City of Haverhill Retirement System

Actuarial Valuation and Review
as of January 1, 2010

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SEGAL

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December 6, 2010

Retirement Board
City of Haverhill Retirement System
4 Summer Street, Room 303
Haverhill, MA 01830

Dear Board Members:

We are pleased to submit this Actuarial Valuation and Review as of January 1, 2010. It summarizes the actuarial data used in the valuation, establishes the funding requirements for fiscal 2011 and later years and analyzes the preceding two years' experience.

The census information and financial information on which our calculations were based was prepared by the staff of the City of Haverhill Retirement System. That assistance is gratefully acknowledged. The actuarial calculations were completed under my supervision.

This actuarial valuation has been completed in accordance with generally accepted actuarial principles and practices. To the best of our knowledge, the information supplied in this actuarial valuation is complete and accurate. Further, in our opinion, the assumptions as approved by the Board are reasonably related to the experience of and the expectations for the Plan.

We look forward to reviewing this report at your next meeting and to answering any questions.

Sincerely,

THE SEGAL COMPANY

By: _____

Kathleen A. Riley, FSA, MAAA, EA
Senior Vice President and Actuary

SECTION 1

VALUATION SUMMARY

Purpose i

Significant Issues in Valuation Year..... i

Summary of Key Valuation Results..... iii

SECTION 2

VALUATION RESULTS

A. Participant Data..... 1

B. Financial Information..... 4

C. Actuarial Experience..... 7

D. Recommended Contribution . 12

E. Information Required by the GASB..... 13

SECTION 3

SUPPLEMENTAL INFORMATION

EXHIBIT A
Table of Plan Coverage.....14

EXHIBIT B
Participants in Active Service as of December 31, 2009 15

EXHIBIT C
Summary Statement of Income and Expenses on an Actuarial Value Basis.....16

EXHIBIT D
Development of the Fund Through December 31, 2009 17

EXHIBIT E
Development of Unfunded Actuarial Accrued Liability 18

EXHIBIT F
Table of Amortization Bases as of July 1, 2010 19

EXHIBIT G
Funding Schedule.....20

EXHIBIT H
Department Results.....21

EXHIBIT I
Definitions of Pension Terms.....22

SECTION 4

REPORTING INFORMATION

EXHIBIT I
Summary of Actuarial Valuation Results.....24

EXHIBIT II
Supplementary Information Required by the GASB – Schedule of Employer Contributions.....25

EXHIBIT III
Supplementary Information Required by the GASB – Schedule of Funding Progress...26

EXHIBIT IV
Supplementary Information Required by the GASB.....27

EXHIBIT V
Actuarial Assumptions and Actuarial Cost Method 28

EXHIBIT VI
Summary of Plan Provisions 32

Purpose

This report has been prepared by The Segal Company to present a valuation of the City of Haverhill Retirement System as of January 1, 2010. The valuation was performed to determine whether the assets and contributions are sufficient to provide the prescribed benefits. The contribution requirements presented in this report are based on:

- The benefit provisions of M.G.L. Chapter 32;
- The characteristics of covered active participants, inactive participants, and retired participants and beneficiaries as of January 1, 2010;
- The assets of the Plan as of December 31, 2009;
- Economic assumptions regarding future salary increases and investment earnings; and
- Other actuarial assumptions, regarding employee terminations, retirement, death, etc.

Significant Issues in Valuation Year

The following key findings were the result of this actuarial valuation:

- The actuarial valuation report as of January 1, 2010 is based on financial information as of that date. Changes in the value of assets subsequent to that date are not reflected. We are prepared to work with the Board to model the effects of these and any other subsequent developments.
- During the plan years ended 2008 and 2009, the market value rates of return were -27.36% and 21.31%, respectively, compared to the assumed rate of return of 8.25%. Because the actuarial value of assets gradually recognizes market value fluctuations over a five-year period, the actuarial rates of return for the plan years ended 2008 and 2009 were -9.80% and 6.71%, respectively. The actuarial value of assets as of December 31, 2009 was $146.0 million, or 106.3% of the market value of assets of $137.3 million reported in the Annual Statement. As of December 31, 2007, the actuarial value of assets was 96.2% of the market value.
- As indicated in Section 2, Subsection B of this report, the total unrecognized investment loss as of December 31, 2009 is $8.7 million. This investment loss will be recognized in the determination of the actuarial value of assets for funding purposes in the next few years, to the extent it is not offset by recognition of investment gains derived from future experience. This implies that earning the assumed rate of investment return of 8.25% per year (net of expenses) on a market value basis will result in investment losses on the actuarial value of assets in the next few years. The funding

schedule shown in Section 3, Exhibit G reflects the deferred investment losses in accordance with the asset valuation method adopted by the Board.

- This valuation reflects a change in the salary scale assumption from 4.5% in 2010 and 2011 and 5.25% thereafter, to 2.0% in 2010, 3.0% in 2011, 3.5% in 2012, 4.0% in 2013, 4.5% in 2014 and 5.0% thereafter.
- As of January 1, 2008 the System had an unfunded liability of $108.1 million. The unfunded liability was expected to increase to $109.5 million as of January 1, 2010. The actual unfunded liability of $138.2 million was $28.7 million higher than expected due to an experience loss of $31.4 million (see Section 2, Subsection C), partially offsets by $2.7 million due to the change in the salary scale assumption noted above.
- Because the fiscal 2011 appropriation has already been budgeted at $11,322,708, the results of this valuation will first be reflected in the fiscal 2012 appropriation. The Board has adopted a funding schedules that fully funds the Retirement System by June 30, 2032 with amortization payments increasing 4.0% per year and with a fiscal 2012 appropriation of $12,341,752 that is 9.0% higher than the fiscal 2011 amount. In projecting the unfunded actuarial accrued liability for future fiscal years, the deferred investment losses have been reflected in accordance with the asset valuation method approved by the Board. Exhibit G in Section 3 shows the recommended contributions through fiscal 2032 based on this funding schedule.

Summary of Key Valuation Results

	2010	2008
Contributions for fiscal year beginning July 1:		
Recommended for 2010 and 2008	$11,322,708	$10,406,685
Recommended for 2011 and 2009	12,341,752	10,835,128
Recommended for 2012 and 2010	13,402,512	11,322,708
Funding elements for plan year beginning January 1:		
Normal cost, including administrative expenses	$5,126,571	$5,449,993
Market value of assets as reported in the Annual Statement	137,335,596	174,261,251
Actuarial value of assets	146,003,639	167,717,317
Actuarial accrued liability	284,159,660	275,805,310
Unfunded actuarial accrued liability	138,156,021	108,087,993
GASB 25/27 for fiscal year beginning July 1:		
Annual required contributions	$11,322,708	$10,540,861
Actual contributions	--	10,540,861
Percentage contributed	--	100%
Funded ratio	51.38%	60.81%
Covered payroll	$35,788,543	$36,828,302
Demographic data for plan year beginning January 1:		
Number of retired participants and beneficiaries	1,094	1,124
Number of inactive participants entitled to a return of employee contributions	119	174
Number of inactive participants with a vested right to a deferred or immediate benefit	63	87
Number of active participants	876	945
Total payroll	$35,096,940	$35,452,924
Average payroll	40,065	37,516

A. PARTICIPANT DATA

The Actuarial Valuation and Review considers the number and demographic characteristics of covered participants, including active participants, inactive participants, retired participants and beneficiaries.

This section presents a summary of significant statistical data on these participant groups.

More detailed information for this valuation year and the preceding valuation can be found in Section 3, Exhibits A and B.

A historical perspective of how the participant population has changed over the past ten valuations can be seen in this chart.

