January 1, 2016

Actuarial Valuation Report

Northampton Retirement System

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September 8, 2016

Northampton Retirement Board
Memorial Hall, First Floor
240 Main Street
Northampton, MA 01060

Dear Northampton Retirement Board:

Stone Consulting, Inc. has performed a January 1, 2016 actuarial valuation of the Northampton Retirement System. This valuation and report was prepared using generally accepted actuarial principles and practices. To the best of our knowledge, this report is complete and accurate, and the assumptions used represent our best estimate of anticipated experience of the system.

As part of performing the valuation, Stone Consulting, Inc. was furnished member data by the Northampton Retirement System's administrative staff. Although examined for general reasonableness, the data was not audited by the actuary. In addition, the administrative staff furnished financial statements that were not audited by the actuary or by the plan's auditors.

The funding objective of the plan is to fully fund the system while attempting to maintain a stable contribution amount for the upcoming fiscal year that is consistent with prior funding schedules or if employer finances allow it, to increase the contribution amount. This funding objective is being met.

We anticipate over time the contribution level to increase as a percentage of payroll. The contribution rate is determined by adding the normal cost plus an amortization of the unfunded actuarial accrued liability. The normal cost is expected to remain at a level percentage of payroll. The length of the funding schedule contained in this actuarial valuation report is fifteen years (fully funded by 2032). The amortization of the unfunded liability is set to increase by 3.65% annually.

The contribution amount for Fiscal Year 2018 is $5,930,334 which is $410,170 greater than the anticipated contribution amount from the prior funding schedule. PERAC and GASB guidelines indicate that actuarial valuations should be conducted every year. The Northampton Retirement Board conducted their previous actuarial valuation effective January 1, 2014.

We are pleased to present the results of this valuation. If the Retirement Board has any questions on the content of this report, we would be glad to respond. Please note that this report is meant to be used in its entirety. Use of excerpts of this report may result in inaccurate or misleading understanding of the results.

I, Lawrence Stone, am a consultant for Stone Consulting, Inc. I am a member of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,
STONE CONSULTING, INC.
Actuaries for the Plan

Lawrence B. Stone

Lawrence B. Stone
Member, American Academy of Actuaries

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Introduction

This report presents the results of the actuarial valuation of the Northampton Retirement System. The valuation was performed at the request of the Retirement Board as of January 1, 2016 for the purpose of determining the contribution requirements for Fiscal Year 2018 and beyond. The contribution requirements are based on:

- The financial condition of the system as of December 31,
- The benefit provisions of M.G.L. Chapter 32 and related statutes;
- The demographics of members in the system (i.e., active and inactive participants, retirees and beneficiaries as of January 1, 2016);
- Economic assumptions regarding salary increases and investment earnings; and
- Other actuarial assumptions (e.g., withdrawals, retirement, death, etc.)

Valuation Summary

	January 1, 2016 Valuation	January 1, 2014 Valuation	Change
Contribution Fiscal 2018	$5,930,334	$5,520,164	$410,170 increase
Funding Schedule Length (as of Fiscal 2018)	15 years	19 years	-4 years
Amortization Increase	3.65%	3.77%	-0.12%
Funding Ratio	70%	63%	7%
Interest Rate Assumption	7.50%	7.75%	-0.25%
Salary Increase Rate Assumption	3.00% steps for eight years 4.00% ultimate rate, reduced to 2.00% for 2016-2017 Base reduced by 0.50% when receiving steps	Same, with ultimate rate reduced to 2.00% for 2014-2015	Same, apart from extension of reduced ultimate rate

- The Fiscal Year 2018 contribution is $410,170 greater than the planned 2018 contribution. The Board shortened the funding schedule, as well as lowered the interest assumption, which resulted in the increase in the FY2018 contribution.

- Stone Consulting, with agreement from the Retirement Board, values assets using a four-year asset smoothing method. In this approach, asset gains and losses are recognized over a four-year period. The purpose of this approach is to avoid wide swings in asset value from one year to the next.

- The System, over the two-year period from January 1, 2014 to December 31, 2015, experienced a 5.9% annual return on the market value of assets versus our assumption of 7.75%. There was a $4,265,517 net actuarial loss in calendar years 2014 and 2015. The System's asset portfolio, effective December 31, 2015 is approximately 60% equities and 40% fixed income and short-term investments. Note that the asset allocation tends to have significant changes from year to year. The interest rate assumption was reduced to 7.50% to reflect anticipated future market performance. This change increased the actuarial accrued liability by $4.1 million.

- The salary increase assumption is based on a select and ultimate table, with a 4.00% ultimate rate, reduced to 2.00% for 2016-2017. Employees receive 3.00% steps for their first eight years of service, during which time whatever base rate is in effect is reduced by 0.50%. This assumption has been maintained from the prior valuation, with the exception of the ultimate rate being lowered to 2.00% for years 2014 and 2015 in the January 1, 2014 valuation. Extending the 2.00% ultimate rate for another two years reduced the liability by $1.4 million compared to the prior assumption of 4.00% in 2016 and 2017. Total compensation changed by 9.0% over the prior valuation; however average annual compensation (compensation divided by number of active members) only changed by 4.1%.

- The funding level of the Northampton Retirement System is 70% compared to 63% for the January 1, 2014 actuarial valuation. The funding level is estimated to be above the median for Massachusetts' Contributory Retirement Systems.

The schedule length is fifteen (15) years, a four-year reduction from the 19 years remaining from the 21 year schedule from the January 1, 2014 valuation. The maximum period permitted under Section 22F of Chapter 32 of the Massachusetts General Laws is twenty-three years (Fiscal 2040). The amortization of the unfunded liability increases by 3.65% each year.

- The mortality assumption is based upon the RP-2000 mortality table projected with Generational Mortality, Scale BB, with a base year of 2000. This is consistent with the prior valuation.

