%	540.078	4.24%	1,111.235	2,657.445	(1,546.210)	54,680.019	42,445.088
2031	13,365.000	598.752	4.48%	566.116	4.24%	1,164.868	2,775.618	(1,610.750)	55,266.394	44,044.048
2032	14,015.337	627.887	4.48%	593.600	4.24%	1,221.487	2,892.989	(1,671.502)	50,715.346	45,706.305
2033	14,701.613	658.632	4.48%	622.590	4.23%	1,281.223	3,010.982	(1,729.759)	59,885.977	47,438.778
2034	15,424.735	691.028	4.48%	653.135	4.23%	1,344.163	3,127.599	(1,783.436)	63,907.471	49,255.076
2035	16,186.518	725.156	4.48%	685.314	4.23%	1,410.470	3,244.970	(1,834.501)	64,494.617	51,161.518
2036	16,990.331	761.167	4.48%	719.257	4.23%	1,480.424	3,361.049	(1,880.626)	60,593.018	53,171.700

Chart 4-1

PERA Projections
Investment Return - Cyclical

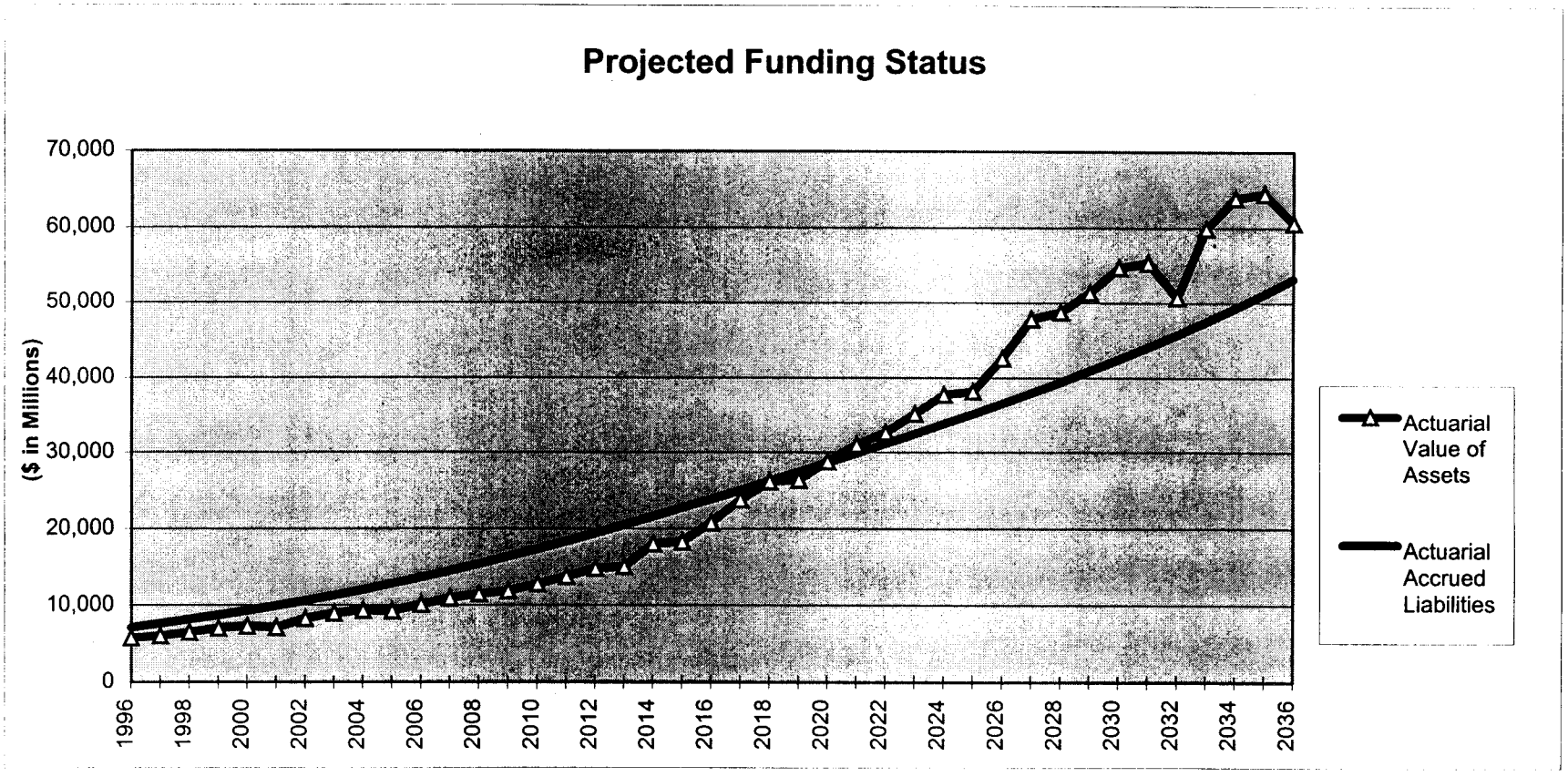
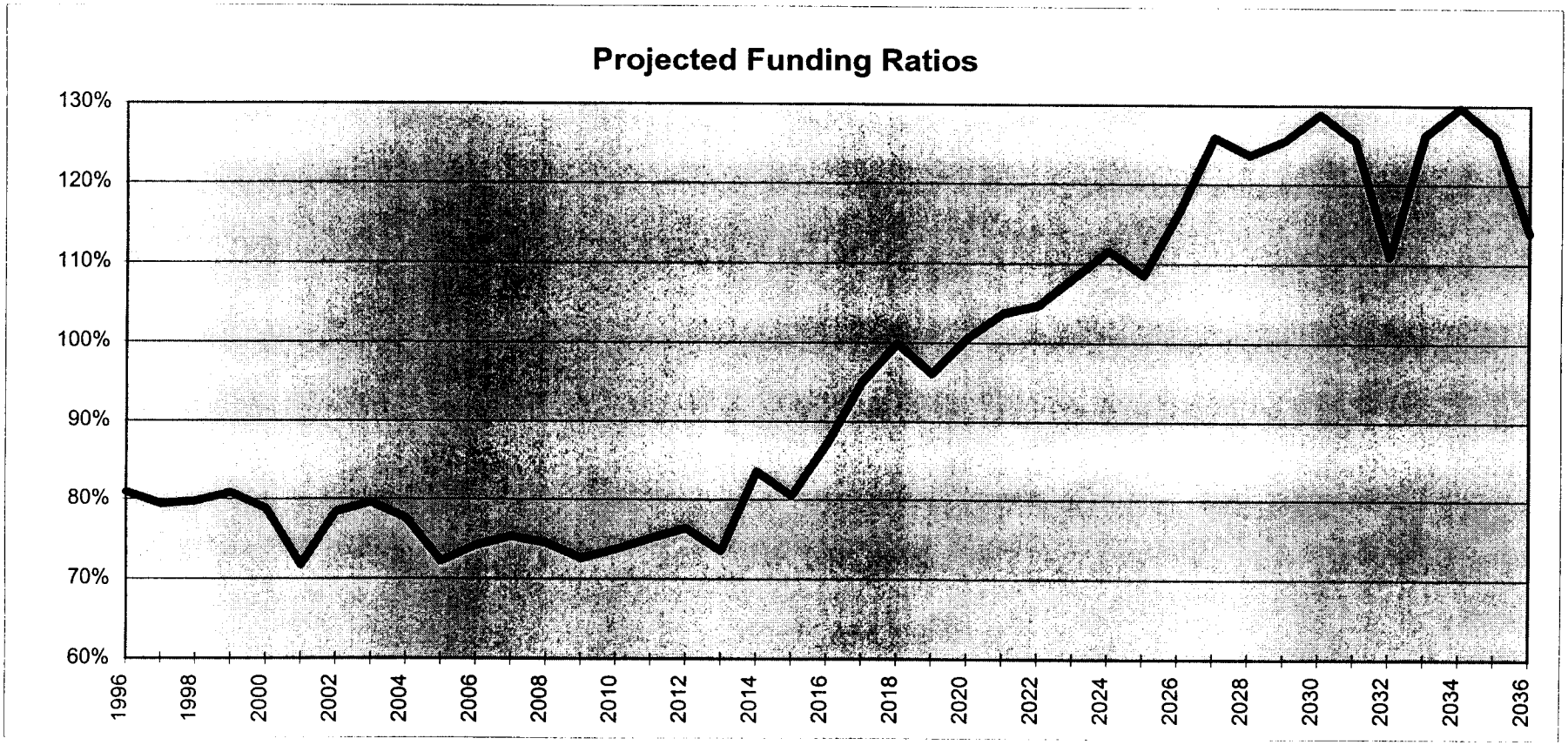