CHART 1

Participant Population: 1991 – 2009

Year Ended December 31	Active Participants	Inactive Participants	Retired Participants and Beneficiaries
1991	1,469	502	902
1993	1,460	186	892
1995	1,510	181	922
1997	1,548	189	954
1999	1,630	271	955
2001	1,120	504	1,103
2003	936	464	1,204
2005	976	474	1,159
2007	945	261	1,124
2009	876	182	1,094

Active Participants
Plan costs are affected by the age, years of service and payroll of active participants. In this year's valuation, there were 876 active participants with an average age of 48.3, average years of service of 12.8 years and average payroll of $40,065. The 945 active participants in the prior valuation had an average age of 47.2, average service of 11.8 years and average payroll of $37,516.

Among the active participants, there were none with unknown age.

Inactive Participants
In this year's valuation, there were 63 participants with a vested right to a deferred or immediate vested benefit and 119 participants entitled to a return of their employee contributions.

These graphs show a distribution of active participants by age and by years of service.

CHART 2

Distribution of Active Participants by Age as of December 31, 2009

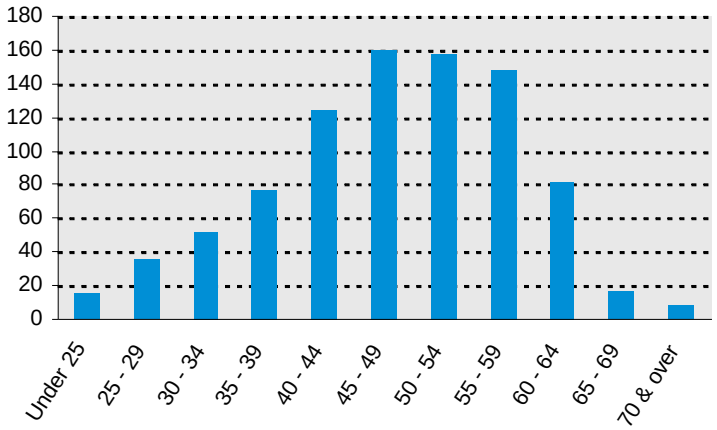
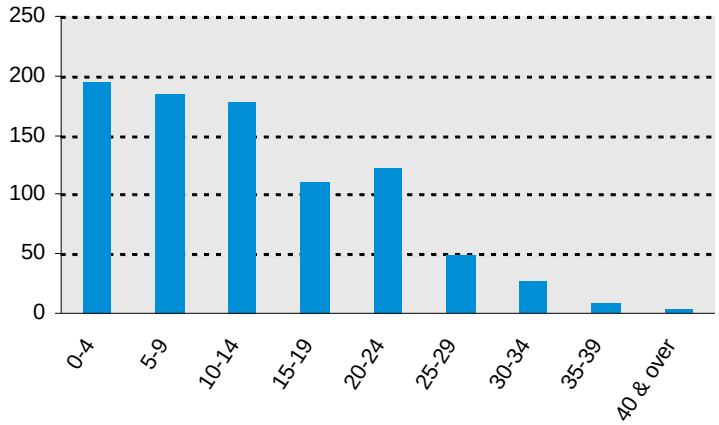


CHART 3

Distribution of Active Participants by Years of Service as of December 31, 2009



Retired Participants and Beneficiaries
As of December 31, 2009, 1,009 retired participants and 85 beneficiaries were receiving total monthly benefits of $1,730,744, excluding COLAs reimbursed by the Commonwealth. For comparison, in the previous valuation, there were 1,029 retired participants and 95 beneficiaries receiving monthly benefits of $1,665,209.

These graphs show a distribution of the current retired participants and beneficiaries based on their monthly amount and age, by type of pension.

CHART 4

Distribution of Retired Participants and Beneficiaries by Type and by Monthly Amount as of December 31, 2009

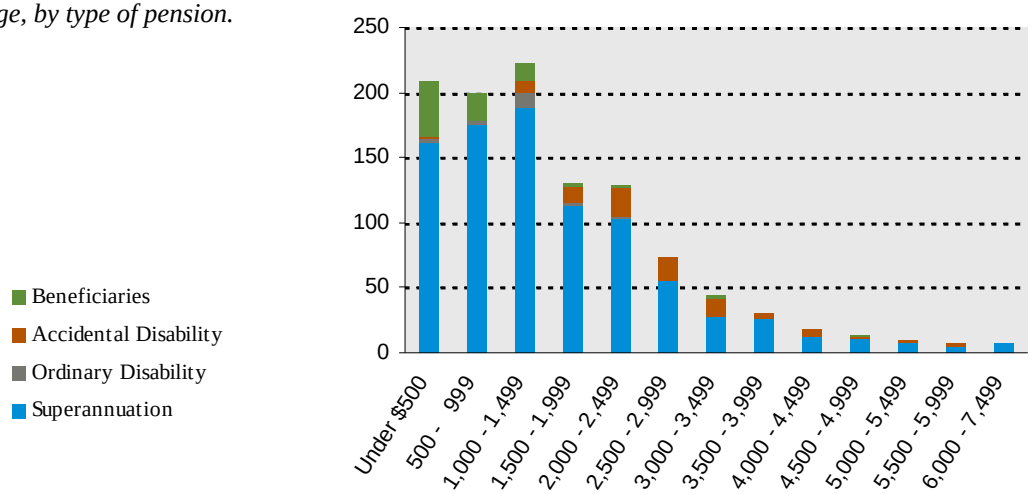
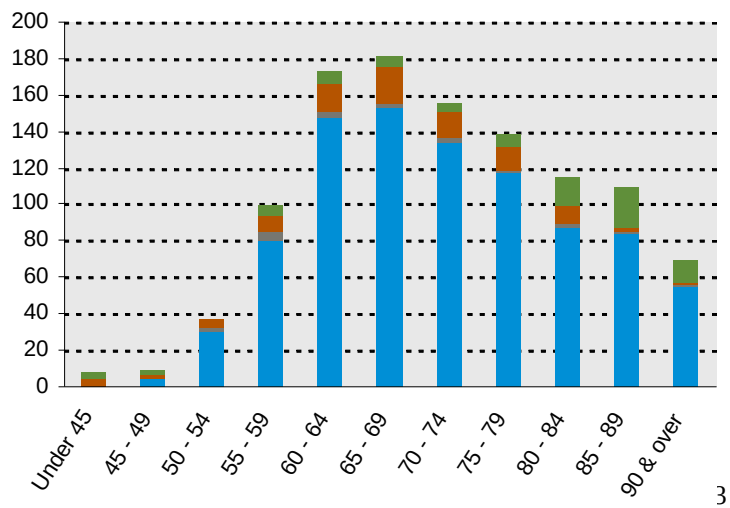


CHART 5

Distribution of Retired Participants and Beneficiaries by Type and by Age as of December 31, 2009