January 1, 2016 Actuarial Valuation Results Including Demographic Information

	January 1, 2016	January 1, 2014	Percentage Change
Funding			
Contribution for Fiscal 2018	$5,930,334		7.4%
Contribution for Fiscal 2018 based on current schedule		$5,520,164	
Members			
▪ Actives			
a. Number	633	604	4.8%
b. Annual Compensation	$26,241,401	$24,064,230	9.0%
c. Average Annual Compensation	$41,456	$39,841	4.1%
d. Average Attained Age	46.0	46.8	-1.7%
e. Average Past Service	10.8	11.5	-6.1%
▪ Retired, Disabled and Beneficiaries			
a. Number	403	392	2.8%
b. Total Benefits*	$9,235,565	$8,211,667	12.5%
c. Average Benefits*	$22,917	$20,948	9.4%
d. Average Age	70.9	71.1	-0.3%
▪ Inactives			
a. Number	200	184	8.7%
Normal Cost			
a. Total Normal Cost as of January 1, 2016	$3,571,819	$3,204,759	11.5%
b. Less Expected Members' Contributions	2,358,929	2,127,234	10.9%
c. Normal Cost to be funded by the Municipality	$1,212,890	$1,077,525	12.6%
d. Adjustment to July 1, 2017	82,784	73,545	12.6%
e. Administrative Expense Assumption	214,347	211,028	1.6%
f. Normal Cost Adjusted to July 1, 2017	$1,510,022	$1,362,098	10.9%
Actuarial Accrued Liability as of January 1, 2016			
a. Active Members	$64,664,011	$63,414,242	2.0%
b. Inactive Members	2,295,575	1,436,207	59.8%
c. Retired Members and Beneficiaries	94,080,323	84,170,369	11.8%
d. Total	$161,039,909	$149,020,818	8.1%
Unfunded Actuarial Accrued Liability			
a. Actuarial Accrued Liability as of January 1, 2016	$161,039,909	$149,020,818	8.1%
b. Less Actuarial Value of Assets as of January 1, 2016	112,320,084	93,943,208	19.6%
c. Unfunded Actuarial Accrued Liability as of January 1, 2016	$48,719,825	$55,077,610	-11.5%
d. Adjustment to July 1, 2017	1,776,670	3,174,484	
e. Unfunded Actuarial Accrued Liability as of July 1, 2017	$50,496,495	$58,252,094	

*Excluding State reimbursed COLA

Data and History of Active Participants

- The data was supplied by the Northampton Retirement Board. The data was checked under broad parameters for reasonableness. With the assistance of the staff of the Northampton Retirement Board, we were able to develop a database sufficient for valuation purposes.

Valuation Year	Number	Average Age	Average Past Service	Average Ann'l Compensation
2016	633	46.0	10.8	$41,456
2014	604	46.8	11.5	$39,841
2012	624	46.7	11.4	$38,283
2010	602	47.0	11.4	$37,468
2008	626	45.9	10.7	$34,750
2007	603	46.0	10.8	$33,724
2005	578	45.3	10.4	$31,350
2003	615	45.8	10.6	$29,635
2000	580	45.4	10.6	$27,298
1998	544	45.5	10.3	$25,784

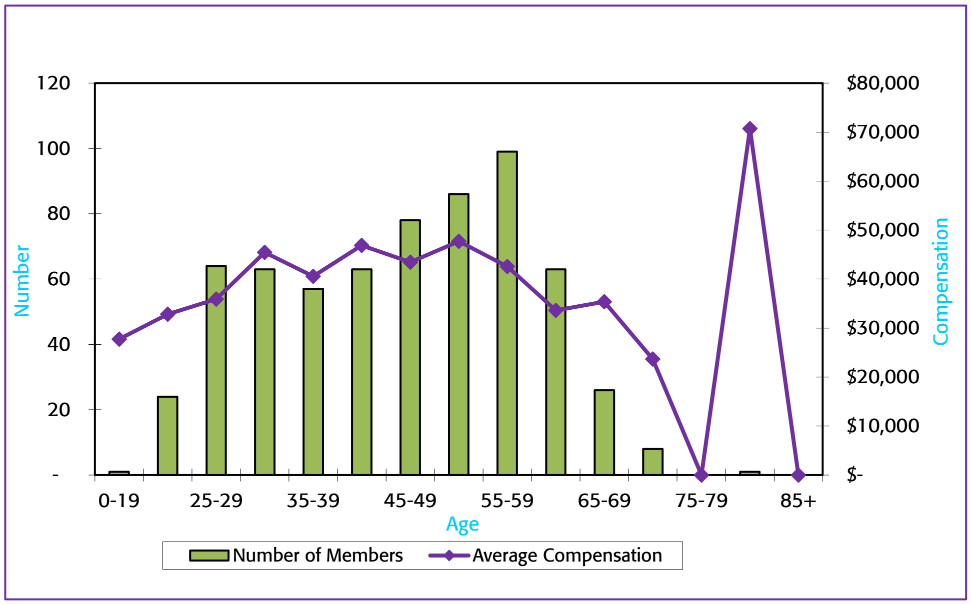
- Employee age has increased by 0.5 years and service has increased by 0.5 years over the course of the past eighteen years. This is consistent with the trend in the Commonwealth towards an aging of the employee population. Average annual compensation has grown by 60.8% (2.7% annually) over the same time period. There was a reduction in the average age and service since the prior valuation. This is consistent with the increase in the number of employees. This may be due to increases in school employees.