Chart 4-2

PERA Projections
Investment Return - Cyclical



Projection 5
Active Population Increases by 2% per Year

This projection is identical to the Base Line except that the group of active members of PERF is assumed to grow at the rate of 2% per year. In fact, in recent years that active population has been growing at a rate of 3 - 4% per year.

Table 5 shows that this population growth has several effects:

1. **Benefit Payments** - Over the 40 year projection period, benefit payments increase meaningfully. At the end of the period the annual benefits being paid in this scenario are 15% higher than under the Base Line.
2. **Contributions** - Since payrolls by the end of the period are double those of the Base Line, contributions to PERF in the 40th year are also double those of the Base Line.
3. **Assets** - The higher benefit payments are more than offset by the higher contributions. Thus, assets grow to significantly higher levels under this scenario.
4. **Actuarial Accrued Liability** - AAL is also greater in this scenario. However, AAL does not grow as fast as do assets.

The bottom line, here, is that assets first exceed AAL in 2021. Thus, under this scenario the funding goal would nearly be achieved.

Charts 5-1 and 5-2 illustrate this funding progress.

Table 5

PERA Projections
2% Annual Population Growth

($ in millions)

Year	Valuation Payroll	Employer Contributions $	Employer Contributions % of Pay	Ee Contributions $	Ee Contributions % of Pay	Total Statutory Contributions	Total Benefits and Refunds	Net Non-Investment Cash Flow	Actuarial Value of Assets	Actuarial Accrued Liabilities
1996	2,924.530								5,786.398	7,149.674
1997	3,052.959	139.826	4.58%	130.118	4.26%	269.943	329.922	(59.979)	6,215.765	7,648.220
1998	3,228.499	147.542	4.57%	137.472	4.26%	285.015	346.713	(61.698)	6,679.839	8,176.155
1999	3,414.376	155.696	4.56%	145.282	4.26%	300.977	364.223	(63.246)	7,181.746	8,737.558
2000	3,611.447	164.321	4.55%	153.579	4.25%	317.900	382.590	(64.690)	7,724.811	9,335.916
2001	3,819.803	173.419	4.54%	162.364	4.25%	335.783	402.160	(66.377)	8,312.280	9,975.261
2002	4,040.462	183.033	4.53%	171.677	4.25%	354.710	423.329	(68.619)	8,947.347	10,658.289
2003	4,274.298	193.198	4.52%	181.554	4.25%	374.753	446.667	(71.914)	9,632.964	11,386.977
2004	4,521.551	203.922	4.51%	192.004	4.25%	395.926	472.667	(76.741)	10,371.830	12,162.592
2005	4,783.399	215.253	4.50%	203.076	4.25%	418.329	501.379	(83.049)	11,166.929	12,987.367
2006	5,061.426	226.752	4.48%	214.824	4.24%	441.576	533.161	(91.585)	12,020.720	13,864.061
2007	5,356.216	239.958	4.48%	227.302	4.24%	467.260	568.677	(101.417)	12,936.842	14,792.722
2008	5,668.725	253.959	4.48%	240.531	4.24%	494.490	608.944	(114.453)	13,917.255	15,773.981
2009	5,999.629	268.783	4.48%	254.541	4.24%	523.325	654.790	(131.465)	14,963.283	16,805.093
2010	6,351.017	284.526	4.48%	269.420	4.24%	553.946	705.972	(152.026)	16,076.807	17,887.776
2011	6,725.412	301.298	4.48%	285.274	4.24%	586.573	762.905	(176.332)	17,259.662	19,021.750
2012	7,125.223	319.210	4.48%	302.205	4.24%	621.415	828.053	(206.638)	18,511.492	20,202.109
2013	7,551.075	338.288	4.48%	320.241	4.24%	658.529	898.822	(240.293)	19,834.672	21,431.534
2014	8,006.997	358.713	4.48%	339.550	4.24%	698.264	975.587	(277.323)	21,231.750	22,710.381
2015	8,496.439	380.640	4.48%	360.279	4.24%	740.920	1,058.143	(317.223)	22,706.020	24,040.935
2016	9,022.718	404.218	4.48%	382.570	4.24%	786.788	1,148.514	(361.726)	24,259.245	25,416.877
2017	9,586.522	429.476	4.48%	406.449	4.24%	835.925	1,244.689	(408.764)	25,895.499	26,843.328
2018	10,194.309	456.705	4.48%	432.191	4.24%	888.896	1,344.851	(455.955)	27,621.679	28,326.852
2019	10,849.159	486.042	4.48%	459.927	4.24%	945.970	1,449.465	(503.496)	29,445.064	29,868.954
2020	11,554.328	517.634	4.48%	489.793	4.24%	1,007.427	1,559.318	(551.891)	31,373.026	31,470.591
2021	12,312.451	551.598	4.48%	521.903	4.24%	1,073.500	1,673.604	(600.104)	33,414.645	33,137.161
2022	13,136.047	588.495	4.48%	556.783	4.24%	1,145.278	1,791.545	(646.267)	35,581.717	34,877.066
2023	14,014.562	627.852	4.48%	593.990	4.24%	1,221.842	1,911.809	(689.967)	37,887.470	36,696.835
2024	14,957.227	670.084	4.48%	633.908	4.24%	1,303.992	2,035.305	(731.313)	40,346.145	38,600.759
2025	15,975.158	715.687	4.48%	677.006	4.24%	1,392.693	2,166.471	(773.777)	42,969.575	40,595.074
2026	17,063.107	764.427	4.48%	723.066	4.24%	1,487.493	2,297.264	(809.771)	45,778.504	42,690.003
2027	18,228.302	816.628	4.48%	772.388	4.24%	1,589.016	2,433.261	(844.244)	48,790.284	44,890.755
2028	19,476.424	872.544	4.48%	825.210	4.24%	1,697.754	2,574.051	(876.298)	52,024.677	47,205.664
2029	20,832.693	933.305	4.48%	882.600	4.24%	1,815.904	2,718.423	(902.519)	55,506.681	49,655.727
2030	22,272.611	997.813	4.48%	943.519	4.24%	1,941.332	2,867.445	(926.113)	59,260.078	52,246.274
2031	23,815.377	1,066.929	4.48%	1,008.774	4.24%	2,075.703	3,019.887	(944.183)	63,313.692	55,000.082
2032	25,469.820	1,141.048	4.48%	1,078.738	4.24%	2,219.786	3,176.023	(956.237)	67,699.307	57,931.939
2033	27,246.245	1,220.632	4.48%	1,153.836	4.23%	2,374.467	3,337.646	(963.178)	72,450.470	61,060.021
2034	29,148.107	1,305.835	4.48%	1,234.228	4.23%	2,540.064	3,503.137	(963.073)	77,605.591	64,410.447
2035	31,188.909	1,397.263	4.48%	1,320.493	4.23%	2,717.756	3,675.094	(957.338)	83,204.870	68,003.157
2036	33,378.224	1,495.344	4.48%	1,413.010	4.23%	2,908.355	3,851.744	(943.389)	89,294.619	71,867.126