B. FINANCIAL INFORMATION

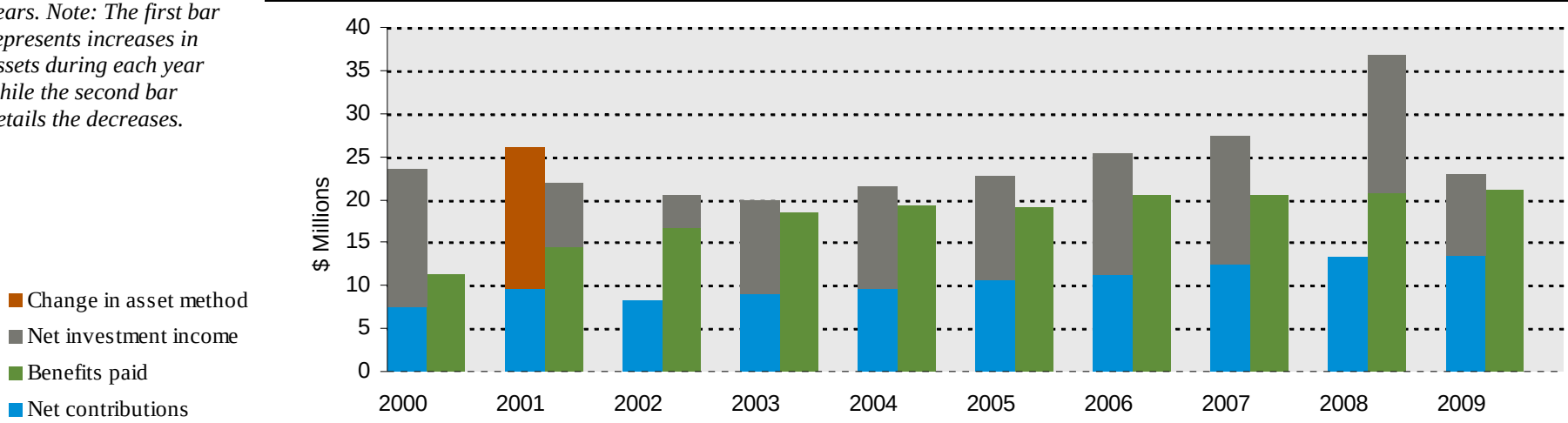
Retirement plan funding anticipates that, over the long term, both net contributions (less administrative expenses) and net investment earnings (less investment fees) will be needed to cover benefit payments.

Retirement plan assets change as a result of the net impact of these income and expense components. Additional financial information, including a summary of these transactions for the valuation year, is presented in Section 3, Exhibits C and D.

The chart depicts the components of changes in the actuarial value of assets over the last ten years. Note: The first bar represents increases in assets during each year while the second bar details the decreases.

CHART 6

Comparison of Increases and Decreases in the Actuarial Value of Assets for Years Ended December 31, 2000 – 2009



It is desirable to have level and predictable plan costs from one year to the next. For this reason, the Board has approved an asset valuation method that gradually adjusts to market value. Under this valuation method, the full value of market fluctuations is not recognized in a single year and, as a result, the asset value and the plan costs are more stable.

The amount of the adjustment to recognize market value is treated as income, which may be positive or negative. Realized and unrealized gains and losses are treated equally and, therefore, the sale of assets has no immediate effect on the actuarial value.

The chart shows the determination of the actuarial value of assets as of the valuation date.

CHART 7

Determination of Actuarial Value of Assets

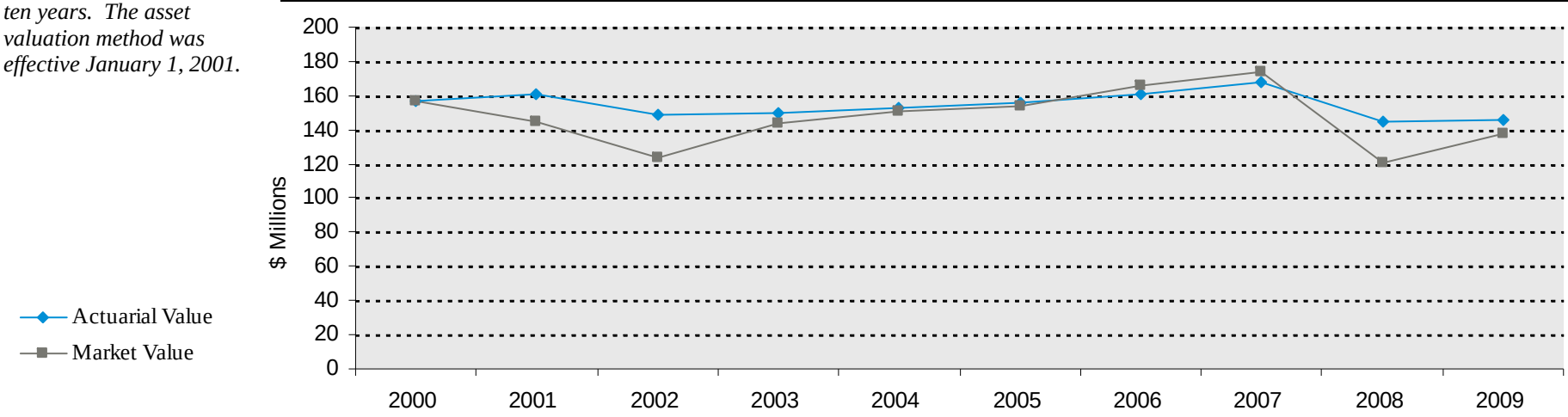
	Year Ended	
	December 31, 2009	**December 31, 2008**
1. Actuarial value of assets from prior year	$144,291,739	$167,717,317
2. Contributions, less benefit payments and expenses	-7,707,235	-7,348,919
3. Average actuarial value: (1) + [50% of (2)]	140,438,122	164,042,858
4. Expected investment income: .0825 x (3)	11,586,145	13,533,536
5. Preliminary actuarial value of assets at the end of the year: (1) + (2) + (4)	148,170,649	173,901,934
6. Market value of assets at the end of the year	137,335,596	120,243,116
7. Adjustment toward market value: 20% of [(6) –(5)]	-2,167,011	-10,731,764
8. Adjustment to be within 20% corridor	0	-18,878,431
9. Final actuarial value of assets: (5) + (7) + (8)	$146,003,638	$144,291,739
10. Actuarial value as a percentage of market value: (9) ÷ (6)	106.3%	120.0%

Both the actuarial value and market value of assets are representations of the City of Haverhill Retirement System's financial status. As investment gains and losses are gradually taken into account, the actuarial value of assets tracks the market value of assets. The actuarial asset value is significant because the City of Haverhill Retirement System's liabilities are compared to these assets to determine what portion, if any, remains unfunded. Amortization of the unfunded actuarial accrued liability is an important element in determining the contribution requirement.

This chart shows the change in the actuarial value of assets versus the market value over the past ten years. The asset valuation method was effective January 1, 2001.

CHART 8

Actuarial Value of Assets vs. Market Value of Assets as of December 31, 2000 – 2009



C. ACTUARIAL EXPERIENCE

To calculate the required contribution, assumptions are made about future events that affect the amount and timing of benefits to be paid and assets to be accumulated. Each year actual experience is measured against the assumptions. If overall experience is more favorable than anticipated (an actuarial gain), the contribution requirement will decrease from the previous year. On the other hand, the contribution requirement will increase if overall actuarial experience is less favorable than expected (an actuarial loss).

Taking account of experience gains or losses in one year without making a change in assumptions reflects the belief that the single year's experience was a short-term development and that, over the long term, experience will return to the original assumptions. For contribution requirements to remain stable, assumptions should approximate experience.

If assumptions are changed, the contribution requirement is adjusted to take into account a change in experience anticipated for all future years.

The total loss over the past two years is $31,425,229. A discussion of the major components of the actuarial experience is on the following pages.

This chart provides a summary of the actuarial experience over the past two years.

CHART 9

Actuarial Experience for Two-Year Period Ended December 31, 2009

1.	Net loss from investments*	-$34,220,046
2.	Net gain from administrative expenses	120,356
3.	Net gain from other experience**	2,674,461
4.	Net experience loss: (1) + (2) + (3)	-$31,425,229

* *Details in Chart 10*

** *Details in Chart 13*

Investment Rate of Return
A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on the City of Haverhill Retirement System's investment policy. For valuation purposes, the assumed rate of return on the actuarial value of assets is 8.25%. The actual rates of return on an actuarial basis for the 2009 and 2008 plan years were 6.71% and -9.80%, respectively.

Since the actual return for the last two years was less than the assumed return, the City of Haverhill Retirement System experienced an actuarial loss of $34,220,046 during the two-year period ending December 31, 2009 with regard to its investments, including an adjustment for interest.