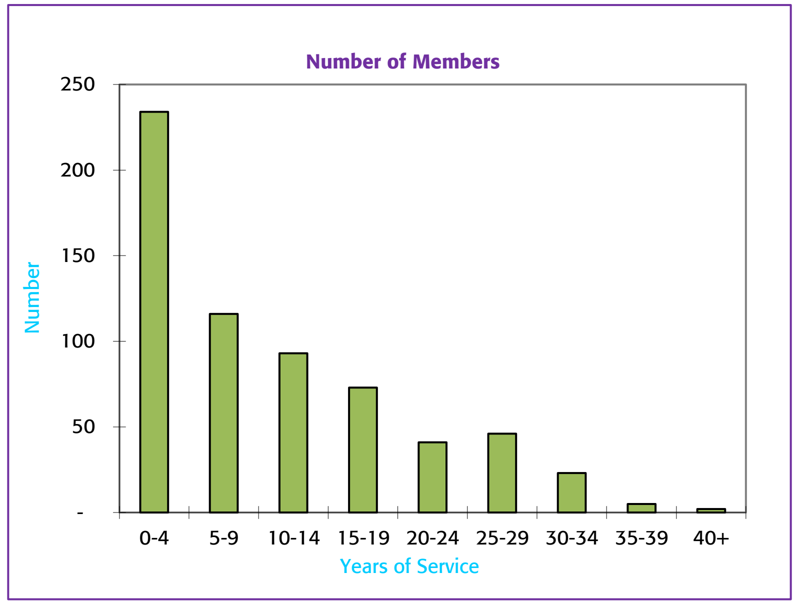
The charts on the following pages summarize demographic information regarding active and retiree members.

Distribution of Plan Members as of January 1, 2016

ACTIVE MEMBERS

AGE	0-4 Years	5-9 Years	10-14 Years	15-19 Years	20-24 Years	25-29 Years	30-34 Years	35-39 Years	40 + Years	Total	Total Compensation	Average Compensation
0-19	1	-	-	-	-	-	-	-	-	1	$ 27,743	$ 27,743
20-24	24	-	-	-	-	-	-	-	-	24	$ 787,452	$ 32,811
25-29	57	7	-	-	-	-	-	-	-	64	$ 2,296,757	$ 35,887
30-34	32	19	12	-	-	-	-	-	-	63	$ 2,862,591	$ 45,438
35-39	28	11	14	3	1	-	-	-	-	57	$ 2,311,700	$ 40,556
40-44	20	12	10	15	6	-	-	-	-	63	$ 2,953,240	$ 46,877
45-49	23	16	8	12	12	7	-	-	-	78	$ 3,389,957	$ 43,461
50-54	13	16	16	15	10	9	7	-	-	86	$ 4,102,091	$ 47,699
55-59	21	21	12	13	8	11	11	2	-	99	$ 4,212,761	$ 42,553
60-64	10	4	17	8	3	13	4	3	1	63	$ 2,116,891	$ 33,601
65-69	4	8	3	5	1	5	-	-	-	26	$ 920,122	$ 35,389
70-74	1	2	1	2	-	1	1	-	-	8	$ 189,387	$ 23,673
75-79	-	-	-	-	-	-	-	-	-	-	$ -	$ -
80-84	-	-	-	-	-	-	-	-	1	1	$ 70,709	$ 70,709
85+	-	-	-	-	-	-	-	-	-	-	$ -	$ -
TOTAL	**234**	**116**	**93**	**73**	**41**	**46**	**23**	**5**	**2**	**633**	**$ 26,241,401**	**$ 41,456**





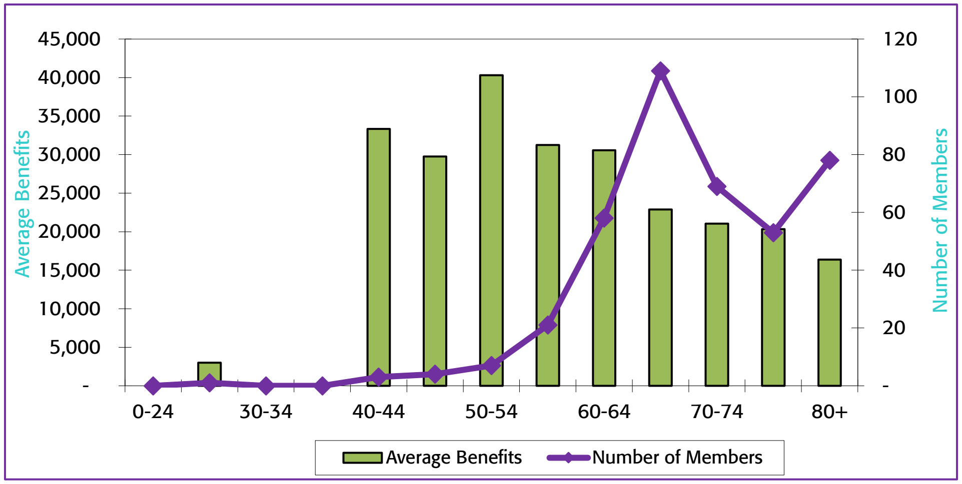
Distribution of Plan Members as of January 1, 2016

RETIRED MEMBERS

Retired Members and Beneficiaries			
Age	Number	Average Benefit	Total Benefit
0-24	-	-	-
25-29	1	3,000	3,000
30-34	-	-	-
35-39	-	-	-
40-44	1	14,065	14,065
45-49	1	13,208	13,208
50-54	4	46,686	186,743
55-59	16	29,809	476,951
60-64	52	30,270	1,574,053
65-69	102	22,353	2,280,007
70-74	59	20,545	1,212,173
75-79	48	19,941	957,168
80+	77	16,375	1,260,859
TOTAL	**361**	**$ 22,100**	**$ 7,978,227**

Disabled Members			
Age	Number	Average Benefit	Total Benefit
0-24	-	-	-
25-29	-	-	-
30-34	-	-	-
35-39	-	-	-
40-44	2	42,950	85,900
45-49	3	35,290	105,871
50-54	3	31,805	95,415
55-59	5	35,924	179,620
60-64	6	33,270	199,619
65-69	7	30,503	213,523
70-74	10	24,012	240,118
75-79	5	24,017	120,084
80+	1	17,188	17,188
TOTAL	**42**	**$ 29,937**	**$ 1,257,338**

Total			
Age	Number	Average Benefit	Total Benefit
0-24	-	-	-
25-29	1	3,000	3,000
30-34	-	-	-
35-39	-	-	-
40-44	3	33,322	99,965
45-49	4	29,770	119,079
50-54	7	40,308	282,157
55-59	21	31,265	656,571
60-64	58	30,581	1,773,673
65-69	109	22,876	2,493,530
70-74	69	21,048	1,452,291
75-79	53	20,326	1,077,252
80+	78	16,385	1,278,047
TOTAL	**403**	**$ 22,917**	**$ 9,235,565**



Benefits shown are net of State reimbursed COLA.