Chart 5-1

PERA Projections
2% Annual Population Growth

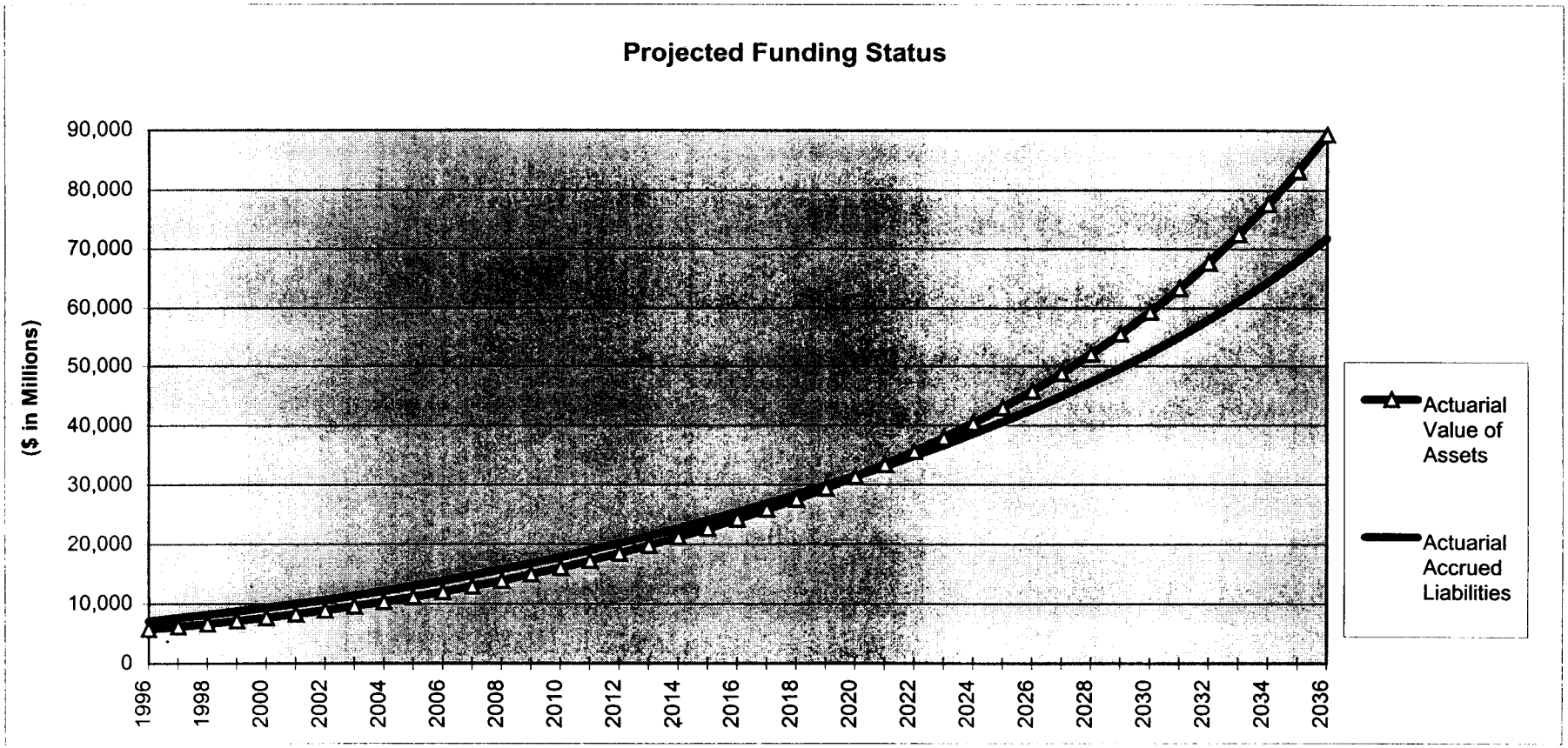
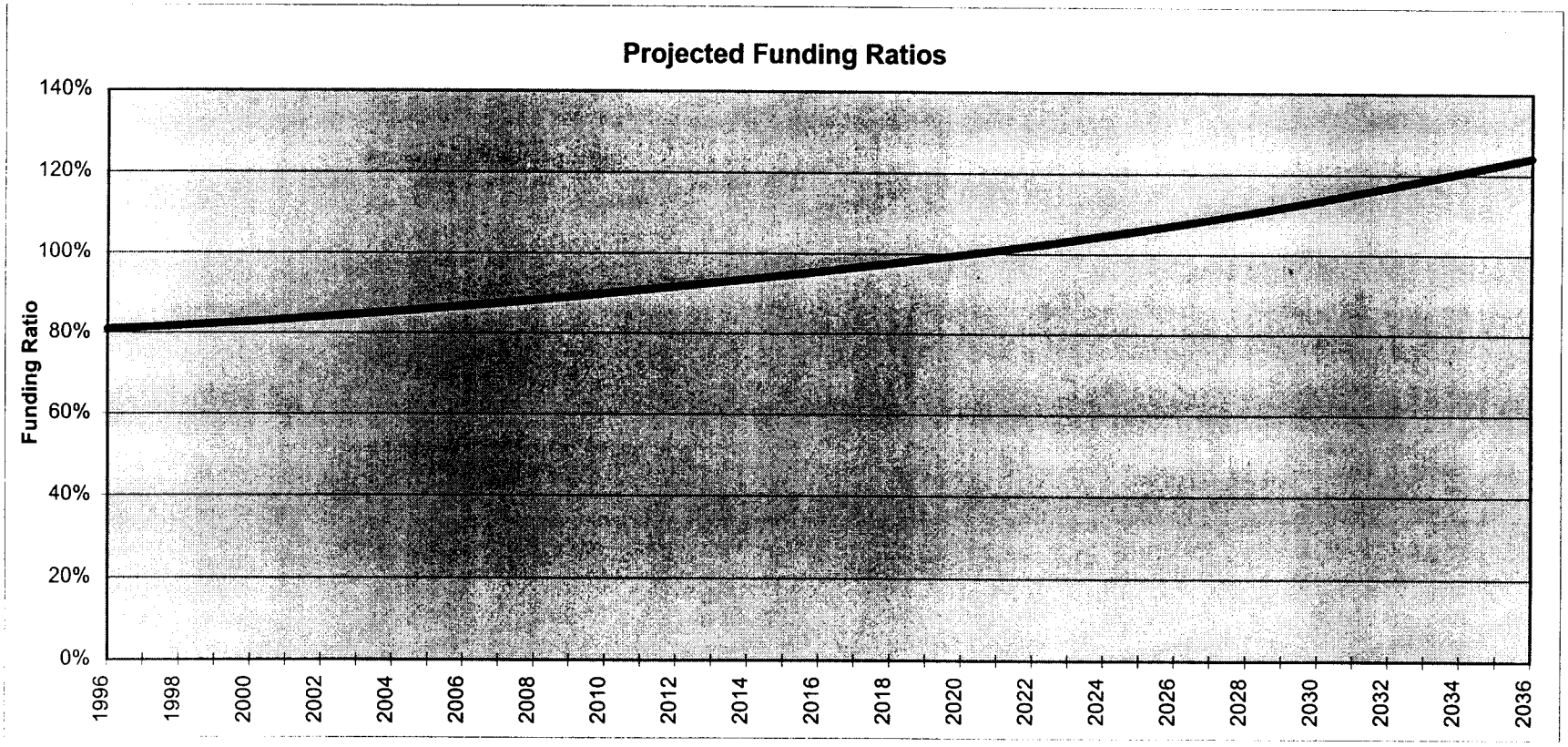


Chart 5-2

PERA Projections
2% Annual Population Growth



Projection 6
Active Population Declines by 2% per Year

This projection is identical to the Base Line except that the group of active members of PERF is assumed to decline by 2% per year. While there has, in fact, been growth in that population in recent years, there has also been considerable talk about "downsizing" government.