This chart shows the gain/(loss) due to investment experience.

CHART 10

Actuarial Value Investment Experience

	Year Ended	
	December 31, 2009	**December 31, 2008**
1. Actual return	$9,419,134	-$16,076,658
2. Average value of assets	140,438,122	164,042,858
3. Actual rate of return: (1) ÷ (2)	6.71%	-9.80%
4. Assumed rate of return	8.25%	8.25%
5. Expected return: (2) x (4)	$11,586,145	$13,533,536
6. Actuarial gain/(loss): (1) – (5)	-$2,167,011	-$29,610,194

Because actuarial planning is long term, it is useful to see how the assumed investment rate of return has followed actual experience over time. The chart below shows the rate of return on an actuarial basis compared to the market value investment return for the last ten years, including five-year and ten-year averages.

Based upon this experience and future expectations, we have maintained the assumed rate of return of 8.25%.

CHART 11

Investment Return – Actuarial Value vs. Market Value: 2000 - 2009

Year Ended December 31	Actuarial Value Investment Return		Market Value Investment Return	
	Amount	Percent	Amount	Percent
2000	$16,095,798	11.29%	$16,095,798	11.29%
2001	9,020,851	5.85	-7,350,658	-4.76
2002	-3,797,316	-2.42	-12,205,432	-8.70
2003	10,720,838	7.45	29,434,255	24.70
2004	11,996,939	8.26	16,696,694	12.00
2005	12,154,824	8.21	11,791,347	8.04
2006	14,022,464	9.26	20,379,961	13.62
2007	14,960,009	9.54	16,876,376	10.46
2008	-16,076,658	-9.80	-46,669,214	-27.36
2009	9,419,134	6.71	24,799,715	21.31
Total	$78,516,883		$69,848,842	
	Five-year average return	4.53%		3.65%
	Ten-year average return	5.22%		4.85%

Note: Each year's yield is weighted by the average asset value in that year.

Subsection B described the actuarial asset valuation method that gradually takes into account fluctuations in the market value rate of return. The effect of this is to stabilize the actuarial rate of return, which contributes to leveling pension plan costs.

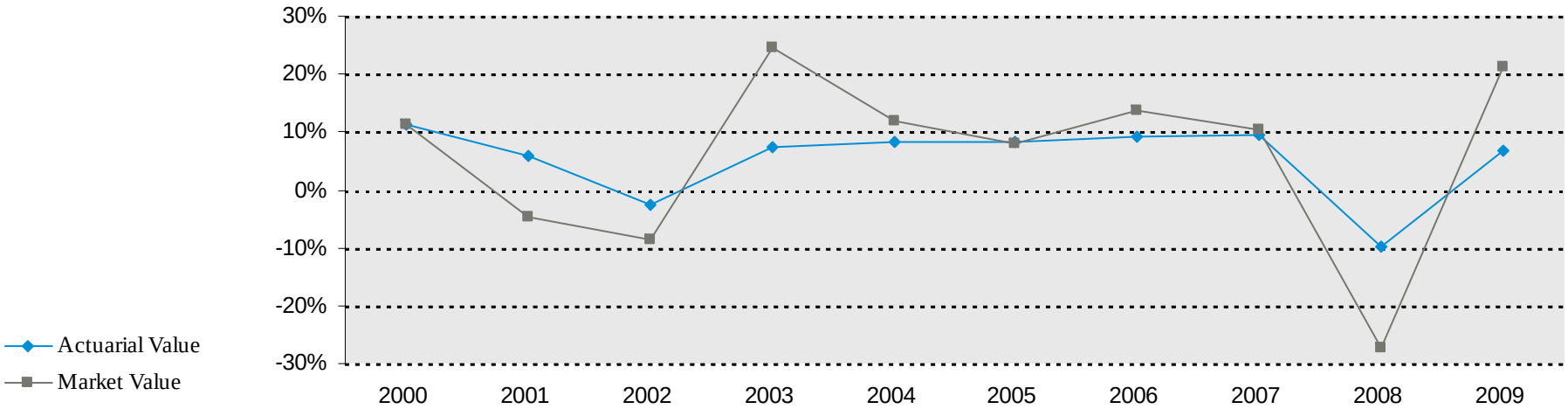
Administrative Expenses

Administrative expenses for the years ending December 31, 2008 and 2009 were $323,041 and $359,162, respectively compared to the assumption of $375,000 for 2008 and $391,875 for 2009. This resulted in a gain of $120,356 for the two-year period, including an adjustment for interest. We have maintained the assumption of $375,000 for calendar 2010.

This chart illustrates how this leveling effect has actually worked over the years 2000 - 2009.

CHART 12

Market and Actuarial Rates of Return for Years Ended December 31, 2000 - 2009



Other Experience

There are other differences between the expected and the actual experience that appear when the new valuation is compared with the projections from the previous valuation. These include:

- the extent of turnover among the participants,
- retirement experience (earlier or later than expected),
- mortality (more or fewer deaths than expected),
- the number of disability retirements, and
- salary increases different than assumed.

The net gain from this other experience for the two-year period ending December 31, 2009 amounted to $2,674,461 which is 0.1% of the actuarial accrued liability. Detail is shown in the chart below.

This valuation reflects a change in the salary scale from 4.5% in 2010 and 2011 and 5.25% thereafter to 2.0% in 2010, 3.0% in 2011, 3.5% in 2012, 4.0% in 2013, 4.5% in 2014 and 5.0% thereafter.

Changing this assumption resulted in a decrease in the unfunded liability of $2,720,713 and a decrease in the employer normal cost $508,555.

The chart shows elements of the experience gain/(loss) for the most recent years.

CHART 13

Experience Due to Changes in Demographics for Two-Year Period Ended December 31, 2009

1.	Salary increases for continuing actives less than expected	$2,726,018
2.	Miscellaneous loss	-51,557
3.	Total	$2,674,461

D. RECOMMENDED CONTRIBUTION

The amount of annual contribution required to fund the Plan is comprised of an employer normal cost payment and a payment on the unfunded actuarial accrued liability. Because the fiscal 2011 appropriation has already been budgeted at $11,322,708, the results of this valuation will first be reflected in the fiscal 2012 appropriation.

The Board has adopted a funding schedule that fully funds the Retirement System by June 30, 2032 with amortization payments increasing 4.0% per year and with a fiscal 2012 appropriation of $12,341,752 that is 9.0% higher than the fiscal 2011 amount.

In projecting the unfunded actuarial accrued liability for future fiscal years, the deferred investment losses have been reflected in accordance with the asset valuation method approved by the Board.

Exhibit G in Section 3 shows the recommended contributions through fiscal 2032 based on this funding schedule.

The chart compares this valuation's recommended contribution with the prior valuation.

CHART 14

Recommended Contribution

	Year Beginning January 1			
	2010		2008	
	Amount	% of Payroll	Amount	% of Payroll
1. Total normal cost	$4,751,571	13.28%	$5,074,993	13.78%
2. Administrative expenses	375,000	1.05%	375,000	1.02%
3. Expected employee contributions	-3,175,433	-8.87%	-3,231,131	-8.77%
4. Employer normal cost: (1) + (2) + (3)	$1,951,138	5.45%	$2,218,862	6.02%
5. Actuarial accrued liability	284,159,660		275,805,310	
6. Actuarial value of assets	146,003,639		167,717,317	
7. Unfunded actuarial accrued liability: (5) - (6)	$138,156,021		$108,087,993	
8. Employer normal cost projected to July 1, 2010 and 2008, adjusted for timing	2,050,227	5.67%	2,359,948	6.27%
9. Projected unfunded actuarial accrued liability	143,742,029		112,458,271	
10. Payment on projected unfunded actuarial accrued liability, (22-year (4% increasing) and 20-year (4.5% increasing), adjusted for timing	10,025,056	27.74%	8,011,207	21.28%
11. Total recommended contribution: (8) + (10), adjusted for timing*	$12,075,283	33.41%	$10,371,155	27.55%
12. Budgeted appropriation	$11,322,708	31.33%	$10,406,685	27.64%
13. Projected payroll	$36,144,657		$37,647,821	

Note: Recommended contributions are assumed to be paid monthly.