Valuation Methodology

Stone Consulting, Inc. used the Entry Age Normal actuarial funding method in this actuarial valuation. The use of the Entry Age Normal actuarial funding method is consistent with the requirements of Chapter 32 of the Massachusetts General Laws.

NORMAL COST

	January 1, 2016	% of Payroll*
Gross Normal Cost (GNC)	$3,571,819	13.6%
Employees Contribution	$2,358,929	9.0%
Net Normal Cost (NNC)	$1,212,890	4.6%
Adjusted to Beginning of Fiscal Year 2018	$82,784	
Administrative Expense	$214,347	0.8%
Adjusted Net Normal Cost With Admin. Expense	$1,510,022	

*Payroll paid in 2015 for employees as of January 1, 2016 is $26,241,401. Included in this amount is payroll for new hires in 2015, which was annualized.

- The gross normal cost (GNC) is the "price" of benefits accruing in the current year if the assumptions underlying the normal cost were realized.

- An individual normal cost represents that part of the cost of a member's future benefits that are assigned to the current year as if the costs are to remain level as a percentage of the member's pay. Benefits payable under all circumstances (i.e., retirement, death, disability, and withdrawals) are included in this calculation.

- Anticipated employee contributions to be made during the year are subtracted from the GNC to determine employer normal cost, or net normal cost (NNC).

- Administrative expenses added to the NNC. The administrative expense does not include investment manager and custodial fees. These fees are considered part of the interest rate assumption that is net of fees.

Actuarial Accrued Liability and Funded Status

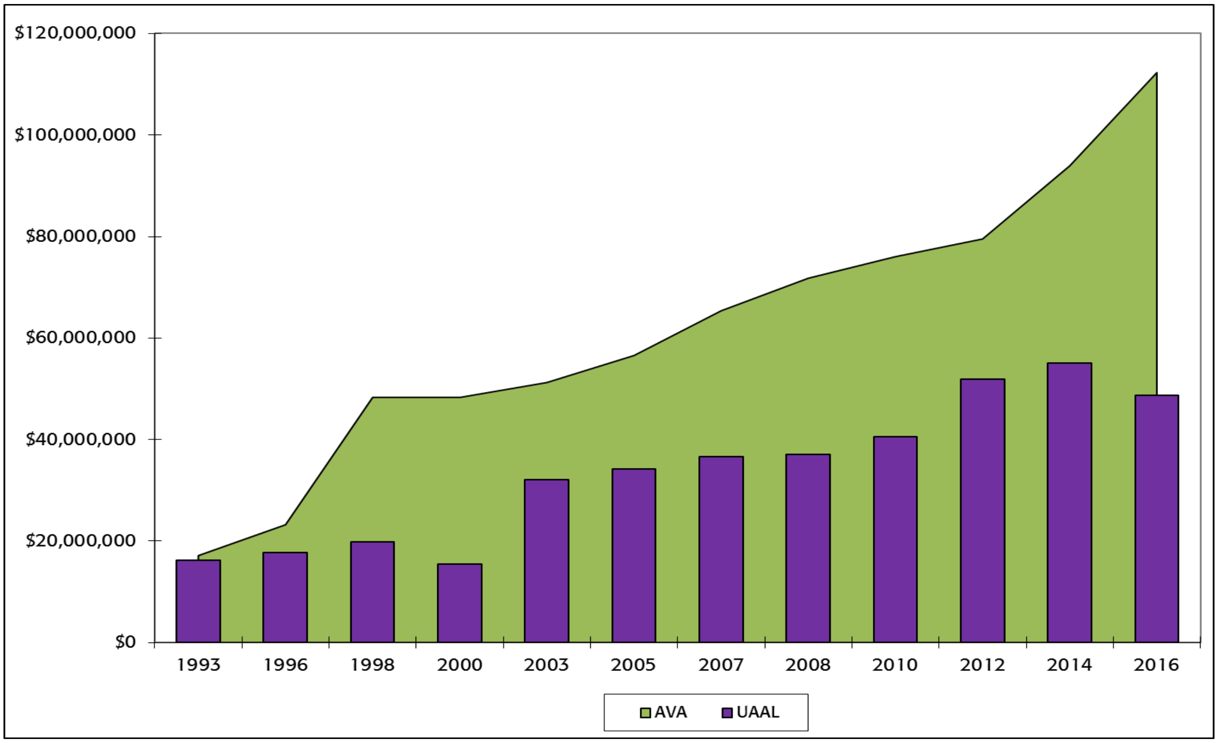
				January 1, 2016	Percentage Change
Active Actuarial Accrued Liability			$	64,664,011	2.0%
Superannuation	$	58,630,932			
Death	$	1,534,591			
Disability	$	3,731,916			
Withdrawal	$	766,572			
Retiree, Inactive, Survivor and Beneficiary Actuarial Accrued Liability			$	96,375,898	12.6%
Retirees and Beneficiaries	$	79,502,176			
Disabled	$	14,578,147			
Inactive	$	2,295,575			
Total Actuarial Accrued Liability (AAL)			$	161,039,909	8.1%
Actuarial Value of Assets (AVA)			$	112,320,084	19.6%
Unfunded Actuarial Accrued Liability			$	48,719,825	-11.5%
Funded Ratio (AVA / AAL)					
2016 (7.50% interest rate):	70%				
2014 (7.75% interest rate):	63%				