If this downsizing of government is realized, it would probably result in a large reduction in population in the first few years followed by a period of stability, or, possibly, slow growth. While this projection does not follow that pattern, it gives a sense of the impact of the contraction of active lives on the financing of PERF.

Table 6 shows the opposite picture from Table 5:

1. **Benefits** - Benefit payments are reduced over the period, but not substantially. In the last year of the projection, the projected benefit payments are only about 10% below those of the Base Line.
2. **Contributions** - Pay levels, however, are sharply lower. The projected salaries of active members in the last year of this projection are slightly over half the level of the Base line. Contributions follow directly.
3. **Actuarial Accrued Liability** - AAL in the last projection year is over 20% lower in this scenario than the Base Line.
4. **Assets** - Due to the drastic reduction in projected contributions to PERF, assets by the end of the projection period are 35% lower than the Base Line.

The net result is that PERF never reaches full funding in this scenario.

Charts 6-1 and 6-2 illustrate this phenomenon.

Table 6

PERA Projection
2% per Year Population Decline

($ in millions)

Year	Valuation Payroll	Employer Contributions $	Employer Contributions % of Pay	Employee Contributions $	Employee Contributions % of Pay	Total Statutory Contributions	Total Benefits and Refunds	Net Non-Investment Cash Flow	Actuarial Value of Assets	Actuarial Accrued Liabilities
1996	2,924.530								5,786.398	7,149.674
1997	3,052.959	139.826	4.58%	130.118	4.26%	269.943	329.922	(59.979)	6,215.765	7,648.220
1998	3,141.055	143.546	4.57%	133.749	4.26%	277.295	346.713	(69.418)	6,671.797	8,176.155
1999	3,232.912	147.421	4.56%	137.561	4.26%	284.981	364.009	(79.028)	7,156.582	8,728.675
2000	3,328.785	151.460	4.55%	141.559	4.25%	293.018	381.828	(88.809)	7,672.385	9,308.756
2001	3,428.085	155.635	4.54%	145.714	4.25%	301.349	400.665	(99.317)	8,221.086	9,919.592
2002	3,531.028	159.956	4.53%	150.032	4.25%	309.987	421.036	(111.049)	8,804.206	10,562.817
2003	3,637.477	164.414	4.52%	154.505	4.25%	318.919	443.454	(124.536)	9,422.844	11,239.253
2004	3,746.970	168.988	4.51%	159.112	4.25%	328.101	468.426	(140.325)	10,077.618	11,948.859
2005	3,859.401	173.673	4.50%	163.849	4.25%	337.522	496.002	(158.481)	10,769.136	12,692.321
2006	3,975.554	178.105	4.48%	168.736	4.24%	346.841	526.525	(179.684)	11,497.348	13,470.741
2007	4,094.210	183.421	4.48%	173.746	4.24%	357.167	560.637	(203.471)	12,262.680	14,282.252
2008	4,214.713	188.819	4.48%	178.836	4.24%	367.655	599.325	(231.670)	13,063.693	15,125.353
2009	4,335.689	194.239	4.48%	183.947	4.24%	378.186	643.375	(265.189)	13,897.877	15,994.973
2010	4,458.503	199.741	4.48%	189.137	4.24%	388.878	692.475	(303.598)	14,762.959	16,890.426
2011	4,583.696	205.350	4.48%	194.428	4.24%	399.778	746.972	(347.194)	15,656.162	17,808.851
2012	4,708.012	210.919	4.48%	199.683	4.24%	410.602	809.317	(398.715)	16,571.621	18,741.665
2013	4,834.341	216.578	4.48%	205.024	4.24%	421.603	876.734	(455.131)	17,506.129	19,689.149
2014	4,962.605	222.325	4.48%	210.448	4.24%	432.772	949.532	(516.760)	18,455.876	20,647.896
2015	5,093.349	228.182	4.48%	215.976	4.24%	444.158	1,027.364	(583.205)	19,417.139	21,616.405
2016	5,222.670	233.976	4.48%	221.445	4.24%	455.421	1,112.143	(656.722)	20,383.532	22,583.618
2017	5,353.806	239.851	4.48%	226.991	4.24%	466.841	1,201.563	(734.722)	21,350.821	23,551.170
2018	5,489.144	245.914	4.48%	232.714	4.24%	478.628	1,293.654	(815.026)	22,316.683	24,520.358
2019	5,626.694	252.076	4.48%	238.532	4.24%	490.608	1,388.672	(898.064)	23,278.148	25,487.276
2020	5,766.425	258.336	4.48%	244.441	4.24%	502.777	1,487.070	(984.292)	24,231.518	26,447.668
2021	5,908.501	264.701	4.48%	250.451	4.24%	515.152	1,587.773	(1,072.621)	25,173.919	27,400.982
2022	6,051.711	271.117	4.48%	256.507	4.24%	527.624	1,689.865	(1,162.241)	26,103.073	28,346.197
2023	6,201.513	277.828	4.48%	262.843	4.24%	540.671	1,791.352	(1,250.680)	27,019.084	29,286.133
2024	6,355.184	284.712	4.48%	269.342	4.24%	554.054	1,892.803	(1,338.749)	27,921.221	30,217.370
2025	6,510.343	291.663	4.48%	275.900	4.24%	567.563	1,998.383	(1,430.820)	28,804.135	31,135.251
2026	6,673.930	298.992	4.48%	282.814	4.24%	581.806	2,099.215	(1,517.409)	29,671.903	32,045.622
2027	6,843.835	306.604	4.48%	289.994	4.24%	596.598	2,200.407	(1,603.809)	30,523.434	32,944.927
2028	7,020.976	314.540	4.48%	297.476	4.24%	612.016	2,300.821	(1,688.805)	31,358.810	33,833.506
2029	7,196.941	322.423	4.48%	304.906	4.24%	627.329	2,399.506	(1,772.177)	32,178.350	34,713.173
2030	7,389.448	331.047	4.48%	313.034	4.24%	644.081	2,495.777	(1,851.696)	32,984.722	35,589.972
2031	7,589.888	340.027	4.48%	321.493	4.24%	661.520	2,588.553	(1,927.033)	33,781.162	36,468.255
2032	7,800.394	349.458	4.48%	330.375	4.24%	679.832	2,677.498	(1,997.666)	34,571.726	37,350.480
2033	8,020.068	359.299	4.48%	339.637	4.23%	698.936	2,763.845	(2,064.909)	35,359.445	38,239.032
2034	8,250.672	369.630	4.48%	349.361	4.23%	718.991	2,845.421	(2,126.430)	36,150.038	39,142.549
2035	8,490.125	380.358	4.48%	359.460	4.23%	739.817	2,924.142	(2,184.325)	36,947.525	40,062.020
2036	8,741.173	391.605	4.48%	370.043	4.23%	761.647	2,997.895	(2,236.247)	37,758.715	41,005.131