E. INFORMATION REQUIRED BY THE GASB

Governmental Accounting Standards Board (GASB) reporting information provides standardized information for comparative purposes of governmental pension plans. This information allows a reader of the financial statements to compare the funding status of one governmental plan to another on relatively equal terms.

Critical information to the GASB is the historical comparison of the GASB required contribution to the actual contributions. This comparison demonstrates whether a plan is being funded within the range of the GASB reporting requirements. Chart 15 below presents a graphical representation of this information for the Plan.

The other critical piece of information regarding the Plan's financial status is the funded ratio. This ratio compares the actuarial value of assets to the actuarial accrued liabilities of the plan as calculated under the GASB. High ratios indicate a well-funded plan with assets sufficient to pay most benefits. Lower ratios may indicate recent changes to benefit structures, funding of the plan below actuarial requirements, poor asset performance, or a variety of other factors.

Although the GASB requires that the actuarial value of assets be used to determine the funded ratio, Chart 16 shows the funded ratio calculated using both the actuarial value of assets (51.38%) and the market value of assets (48.33%).

The details regarding the calculations of these values and other GASB numbers may be found in Section 4, Exhibits II, III, and IV.

These graphs show key GASB factors.

CHART 15

Required Versus Actual Contributions

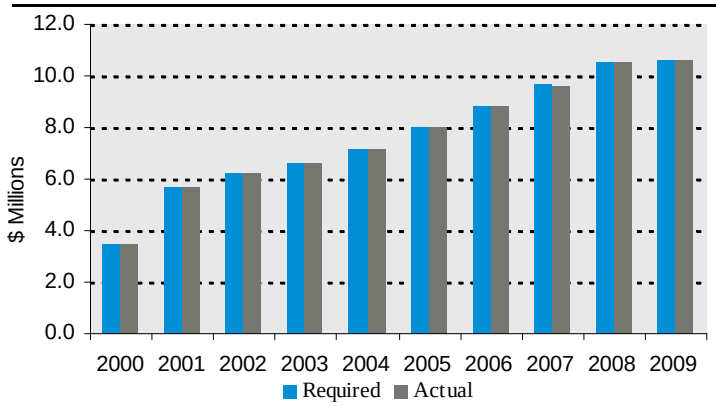


CHART 16

Funded Ratio

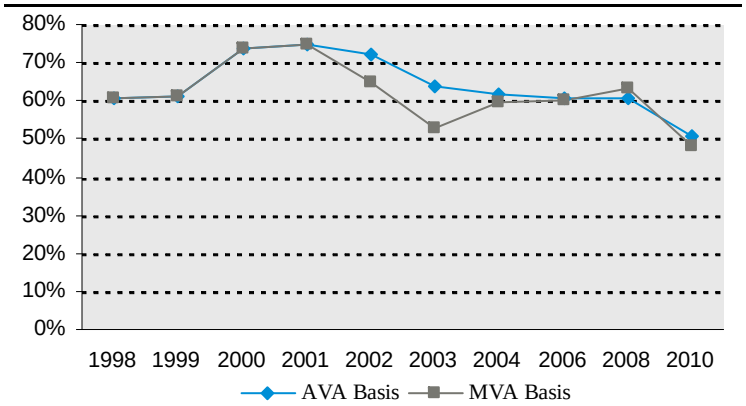


EXHIBIT A

Table of Plan Coverage

Category	Year Ended December 31 2009	Year Ended December 31 2007	Change From Prior Year
Active participants in valuation:			
Number	876	945	-7.3%
Average age	48.3	47.2	N/A
Average service	12.8	11.8	N/A
Projected total payroll	$35,788,543	$36,828,302	-2.8%
Projected average payroll	40,855	38,972	4.8%
Account balances	33,929,636	31,233,498	8.6%
Number with unknown age and/or service information	0	0	N/A
Total active vested participants	876	945	-7.3%
Vested terminated participants	63	14	350.0%
Beneficiaries with rights to a deferred benefit	0	0	N/A
Retired participants:			
Number in pay status	892	916	-2.6%
Average age	71.7	71.4	N/A
Average monthly benefit	$1,559	$1,466	6.3%
Number in suspended status	0	0	N/A
Disabled participants:			
Number in pay status	117	113	3.5%
Average age	67.4	67.1	N/A
Average monthly benefit	$2,352	$2,202	6.8%
Number in suspended status	0	0	N/A
Beneficiaries in pay status	85	95	-10.5%
Inactive employees with vested rights to a return of their contributions or a deferred or immediate benefit participants	119	247	-51.8%

EXHIBIT B

Participants in Active Service as of December 31, 2009
By Age, Years of Service, and Average Payroll

	Years of Service									
Age	Total	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40 & over
Under 25	15	15	- -	- -	- -	- -	- -	- -	- -	- -
	23,181	23,181	- -	- -	- -	- -	- -	- -	- -	- -
25 - 29	36	25	11	- -	- -	- -	- -	- -	- -	- -
	30,515	26,787	38,990	- -	- -	- -	- -	- -	- -	- -
30 - 34	52	24	22	6	- -	- -	- -	- -	- -	- -
	44,022	36,187	51,297	48,683	- -	- -	- -	- -	- -	- -
35 - 39	77	16	26	28	5	2	- -	- -	- -	- -
	46,599	28,507	43,809	57,326	60,706	42,160	- -	- -	- -	- -
40 - 44	124	32	24	28	29	10	1	- -	- -	- -
	41,562	23,342	35,116	49,307	56,006	50,981	49,412	- -	- -	- -
45 - 49	160	31	43	32	21	30	3	- -	- -	- -
	41,211	26,963	29,371	42,884	48,061	62,223	82,238	- -	- -	- -
50 - 54	158	20	23	30	23	33	15	13	1	- -
	42,545	28,665	32,900	37,221	32,586	53,579	65,024	54,420	75,069	- -
55 - 59	148	17	14	30	20	31	18	11	6	1
	39,174	27,558	28,546	31,167	41,570	37,009	46,445	60,894	77,376	45,925
60 - 64	82	12	16	16	11	12	10	2	2	1
	35,278	21,226	24,954	42,251	26,357	36,821	51,486	71,807	47,801	76,983
65 - 69	16	- -	4	6	1	3	1	1	- -	- -
	27,897	- -	18,198	25,815	22,731	38,881	52,905	26,389	- -	- -
70 & over	8	2	1	2	1	1	- -	- -	- -	1
	20,809	17,116	9,342	20,127	24,747	54,542	- -	- -	- -	3,359
Total	876	194	184	178	111	122	48	27	9	3
	$40,065	$27,090	$35,000	$42,544	$43,741	$49,092	$55,734	$57,307	$70,547	$42,089

EXHIBIT C

Summary Statement of Income and Expenses on an Actuarial Value Basis

	Year Ended December 31, 2009		Year Ended December 31, 2008	
Contribution income:				
Employer contributions	$10,621,368		$10,540,861	
Employee contributions	3,127,943		3,071,681	
Other contributions	55,943		56,209	
Less administrative expenses	-359,162		-323,041	
Net contribution income		$13,446,092		$13,345,710
Investment income:				
Interest, dividends and other income	$2,509,882		$2,745,416	
Adjustment toward market value	8,264,977		-17,244,430	
Less investment fees	-1,355,724		-1,577,645	
Net investment income		9,419,135		-16,076,659
Total income available for benefits		$22,865,227		-$2,730,949
Less benefit payments:				
Pensions and annuities	-$20,581,442		-$20,187,186	
Net 3(8)c reimbursements	-189,929		-89,340	
Refunds to members	-381,956		-418,103	
Net benefit payments		-$21,153,327		-$20,694,629
Change in reserve for future benefits		$1,711,900		-$23,425,578