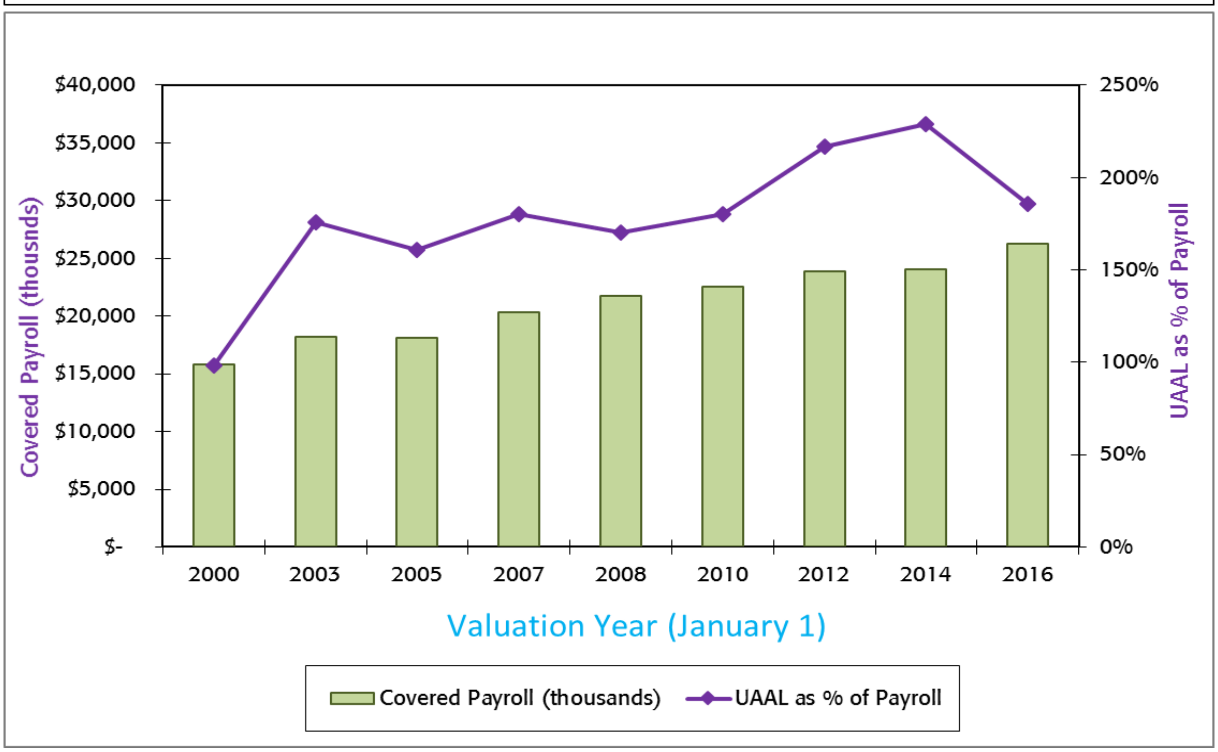
- Actuarial Accrued Liability (AAL) is the “price” of benefits attributable to benefits earned in past years, or in other words, represents today’s value of all benefits earned by active and inactive members.

The total AAL is $161,039,909. This along with an actuarial value of assets of $112,320,084 produces a funded status of 70%. This compares to a funded status of 63% for the 2014 valuation. The funding ratio using market value of assets is 68%.

The charts on the following page contain a history of the unfunded actuarial accrued liability (UAAL) compared to covered payroll and the valuation assets (AVA) over the course of the past twelve actuarial valuations.

Charts of Selected Actuarial and Demographic Statistics





Development of Funding Schedule

Net Employer Normal Cost for Fiscal 2018 (including admin. expenses)	$1,510,022
Net 3(8)(c) Payments	74,689
Amortization	4,345,623
Total Appropriation required for Fiscal 2018	$5,930,334

- The funding schedule is composed of the normal cost, the net 3(8)(c) payments and the amortization of the actuarial accrued unfunded liability and is adjusted by the administrative expense assumption. The contribution is assumed to be made at the beginning of the fiscal year. The 3(8)(c) payments are the amount that the Northampton Retirement System pays to or receives from other retirement boards for service that a retiree had with a different retirement system. The net 3(8)(c) payments is the difference between what the Northampton Retirement System paid out minus what was received by the System.

- The contribution amount for Fiscal 2018 is $5,930,334. The funding schedule is presented on page 11. The schedule's length is fifteen (15) years (for the fresh start base) which is a four year reduction from the 19 years remaining from the 21 year schedule from the January 1, 2014 valuation. The maximum funding schedule length allowed by Section 22F of Chapter 32 of the Massachusetts General Laws is twenty-three years to Fiscal 2040.

- In developing the funding schedule, we used a fresh start approach in which the unfunded actuarial accrued liability (UAAL), other than the UAAL due to past early retirement incentives, is reamortized instead of maintaining the existing amortization amount and separately amortizing the actuarial gain or loss. The use of a fresh-start approach can result in a funding schedule in which the changes in contribution amounts from year to year are more consistent. The amortization increases each year at a rate of 3.65%.

FUNDING SCHEDULE

Fiscal Year	Normal Cost	Unfunded Liability	Funding Amortization of UAAL	Net 3(8)(c) Payments	Schedule Contribution*
2018	1,510,022	50,496,495	4,345,623	74,689	5,930,334
2019	1,577,973	49,612,187	4,506,697	74,689	6,159,359
2020	1,648,982	48,488,402	4,673,761	74,689	6,393,819
2021	1,723,186	47,100,739	4,847,038	74,689	6,641,168
2022	1,800,729	45,422,728	5,026,761	74,689	7,154,237
2023	1,881,762	43,425,664	5,213,170	74,689	7,430,879
2024	1,966,441	41,078,431	5,406,515	74,689	7,718,439
2025	2,054,931	38,347,310	5,607,055	74,689	8,017,353
2026	2,147,403	35,195,774	5,815,059	74,689	8,328,073
2027	2,244,036	31,584,269	6,030,805	74,689	8,651,071
2028	2,345,018	27,469,974	6,254,584	74,689	8,986,838
2029	2,450,544	22,806,544	6,017,239	74,689	8,866,427
2030	2,560,818	18,048,503	6,236,868	74,689	9,208,155
2031	2,676,055	12,697,508	6,464,514	74,689	9,563,293
2032	2,796,478	6,700,469	6,700,469	74,689	9,932,374
2033	2,922,319	-	-	74,689	2,997,008