Chart 6-1

PERA Projection
2% per Year Population Decline

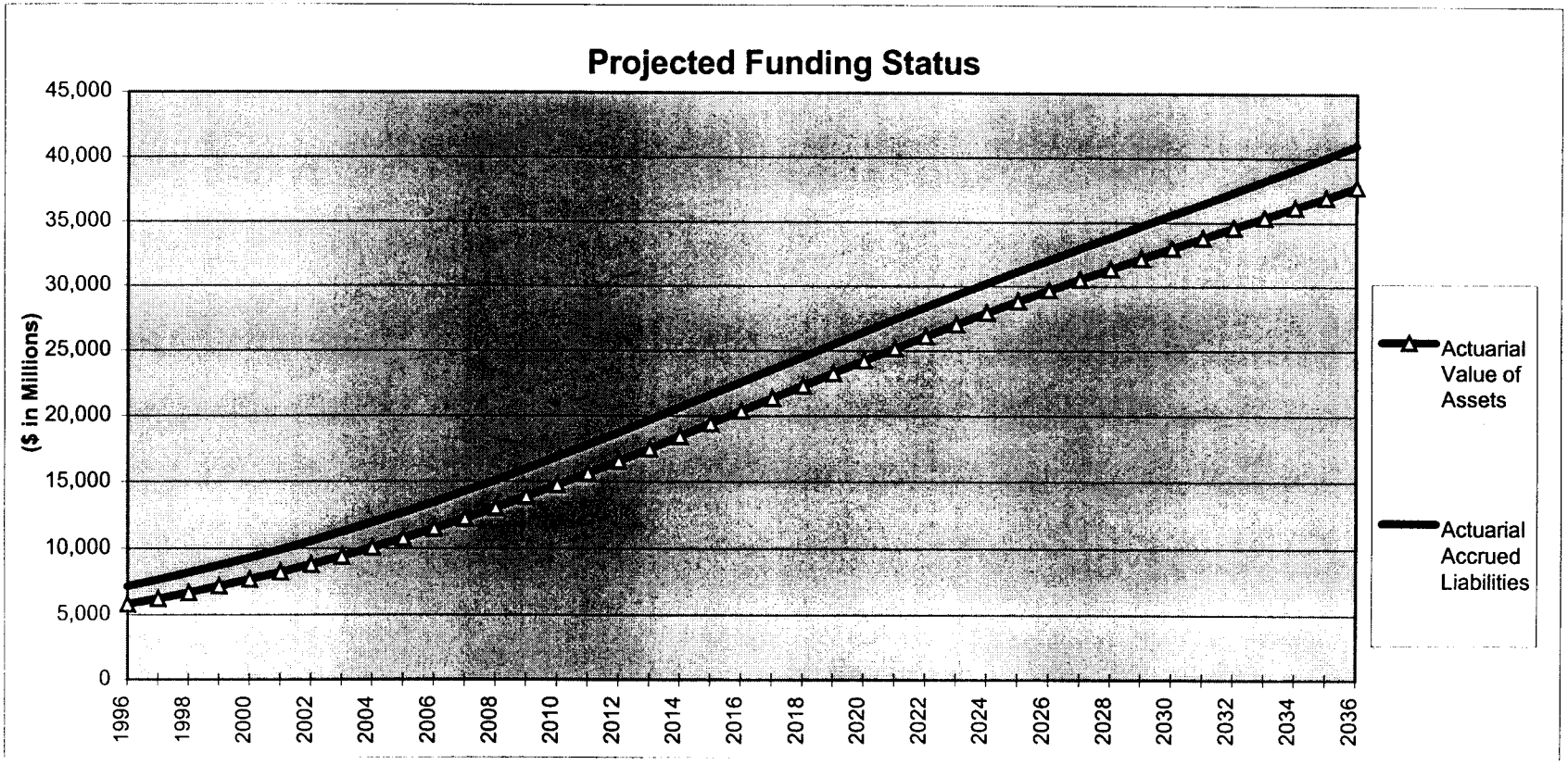
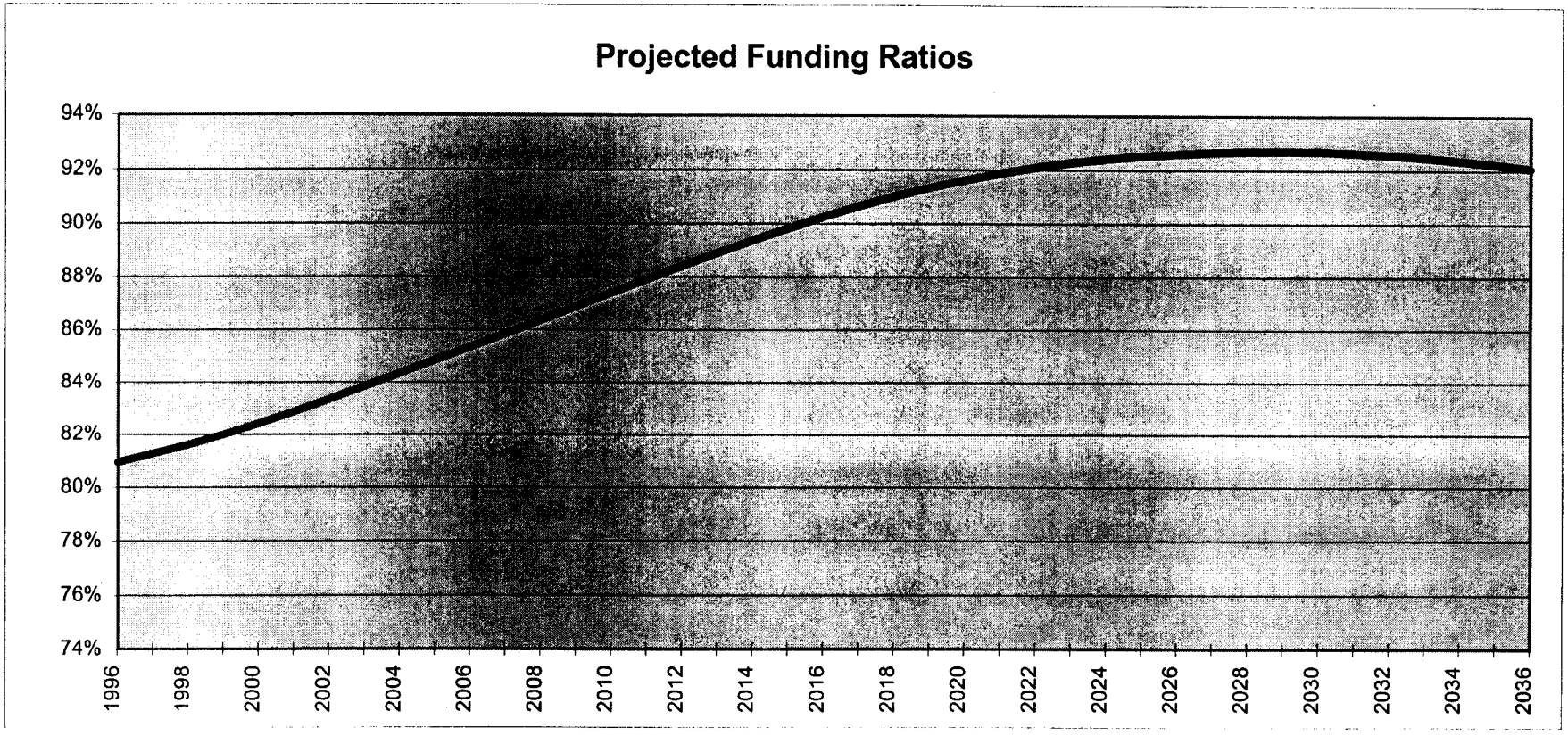


Chart 6-2

PERA Projection
2% per Year Population Decline



Projection 7
Projected Mortality Improvement

This scenario is identical to the Base Line except that a steady, ongoing improvement is longevity (about 1% every 10 years) is recognized throughout the projection period.

This longevity is reflected in both:

1. Increased amounts of benefits paid over time as retirees survive longer, and
2. Increases in AAL, as the changes in longevity are recognized.

The combination of effects above has a negative effect on the funding of PERF. Greater benefit payments mean lower emerging asset values. Lower asset values along with greater AAL results in a "double whammy". Although assets continue to approach the level of the AAL, PERF never reaches full funding during the 40 year projection period.

Table 7 and Charts 7-1 and 7-2 illustrate this result.

Table 7

PERA Projections

Projected Mortality Improvement

($ in millions)