EXHIBIT D

Development of the Fund Through December 31, 2009

Year Ended December 31	Employer Contributions	Employee Contributions	Other Contributions	Net Investment Return	Administrative Expenses	Benefit Payments	Actuarial Value of Assets at End of Year
2000	$3,425,692	$4,248,608	$71,493	$16,095,798	$320,799	$11,316,805	$156,688,801
2001	5,688,580	4,456,641	7,034	9,020,851	433,729	14,537,813	160,890,365
2002	6,158,663	2,635,758	38,790	-3,797,316	493,116	16,755,398	148,677,745
2003	6,543,344	2,853,188	41,296	10,720,838	304,960	18,549,766	149,981,685
2004	7,114,016	2,762,508	40,282	11,996,941	335,010	19,226,270	152,334,152
2005	7,908,628	3,019,938	67,980	12,154,824	406,988	19,085,925	155,992,609
2006	8,724,896	2,793,240	83,529	14,022,464	348,388	20,519,155	160,749,195
2007	9,624,314	3,155,585	71,813	14,960,009	378,190	20,465,409	167,717,317
2008	10,540,861	3,071,681	56,209	-16,076,659	323,041	20,694,629	144,291,739
2009	10,621,368	3,127,943	55,943	9,419,135	359,162	21,153,327	146,003,639

Note: Investment return is net of investment expenses.

EXHIBIT E

Development of Unfunded Actuarial Accrued Liability

	Year Ended			
	December 31, 2009		December 31, 2008	
1. Unfunded actuarial accrued liability at beginning of year		$108,683,456		$108,087,993
2. Normal cost at beginning of year		5,695,243		5,449,993
3. Total contributions		-13,805,254		-13,668,751
4. Interest				
(a) For whole year on (1) + (2)	$9,436,243		$9,366,884	
(b) For half year on (3)	-558,183		-552,663	
(c) Total interest		8,878,060		8,814,221
5. Expected unfunded actuarial accrued liability		$109,451,505		$108,683,456
6. Changes due to:				
(a) Experience loss	$31,425,229			
(b) Assumption change	-2,720,713			
(c) Net change		$28,704,516		
7. Unfunded actuarial accrued liability at end of year		$138,156,021		

EXHIBIT F

Table of Amortization Bases as of July 1, 2010

Type	Annual Payment	Years Remaining	Outstanding Balance
2002 ERI	$365,716	22	$5,243,747
2003 ERI	273,040	22	3,914,914
Remaining unfunded liability	9,386,300	22	134,583,368
Total	$10,025,056		$143,742,029

Notes: Payments include adjustment for timing.
Does not reflect adjustment to set fiscal 2011 appropriation to budgeted amount.
Refer to Exhibit G for information on payments in fiscal year 2012 and later.

EXHIBIT G
Funding Schedule

(1) Fiscal Year Ended June 30	(2) Employer Normal Cost	(3) Amortization of 2002 ERI	(4) Amortization of 2003 ERI	(5) Amortization of Remaining Unfunded Liability	(6) Total Plan Cost: (2)+(3)+(4)+(5)	(7) Total Unfunded Actuarial Liability at Beginning of Fiscal Year	(8) Total Plan Cost: % Increase
2011	2,050,227	365,716	273,040	8,633,725	11,322,708	143,742,029	
2012	2,111,734	380,346	283,961	9,565,711	12,341,752	147,880,241	9.00%
2013	2,185,645	395,559	295,320	10,525,988	13,402,512	151,342,297	8.59%
2014	2,273,071	411,382	307,132	11,074,318	14,065,903	153,817,938	4.95%
2015	2,375,359	427,836	319,417	11,614,460	14,737,072	155,460,267	4.77%
2016	2,482,250	444,950	332,195	12,164,010	15,423,405	156,451,467	4.66%
2017	2,593,951	462,748	345,482	12,725,580	16,127,761	156,763,154	4.57%
2018	2,710,679	481,258	359,301	13,300,748	16,851,986	156,346,393	4.49%
2019	2,832,660	500,508	373,673	13,832,778	17,539,619	154,531,894	4.08%
2020	2,960,130	520,529	388,620	14,386,089	18,255,368	151,979,175	4.08%
2021	3,093,336	541,351	404,165	14,961,532	19,000,384	148,603,791	4.08%
2022	3,232,536	563,004	420,332	15,559,994	19,775,866	144,313,392	4.08%
2023	3,378,000	585,524	437,145	16,182,393	20,583,062	139,007,027	4.08%
2024	3,530,010	608,945	454,631	16,829,689	21,423,275	132,574,399	4.08%
2025	3,688,860	633,303	472,815	17,502,877	22,297,855	124,895,050	4.08%
2026	3,854,859	658,635	491,728	18,202,992	23,208,214	115,837,486	4.08%
2027	4,028,328	684,980	511,398	18,931,111	24,155,817	105,258,216	4.08%
2028	4,209,603	712,380	531,854	19,688,356	25,142,193	93,000,724	4.08%
2029	4,399,035	740,875	553,127	20,475,890	26,168,927	78,894,335	4.08%
2030	4,596,992	770,510	575,252	21,294,926	27,237,680	62,753,011	4.08%
2031	4,803,857	801,331	598,262	22,146,723	28,350,173	44,374,024	4.08%
2032	5,020,031	833,380	622,195	23,032,593	29,508,199	23,536,526	4.08%

Notes: *Recommended contributions are assumed to be paid monthly.*
Anticipates deferred investment losses
Item (2) increases at 2.0% in 2010, 3.0% in 2011, 3.5% in 2012, 4.0% in 2013, and 4.5% thereafter
Items (3) – (5) increase at 4.0% per year.

Assumes contribution of budgeted amount for fiscal year 2011.

EXHIBIT H

Department Results

The results of the January 1, 2010 actuarial valuation projected to July 1, 2010 and July 1, 2011, are shown for the following departments.

Department	Housing Authority	Police & Fire	School	Waste Water	Water	Whittier	All others	Total
Actives	14	180	381	25	33	67	176	876
Inactive nonvested	0	8	70	1	0	14	26	119
Inactive vested	0	1	6	0	1	3	52	63
Retirees	8	218	242	13	16	31	566	1094
Projected 2010 – 2011 payroll	$633,947	$12,209,080	$10,313,461	$1,472,753	$1,724,143	$2,373,302	$7,417,970	$36,144,657
2002 ERI payment	$4,401	$72,803	$57,956	$16,480	$20,534	$3,339	$190,202	$365,716
2003 ERI payment	$0	$90,474	$54,411	$44,613	$16,435	$1,713	$65,395	$273,040
FY 2011 appropriation, including ERI payments	$116,508	$4,467,227	$1,857,750	$323,838	$274,038	$357,299	$3,926,048	$11,322,708
2002 ERI payment	$4,577	$75,715	$60,274	$17,140	$21,356	$3,473	$197,811	$380,346
2003 ERI payment	$0	$94,093	$56,587	$46,398	$17,092	$1,781	$68,010	$283,961
FY 2012 appropriation, including ERI payments	$130,257	$4,775,682	$2,033,820	$345,894	$318,355	$382,951	$4,354,793	$12,341,752
2002 ERI payment	$4,760	$78,744	$62,685	$17,826	$22,210	$3,612	$205,722	$395,559
2003 ERI payment	$0	$97,857	$58,850	$48,254	$17,776	$1,852	$70,731	$295,320
FY 2013 appropriation, including ERI payments	$141,086	$5,171,038	$2,196,945	$374,985	$346,261	$415,916	$4,756,281	$13,402,512

In completing the separate valuations for the departments, assets were allocated in proportion to the total actuarial accrued liability for each department.