Amortization of Unfunded Liability as of July 1, 2017

Year	Type	Original Amort. Amount	Percentage Increasing	Original # of Years	Current Amort. Amount	Years Remaining
2005	ERI-Housing	7,992	4.50%	24	14,009	11
2006	ERI-City	164,100	4.50%	23	275,269	11
2018	Fresh Start	4,056,345	3.65%	15	4,056,345	15

Notes on Amortization of Unfunded Liability

Year is the year the amortization base was established. **Type** is the reason for the creation of the base.
Original Amortization Amount is the annual amortization amount when the base was established.
Percentage Increasing is the percentage that the Original Amortization Amount increases per year.
Original # of Years is the number of years over which the base is being amortized. **Current Amortization Amount** is the amortization payment amount for this year. **Years Remaining** is the number of years left to amortize the base.

* Includes recognition of the following asset gains/(losses) in Fiscal 2020 and 2022:

2020	$ 38,092
2022	$ (2,361,663)

Assumptions and Methodology Summary

The principal actuarial assumptions used in this valuation are the same as the assumptions used in the previous valuation, except where noted, and are summarized in the following table:

Valuation Date	January 1, 2016 Valuation
Interest Rate	7.50% (prior valuation used 7.75%).
Salary Increase	3.00% steps for eight years 4.00% ultimate rate, reduced to 2.00% for 2016-2017 Base reduced by 0.50% when receiving steps
COLA	3% of $13,000
COLA Frequency	Granted every year
Mortality	RP-2000 mortality table projected with Generational Mortality, Scale BB, with a base year of 2000. For members retired under an Accidental Disability (job-related), 40% of deaths are assumed to be from the same cause as the disability. Disabled mortality RP-2000 mortality table projected with Generational Mortality, Scale BB, with a base year of 2000, ages set forward 2 years.
Overall Disability	Groups 1 and 2 45% ordinary disability 55% accidental disability Group 4 10% ordinary disability 90% accidental disability
Retirement Rates	Groups 1 and 2 Ages 55 – 70 Group 4 Ages 50 – 65
Administrative Expense	$214,347 budget estimated for FY 2018 provided by Northampton Retirement Board.

Assets

	Cash	$	1,593,680.66
	Fixed Income Securities		41,225,186.54
	Equities		65,492,462.00
	Pooled Alternative Investments		758,848.80
	Hedge Funds		875,836.27
A	Sub-Total:	$	109,946,014.27
	Interest Due and Accrued		216,471.77
	Accounts Receivable		46,471.72
	Accounts Payable		(212,444.23)
B	Sub-Total:	$	50,499.26
	Market Value of Assets [(A) + (B)]	$	109,996,513.53

- We were furnished with the System's annual report by the Board. The market value of assets as of December 31, 2015 (adjusted for payables and receivables) is $109,996,513.53.

- The asset allocation is approximately 40% fixed income, cash, receivables and payables and 60% equities, alternative investments, hedge funds and similar types of investments. Historically, 9.00% to 10.00% has been the expected long-term rate of return for equities, and 5.00% to 7.00% has been the expected long-term rate of return for fixed income securities. Many economists and investment professionals are projecting lower returns of 6.25% to 9.00% for equities and 3.65% to 6.00% for fixed income securities. In light of these projections, as well as historical investment returns, the 7.50% interest rate assumption is within the reasonable assumption range. We encourage close monitoring for changes in investment performance against expectations.

- Actuarial value of assets (AVA) of $112,320,084 is based on a four-year smoothing method. Investment gains or losses above or below the expected rate of investment return are recognized over 4 years, 25% per year. The AVA must be no more than 110% of the market value of assets and no less than 90% of the market value of assets.

Calculation of Valuation Assets as of January 1, 2016

FOUR-YEAR ASSET SMOOTHING

1. Market value of assets including receivable/payable as of 01/01/2016 — 109,996,514

2. Phase-in of asset gains and losses

	Plan Year (1)	Original Amount (2)	Percent Unrecognized (3)	Amount Unrecognized (2) x (3)
a.	2015	($9,446,651)	75%	($7,084,988)
b.	2014	$5,181,134	50%	$2,590,567
c.	2013	$8,683,404	25%	$2,170,851
d.	2012	$2,298,809	0%	$0
e.	2011	($3,579,316)	0%	$0
f.	Total	$3,137,379		($2,323,571)

3. Valuation assets without corridor as of 01/01/2016 (1. - 2.f.) — 112,320,084

4. Corridor Check
   a. 90% of Market Value — 98,996,862
   b. 110% of Market Value — 120,996,165

5. Valuation assets with corridor as of 01/01/2016 (3. within Corridor) — $112,320,084

6. Calculation of return on valuation assets
   a. Valuation assets as of 01/01/2014 — $93,943,208
   b. ER contribs + EE contribs - Ben Pymts - Expenses — $(2,838,906)
   c. Actual return on valuation assets 5. - (6.a. + 6.b.) — 21,215,782
   d. Weighted value of valuation assets — 92,523,755
   e. Return on valuation assets (6.c. / 6.d.) — 22.9%
   f. Annualized return on assets — 10.9%

Disclosure Information

SCHEDULES OF FUNDING PROGRESS
(Dollars In Thousands)