Year	Valuation Payroll	Employer Contributions $	Employer Contributions % of Pay	Employee Contributions $	Employee Contributions % of Pay	Total Statutory Contributions	Total Benefits and Refunds	Net Non-Investment Cash Flow	Actuarial Value of Assets	Actuarial Accrued Liabilities
1996	2,924.530								5,786.398	7,149.674
1997	3,052.959	139.826	4.58%	130.118	4.26%	269.943	330.252	(60.309)	6,215.422	7,655.868
1998	3,184.344	145.525	4.57%	135.592	4.26%	281.117	347.407	(66.290)	6,674.683	8,192.516
1999	3,321.871	151.477	4.56%	141.346	4.26%	292.823	365.209	(72.385)	7,166.632	8,759.298
2000	3,466.035	157.705	4.55%	147.395	4.25%	305.100	383.734	(78.634)	7,693.887	9,359.458
2001	3,616.451	164.187	4.54%	153.720	4.25%	317.907	403.407	(85.499)	8,258.809	9,996.628
2002	3,773.665	170.947	4.53%	160.341	4.25%	331.288	424.686	(93.398)	8,863.521	10,672.984
2003	3,937.914	177.994	4.52%	167.266	4.25%	345.260	448.123	(102.863)	9,509.774	11,389.932
2004	4,108.943	185.313	4.51%	174.483	4.25%	359.797	474.225	(114.428)	10,198.913	12,148.077
2005	4,287.118	192.920	4.50%	182.007	4.25%	374.927	503.050	(128.123)	10,932.364	12,948.861
2006	4,473.460	200.411	4.48%	189.869	4.24%	390.280	534.959	(144.679)	11,710.912	13,794.191
2007	4,667.428	209.101	4.48%	198.072	4.24%	407.172	570.621	(163.448)	12,536.086	14,683.088
2008	4,868.936	218.128	4.48%	206.595	4.24%	424.724	611.057	(186.334)	13,407.562	15,615.025
2009	5,077.323	227.464	4.48%	215.412	4.24%	442.876	657.099	(214.223)	14,324.063	16,585.932
2010	5,294.090	237.175	4.48%	224.584	4.24%	461.759	708.478	(246.719)	15,284.618	17,596.178
2011	5,520.414	247.315	4.48%	234.161	4.24%	481.476	765.592	(284.116)	16,287.865	18,643.993
2012	5,755.233	257.834	4.48%	244.099	4.24%	501.934	830.955	(329.021)	17,329.615	19,722.268
2013	6,000.204	268.809	4.48%	254.468	4.24%	523.278	901.850	(378.573)	18,408.298	20,832.252
2014	6,256.674	280.299	4.48%	265.325	4.24%	545.624	978.639	(433.016)	19,521.960	21,972.057
2015	6,526.100	292.369	4.48%	276.730	4.24%	569.099	1,061.050	(491.951)	20,668.894	23,141.694
2016	6,807.210	304.963	4.48%	288.631	4.24%	593.594	1,151.102	(557.509)	21,845.031	24,331.825
2017	7,101.738	318.158	4.48%	301.099	4.24%	619.257	1,246.599	(627.341)	23,048.399	25,545.412
2018	7,413.281	332.115	4.48%	314.289	4.24%	646.404	1,345.609	(699.205)	24,279.197	26,785.848
2019	7,741.435	346.816	4.48%	328.182	4.24%	674.998	1,448.498	(773.499)	25,537.226	28,051.224
2020	8,086.925	362.294	4.48%	342.808	4.24%	705.103	1,555.891	(850.788)	26,821.681	29,339.108
2021	8,450.274	378.572	4.48%	358.192	4.24%	736.764	1,666.816	(930.051)	28,132.751	30,651.124
2022	8,835.047	395.810	4.48%	374.481	4.24%	770.291	1,780.400	(1,010.109)	29,471.872	31,989.880
2023	9,239.668	413.937	4.48%	391.612	4.24%	805.549	1,894.895	(1,089.346)	30,842.282	33,359.306
2024	9,665.342	433.007	4.48%	409.631	4.24%	842.638	2,011.032	(1,168.394)	32,246.838	34,758.632
2025	10,114.012	453.108	4.48%	428.618	4.24%	881.726	2,133.217	(1,251.491)	33,684.225	36,187.072
2026	10,587.130	474.303	4.48%	448.640	4.24%	922.943	2,252.680	(1,329.736)	35,162.286	37,651.692
2027	11,085.187	496.616	4.48%	469.713	4.24%	966.329	2,374.868	(1,408.538)	36,683.900	39,151.728
2028	11,609.904	520.124	4.48%	491.908	4.24%	1,012.032	2,498.925	(1,486.893)	38,253.234	40,689.922
2029	12,164.140	544.953	4.48%	515.347	4.24%	1,060.301	2,623.725	(1,563.425)	39,876.244	42,275.222
2030	12,749.032	571.157	4.48%	540.078	4.24%	1,111.235	2,749.305	(1,638.070)	41,559.456	43,912.288
2031	13,365.000	598.752	4.48%	566.116	4.24%	1,164.868	2,874.434	(1,709.566)	43,311.269	45,612.086
2032	14,015.337	627.887	4.48%	593.600	4.24%	1,221.487	2,998.980	(1,777.493)	45,141.230	47,380.856
2033	14,701.613	658.632	4.48%	622.590	4.23%	1,281.223	3,124.417	(1,843.194)	47,058.302	49,225.979
2034	15,424.735	691.028	4.48%	653.135	4.23%	1,344.163	3,248.673	(1,904.510)	49,074.457	51,161.814
2035	16,186.518	725.156	4.48%	685.314	4.23%	1,410.470	3,373.959	(1,963.489)	51,200.550	53,195.200
2036	16,990.331	761.167	4.48%	719.257	4.23%	1,480.424	3,498.147	(2,017.723)	53,450.869	55,340.572

GABRIEL, ROEDER, SMITH & COMPANY
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March 10, 1997

The Board of Trustees
Public Employees Retirement Association
of Minnesota
514 St. Peter Street - Suite 200
St. Paul, Minnesota 55102

Dear Board Members:

At your request, we have developed a set of actuarial projections of the Public Employees Retirement Fund ("PERF"). The purpose of this work is to provide additional perspectives on the funding of PERF.

This work is based on the data on the membership used in the actuarial valuation of PERF as of July 1, 1996. Except where specifically noted, all actuarial assumptions utilized in this study are identical to those used in that valuation.

Hopefully, the results of these projections will provide you with an additional way of interpreting the results of each actuarial valuation.

Respectfully submitted,

Norman S. Losk
Consultant and Actuary

NSL:cml

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