EXHIBIT I

Definitions of Pension Terms

The following list defines certain technical terms for the convenience of the reader:

Assumptions or actuarial assumptions: The estimates on which the cost of the Plan is calculated including:

(a) Investment return — the rate of investment yield that the Plan will earn over the long-term future;

(b) Mortality rates — the death rates of employees and pensioners; life expectancy is based on these rates;

(c) Retirement rates — the rate or probability of retirement at a given age;

(d) Turnover rates — the rates at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement.

Normal cost: The amount of contributions required to fund the benefit allocated to the current year of service.

Actuarial accrued liability for actives: The equivalent of the accumulated normal costs allocated to the years before the valuation date.

Actuarial accrued liability for pensioners: The single sum value of lifetime benefits to existing pensioners. This sum takes account of life expectancies appropriate to the ages of the pensioners and the interest that the sum is expected to earn before it is entirely paid out in benefits.

Unfunded actuarial accrued liability: The extent to which the actuarial accrued liability of the Plan exceeds the assets of the Plan. There are many approaches to paying off the unfunded actuarial accrued liability, from meeting the interest accrual only to amortizing it over a specific period of time.

Amortization of the unfunded actuarial accrued liability:	Payments made over a period of years equal in value to the Plan's unfunded actuarial accrued liability.
Investment return:	The rate of earnings of the Plan from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next

EXHIBIT I

Summary of Actuarial Valuation Results

The valuation was made with respect to the following data supplied to us:

1.	Retired participants as of the valuation date (including 85 beneficiaries in pay status)	1,094
2.	Participants active during the year ended December 31, 2009 with total accumulated contributions of $33,929,636 projected payroll of $35,788,543	876
3.	Inactive employees with vested rights to a return of their contributions as of December 31, 2009	119
4.	Inactive employees with vested rights to a deferred or immediate benefit as of December 31, 2009	63

The actuarial factors as of January 1, 2010 are as follows:

1.	Normal cost, including administrative expenses		$5,126,571
2.	Expected employee contributions		-3,175,433
3.	Employer normal cost: (1) + (2)		$1,951,138
4.	Actuarial accrued liability		284,159,660
	Retired participants and beneficiaries	$188,140,000	
	Inactive participants	3,679,310	
	Active participants	92,340,350	
5.	Actuarial value of assets ($137,335,596 at market value as reported in the Annual Statement)		146,003,639
6.	Unfunded actuarial accrued liability: (4) - (5)		138,156,021

The determination of the recommended contribution projected to July 1, 2010 is as follows:

1.	Projected employer normal cost, adjusted for timing	$2,050,227
2.	Projected unfunded actuarial accrued liability	143,742,029
3.	Payment on projected unfunded actuarial accrued liability (22-year (4% increasing)), adjusted for timing	10,025,056
4.	Preliminary recommended contribution: (1) + (3)	$12,075,283
5.	Budgeted appropriation based on 2008 actuarial valuation	$11,322,708
6.	Projected payroll	$36,144,657

Note: Recommended contributions are assumed to be paid monthly.

EXHIBIT II

Supplementary Information Required by the GASB – Schedule of Employer Contributions

Plan Year Ended December 31	Annual Required Contributions	Actual Contributions	Percentage Contributed
2000	$3,497,185	$3,497,185	100.0%
2001	5,695,614	5,695,614	100.0%
2002	6,197,453	6,197,453	100.0%
2003	6,584,640	6,584,640	100.0%
2004	7,154,297	7,154,297	100.0%
2005	7,976,608	7,976,608	100.0%
2006	8,808,425	8,808,425	100.0%
2007	9,696,127	9,696,127	100.0%
2008	10,540,861	10,540,861	100.0%
2009	10,621,368	10,621,368	100.0%

EXHIBIT III

Supplementary Information Required by the GASB – Schedule of Funding Progress

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded/ (Overfunded) AAL (UAAL) (b) - (a)	Funded Ratio (a) / (b)	Covered Payroll (c)	UAAL as a Percentage of Covered Payroll [(b) - (a)] / (c)
01/01/1999	$111,228,800	$181,575,900	$70,347,100	61.26%	$48,847,800	144.01%
01/01/2000	144,484,800	195,312,800	50,828,000	73.98%	53,469,200	95.10%
01/01/2001	156,688,800	210,219,900	53,531,100	74.54%	55,875,300	95.80%
01/01/2002	160,890,365	222,348,347	61,457,982	72.36%	37,384,107	164.40%
01/01/2003	148,677,744	233,743,425	85,065,681	63.61%	39,066,392	217.75%
01/01/2004	149,981,686	242,187,917	92,206,231	61.93%	32,030,938	287.87%
01/01/2005	152,334,152	247,959,579	95,625,427	61.44%	33,472,330	285.69%
01/01/2006	155,992,609	256,457,734	100,465,125	60.83%	35,282,797	284.74%
01/01/2007	160,749,194	262,172,666	101,423,472	61.31%	36,870,523	275.08%
01/01/2008	167,717,317	275,805,310	108,087,993	60.81%	36,828,302	293.49%
01/01/2009	144,291,739	282,521,561	138,229,821	51.07%	38,301,434	360.90%
01/01/2010	146,003,639	284,159,660	138,156,021	51.38%	35,788,543	386.03%

EXHIBIT IV

Supplementary Information Required by the GASB

Valuation date	January 1, 2010
Actuarial cost method	Entry Age Normal Cost Method
Amortization method	Unfunded liability amortized in payments increasing 4.0% annually.
Remaining amortization period	22 years remaining as of July 1, 2010
Asset valuation method	5-year smoothing of investment returns greater (less) than expected.
Actuarial assumptions:	
Investment rate of return	8.25%
Projected salary increases	2.0% in 2010, 3.0% in 2011, 3.5% in 2012, 4.0% in 2013, 4.5% in 2014 and 5.0% thereafter
Cost of living adjustments	3.00% for the first $12,000 of retirement income
Plan membership:	
Retired participants and beneficiaries receiving benefits	1,094
Terminated participants entitled to a return of their employee contributions	119
Terminated participants with a vested right to a deferred or immediate benefit	63
Active participants	876
Total	2,152

EXHIBIT V

Actuarial Assumptions and Actuarial Cost Method

Mortality Rates:

Healthy: RP-2000 Combined Healthy Mortality Table

Disabled: RP-2000 Combined Healthy Mortality Table set forward 5 years

Termination Rates before Retirement:

	Groups 1 and 2 - Rate (%)			
	Mortality		Disability	Withdrawal
Age	Male	Female		
20	0.03	0.02	0.06	7.94
25	0.04	0.02	0.09	7.72
30	0.04	0.03	0.11	7.22
35	0.08	0.05	0.15	6.28
40	0.11	0.07	0.22	5.15
45	0.15	0.11	0.36	3.98
50	0.21	0.17	0.61	2.56
55	0.36	0.27	- -	- -
60	0.67	0.51	- -	- -

Notes: *25% of the disability rates shown represent accidental disability.*
20% of the accidental disabilities will die from the same cause as the disability.
25% of the death rates shown represent accidental death.

	Group 4 - Rate (%)			
	Mortality		Disability	Withdrawal
Age	Male	Female		
20	0.03	0.02	0.18	--
25	0.04	0.02	0.27	--
30	0.04	0.03	0.33	--
35	0.08	0.05	0.45	--
40	0.11	0.07	0.66	--
45	0.15	0.11	1.08	--
50	0.21	0.17	1.83	--
55	0.36	0.27	--	--
60	0.67	0.51	--	--

Notes: 100% of the disability rates shown represent accidental disability.
60% of the accidental disabilities will die from the same cause as the disability.
100% of the death rates shown represent accidental death.