Actuarial Valuation Date	Actuarial Value of Assets A	Actuarial Accrued Liability B	Unfunded AAL (UAAL) B-A	Funded Ratio A/B	Covered Payroll C	UAAL as a % of Covered Payroll (B-A)/C
1/1/2016	$112,320	$161,040	$48,720	70%	$26,241	186%
1/1/2014	$93,943	$149,021	$55,078	63%	$24,064	229%
1/1/2012	$79,531	$131,388	$51,856	61%	$23,889	217%
1/1/2010	$76,045	$116,637	$40,592	65%	$22,556	180%
1/1/2009	$71,799	$108,846	$37,046	66%	$21,754	170%

NOTES TO SCHEDULES

Additional information as of the latest actuarial valuation follows:

Valuation Date	1/1/2016
Actuarial cost method	Entry Age Normal
Amortization method	3.65% amortization increase
Remaining amortization period	15 years for the fresh start base
Asset valuation method	Market value adjusted by accounts payable and receivables adjusted to phase in over 4 years investment gains or losses above or below the expected rate of investment return. The actuarial value of assets must be no less than 90% of the adjusted market value nor more than 110% of the adjusted market value. Market value of assets is $109,996,513.53
Actuarial assumptions:	
Investment Rate of Return	7.50% per year
Projected Salary Increases	3.00% steps for eight years 4.00% ultimate rate, reduced to 2.00% for 2016-2017 Base reduced by 0.50% when receiving steps

PERAC Information Disclosure

The most recent actuarial valuation of the System was prepared by Stone Consulting, Inc. as of January 1, 2016

The normal cost for employees on that date was:	$2,358,929	9.0% of payroll
The normal cost for the employer was:	$1,212,890	4.6% of payroll

The actuarial liability for active members was:	$64,664,011
The actuarial liability for retired members was (includes inactives):	$96,375,898
Total actuarial accrued liability:	$161,039,909
System assets as of that date ($109,996,513.53 Market Value):	$112,320,084
Unfunded actuarial accrued liability:	$48,719,825

The ratio of system's assets to total actuarial liability was:	70%

As of that date the total covered employee payroll was:	$26,241,401

The principal actuarial assumptions used in the valuation are as follows:

Investment Return:	7.50% per annum
Rate of Salary Increase:	Select and ultimate rate (4.00% ultimate rate)

SCHEDULE OF FUNDING PROGRESS (Dollars in $000's)

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded AAL (UAAL) (b-a)	Funded Ratio (a/b)	Covered Payroll (c)	UAAL as a % of Covered Payroll ((b-a)/c)
1/1/2016	$112,320	$161,040	$48,720	70%	$26,241	186%
1/1/2014	$93,943	$149,021	$55,078	63%	$24,064	229%
1/1/2012	$79,531	$131,388	$51,856	61%	$23,889	217%
1/1/2010	$76,045	$116,637	$40,592	65%	$22,556	180%
1/1/2009	$71,799	$108,846	$37,046	66%	$21,754	170%

Actuarial Methods and Assumptions

ACTUARIAL METHODS

Actuarial Cost Method

The Entry Age Normal Actuarial Cost Method has been used in this valuation. Under this method, the normal cost is the amount calculated as the level percentage of compensation necessary to fully fund the prospective benefits from each member's entry age to retirement age.

The actuarial accrued liability represents the theoretical accumulation of all prior years' normal costs for the plan members as if the program had always been in effect. The unfunded actuarial accrued liability is the excess of the actuarial accrued liability over plan assets.

Asset Valuation Method

Market value of assets (adjusted by payables and receivables) adjusted to phase in investment gains or losses above or below the expected rate of investment return over a four-year rolling period. The phase-in is 25% for year one, 50% for year two, 75% for year three and finally 100% for year four. The actuarial value of assets may be no less than 90%, or more than 110% of the market value of assets plus payables and receivables.

Fiscal Year Adjustment

The actuarial results are adjusted by the valuation interest rate and salary scale to the beginning of Fiscal Year 2018. The unfunded actuarial accrued liability is rolled forward with normal cost and further adjusted by anticipated contributions and interest.

ACTUARIAL ASSUMPTIONS

Investment Return

7.50% per year net of investment expenses (7.75% in prior valuation).

Regular Interest Rate Credited to Annuity Savings Account

2% per year.

Salary Increases

Select and Ultimate Assumption - 3.00% steps for eight years; 4.00% ultimate rate, reduced to 2.00% for 2016-2017. Base reduced by 0.50% when receiving steps (prior valuation reduced 2014-2015 to 2.00%).

Actuarial Methods and Assumptions
(Continued)

Withdrawal Prior to Retirement

The rates shown at the following sample ages illustrate the withdrawal assumption. Withdrawal rates are set to zero if the retirement rate at that age is nonzero.

Rate of Withdrawal

Service	Group 1 and 2	Group 4
0	15%	1.5%
1	12%	1.5%
2	10%	1.5%
3	9%	1.5%
4	8%	1.5%
5	7.6%	1.5%
10	5.4%	1.5%
15	3.3%	0.0%
20	2.0%	0.0%
25	1.0%	0.0%
30+	0.0%	0.0%

Disability Prior to Retirement

The rates shown at the following sample ages illustrate the assumption regarding the incidence of disability:

Rate of Disability

Age	Group 1 and 2	Group 4
20	0.01%	0.10%
25	0.02%	0.20%
30	0.03%	0.30%
35	0.06%	0.30%
40	0.10%	0.30%
45	0.15%	1.00%
50	0.19%	1.25%
55	0.24%	1.20%
60	0.28%	0.85%

Disability is assumed to be 45% ordinary and 55% accidental for Group 1 and 2 and 10% ordinary and 90% accidental for Group 4.