Retirement Rates:

	Rate per year (%)	
Age	Groups 1 and 2	Group 4
50 – 59	--	10.0
60 – 61	10.0	10.0
62	20.0	50.0
63 – 64	10.0	50.0
65	100.0	100.0

Unknown Data for Participants: Same as those exhibited by participants with similar known characteristics.

Age of Spouse: Females three years younger than their spouses

Percent Married: 75%

Net Investment Return: 8.25%

Interest on Employee Contributions: 3.50%

Salary Increases:

Year	Annual increase rate (%)	Prior increase rate (%)
2010	2.00	4.50
2011	3.00	4.50
2012	3.50	5.25
2013	4.00	5.25
2014	4.50	5.25
2015 and later	5.00	5.25

Includes allowance for inflation.

2009 Salary: 2009 salary equal to 2009 contributions reported in the data divided by the contribution rate(s) derived from service. For employees with less than 1 year of service, salaries and contributions are annualized.

Total Service: Total creditable service reported in the data.

Administrative Expenses: $375,000 for calendar year 2010.

Cost of Living Increases: 3.00% on first $12,000 of retirement allowance.

Actuarial Value of Assets: A preliminary actuarial value is first determined by taking the actuarial value of assets at the beginning of the year and adding assumed investment earnings (at the assumed actuarial rate of return) and the net new money during the year (contributions less benefit payments and administrative expenses). Twenty percent of the difference between the market value of assets and the preliminary actuarial value of assets is added to the preliminary actuarial value. In order that the actuarial value not differ too significantly from the market value of assets, the final actuarial value of assets must be within 20% of the market value of assets.

Market value of assets as reported in the Annual Statement.

Actuarial Cost Method: Entry Age Normal Actuarial Cost Method. Entry Age is attained age of the participant less Total Service. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis and are allocated by salary.

Changes in Assumptions: The salary scale was changed from 4.5% in 2010 and 2011 and 5.25% thereafter to 2.0% in 2010, 3.0% in 2011, 3.5% in 2012, 4.0% in 2013, 4.5% in 2014 and 5.0% thereafter.

EXHIBIT VI

Summary of Plan Provisions

This exhibit summarizes the major provisions of Chapter 32 of the Laws of Massachusetts.

Plan Year: January 1 – December 31

Retirement Benefits

Employees covered by the Contributory Retirement Law are classified into one of four groups depending on job classification. Group 1 comprises most positions in state and local government. It is the general category of public employees. Group 4 comprises mainly police and firefighters. Group 2 is for other specified hazardous occupations. (Officers and inspectors of the State Police are classified as Group 3.)

The annual amount of the retirement allowance is based on the member's final three-year average salary multiplied by the number of years and full months of creditable service at the time of retirement and multiplied by a percentage according to the following table based on the age of the member at retirement:

	Age Last Birthday at Date of Retirement		
Percent	**Group 1**	**Group 2**	**Group 4**
2.5	65 or over	60 or over	55 or over
2.4	64	59	54
2.3	63	58	53
2.2	62	57	52
2.1	61	56	51
2.0	60	55	50
1.9	59	--	49
1.8	58	--	48
1.7	57	--	47
1.6	56	--	46
1.5	55	--	45

A member's final three-year average salary is defined as the greater of the highest consecutive three-year average annual rate of regular compensation and the average annual rate of regular compensation received during the last three years of creditable service prior to retirement. The $30,000 cap on salary used in a benefit determination for any employee hired after January 1, 1979 has been removed.

The maximum annual amount of the retirement allowance is 80 percent of the member's final three-year average salary. Any member who is a veteran also receives an additional yearly retirement allowance of $15 per year of creditable service, not exceeding $300. The veteran allowance is paid in addition to the 80 percent maximum.

Employee Contributions

Date of Hire	Contribution Rate
Prior to January 1, 1975	5%
January 1, 1975 – December 31, 1983	7%
January 1, 1984 – June 30, 1996	8%
July 1, 1996 onward	9%

In addition, employees hired after December 31, 1978 contribute an additional 2 percent of salary in excess of $30,000.

Employees hired after 1983 who leave with less than five years of credited service receive no interest on their contributions, and employees who leave with five but less than ten years receive one-half the rate of regular interest otherwise payable.

Retirement Benefits (Superannuation)

Members of Group 1, 2 or 4 may retire upon the attainment of age 55. For retirement at ages below 55, twenty years of creditable service is required.

Members who terminate before age 55 with ten or more years of creditable service are eligible for a retirement allowance upon the attainment of age 55 (provided they have not withdrawn their accumulated deductions from the Annuity Savings Fund of the System).

Ordinary Disability Benefits

A member who is unable to perform his or her job due to a non-occupational disability will receive a retirement allowance if he or she has ten or more years of creditable service and has not reached age 55. The annual amount of such allowance shall be determined as if the member retired for superannuation at age 55, based on the amount of creditable service at the date of disability. For veterans, there is a minimum benefit of 50 percent of the member's most recent year's pay plus an annuity based on his or her own contributions.

Accidental Disability Benefit

For a job-connected disability, the benefit is 72 percent of the member's most recent annual pay plus an annuity based on his or her own contributions, plus additional amounts for surviving children. Benefits are capped at 75 percent of annual rate of regular compensation for employees who become members after January 1, 1988.

Death Benefits

In general, the beneficiary of an employee who dies in active service will receive a refund of the employee's own contributions. Alternatively, if the employee were eligible to retire on the date of death, a spouse's benefit will be paid equal to the amount the employee would have received under Option C. The surviving spouse of a member who dies with two or more years of credited service has the option of a refund of the employee's contributions or a monthly benefit regardless of eligibility to retire, if they were married for at least one year. There is also a minimum widow's pension of $500 per month, and there are additional amounts for surviving children.

If an employee's death is job-connected, the spouse will receive 72 percent of the member's most recent annual pay in addition to a refund of the member's accumulated deductions, plus additional amounts for surviving children. However, in accordance with Section 100 of Chapter 32, the surviving spouse of a police officer, firefighter or corrections officer is killed in the line of duty will be eligible to receive an annual benefit equal to the maximum salary held be the member at the time of death.

"Heart And Lung Law" And Cancer Presumption	
	Any case of hypertension or heart disease resulting in total or partial disability or death to a uniformed fireman, permanent member of a police department, or certain employees of a county correctional facility is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. Any case of disease of the lungs or respiratory tract resulting in total disability or death to a uniformed fireman is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. There is an additional presumption for uniformed firemen that certain types of cancer are job-related if onset occurs while actively employed or within five years of retirement.
Options	
	Members may elect to receive a full retirement allowance payable for life under Option A. Under Option B a member may elect to receive a lower monthly allowance in exchange for a guarantee that at the time of death any contributions not expended for annuity payments will be refunded to the beneficiary. Option C allows the member to take a lesser retirement allowance in exchange for providing a survivor with two-thirds of the lesser amount. Option C pensioners will have benefits converted from a reduced to a full retirement if the beneficiary predeceases the retiree.
Post-Retirement Benefits	
	The Board has adopted the provisions of Section 51 Chapter 127 of the Acts of 1999, which provide that the Retirement Board may approve an annual COLA in excess of the Consumer Price Index but not to exceed a 3% COLA on the first $12,000 of a retirement allowance. Cost-of-living increases granted prior to July 1, 1998 are reimbursed by the Commonwealth and not reflected in this report.
Changes in Plan Provisions	There have been no changes in plan provisions since the last valuation.