Actuarial Methods and Assumptions
(Continued)

Rates of Retirement

The rates shown at the following ages illustrate the assumption regarding the incidence of retirement, once the member has achieved 10 years of service:

Age	Group 1& 2 Male	Group 1 & 2 Female	Group 4	Hired after 4/1/2012 Group 1& 2 Male	Hired after 4/1/2012 Group 1 & 2 Female	Hired after 4/1/2012 Group 4
50	1%	1.5%	2%	0%	0%	0%
51	1%	1.5%	2%	0%	0%	0%
52	1%	2.0%	2%	0%	0%	0%
53	1%	2.5%	2%	0%	0%	0%
54	2%	2.5%	7.5%	0%	0%	0%
55	2%	5.5%	15%	0%	0%	10%
56	2.5%	6.5%	10%	0%	0%	7%
57	2.5%	6.5%	10%	0%	0%	20%
58	5%	6.5%	10%	0%	0%	10%
59	6.5%	6.5%	15%	0%	0%	15%
60	12%	5%	20%	25%	30%	20%
61	20%	13%	20%	20%	13%	20%
62	30%	15%	25%	30%	15%	25%
63	25%	12.5%	25%	25%	12.5%	25%
64	22%	18%	30%	22%	18%	30%
65	40%	15%	100%	40%	15%	100%
66	25%	20%	N/A	25%	20%	N/A
67	25%	20%	N/A	25%	20%	N/A
68	30%	25%	N/A	30%	25%	N/A
69	30%	20%	N/A	30%	20%	N/A
70	100%	100%	N/A	100%	100%	N/A

Mortality

RP-2000 mortality table projected with Generational Mortality, Scale BB, with a base year of 2000 (sex-distinct). Prior valuation used the same assumption. During employment the healthy employee mortality table is used. Post-employment the healthy annuitant table is used. In-service death is assumed to be 55% accidental for group 1 and 2 and 90% accidental for group 4.

Disabled Life Mortality

RP-2000 mortality table projected with Generational Mortality, Scale BB, with a base year of 2000 for healthy annuitants, set-forward by 2 years (sex-distinct). Death is assumed to be due to the same cause as the disability 40% of the time. Prior valuation used the same assumption.

Actuarial Methods and Assumptions
(Continued)

Family Composition

Members assumed married with 2 dependent children – one male and one female both age 15; age difference between member and spouse assumed to be 3 years (the male being the older).

Cost-of-Living Increases

A 3% COLA on the first $13,000 of a member's retirement allowance is assumed to be granted every year.

Administrative Expenses

Estimated budgeted amount of $214,347 for the Fiscal Year 2018 excluding investment management fees and custodial fee is added to the Normal Cost.

Net 3(8)(c)

Net 3(8)(c) payments are assumed to be the same level as the past calendar year for all future years.

Step Increases

Step increases are assumed to be part of the salary increase assumption.

Credited Service

All service is assumed to be due to employment with the municipality.

Contribution Timing

Contributions are assumed to be made at the beginning of the fiscal year.

Total Payroll Increase

The total payroll is assumed to increase at 4.50% per year.

Valuation Date

January 1, 2016.

Summary of Principal Provisions

1. PARTICIPANT

Participation is mandatory for all full-time employees whose employment commences before age 65. There are three classes of members in the retirement system:

- Group 1: general employees
- Group 2: employees in specified hazardous occupations (e.g., electricians)
- Group 4: police and firefighters

2. MEMBER CONTRIBUTIONS

Member contributions vary depending upon date hired as follows:

Date of Hire	Member Contribution Rate
Prior to 1975	5% of Pay
1975 – 1983	7% of Pay
1984 – June 30, 1996	8% of Pay
After June 30, 1996	9% of Pay

Members hired after 1978 contribute an additional 2% of pay over $30,000 (annualized on a pay period basis).

3. PAY

a. Pay

Gross regular compensation excluding bonuses, overtime, severance pay, unused sick pay, and other similar compensation. For those hired after 12/31/2010, covered pay is limited to 64% of the IRS Code Section 401(a)(17) pay limit.

b. Average Pay

The average of pay during the three consecutive years that produce the highest average or, if greater, during the last three years (whether or not consecutive) preceding retirement. For members joining the MGL Chapter 32 Retirement System after April 1, 2012, five-year averages will be used.

4. CREDITED SERVICE

Period during which an employee contributes to the retirement system plus certain periods of military service and "purchased" service.

5. SERVICE RETIREMENT

a. Eligibility

1) Attainment of age 55 and completion of ten years of credited service or at any age with completion of 20 years of service. If hired prior to 1978 or a member of Group 4, the completion of ten years of service is not required.

2) System member after April 1, 2012 and Group 1 – Age 60 and Completion of 10 years of credited service. Group 2 – Age 55 and completion of 10 years of service. Group 4 – Age 55.

Summary of Principal Provisions (Continued)

b. Retirement Allowance

Determined as the product of the member's benefit percentage, average pay and credited service, where the benefit percentage is shown below (maximum allowance of 80% of average pay):

Benefit % X Average Pay X Years of Service = Benefit, limited at 80% of average pay

BENEFIT % BASED ON ATTAINED AGE AT RETIREMENT			
Benefit Percentage	Group 1	Group 2	Group 4
2.5%	65+	60+	55+
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	N/A	49
1.8	58	N/A	48
1.7	57	N/A	47
1.6	56	N/A	46
1.5	55	N/A	45
	Hired after April 1, 2012*		
2.5%	67+	62+	57+
2.35	66	61	56
2.20	65	60	55
2.05	64	59	54
1.90	63	58	53
1.75	62	57	52
1.60	61	56	51
1.45	60	55	50

*Reduction is .125% for each year early instead of .15% per year for employees with over 30 years of service.

In addition, veterans receive an additional $15 per year for each year of credited service up to 20 years

6. DEFERRED VESTED RETIREMENT

a. Eligibility

Completion of 10 years of credited service (for elected and appointed members, 6 years in the event of involuntary termination).

b. Retirement Allowance

Determined in the same manner as "Service Retirement" section above with the member eligible to start collecting a benefit at age 55, (or age 57 for post-April 1, 2012 hires) or defer until later at his or her discretion. If a member chooses, his or her contributions with interest may be withdrawn. The amount of interest he or she will receive depends on length of service and whether or not the termination of employment was voluntary.

Summary of Principal Provisions (Continued)

7. ORDINARY DISABILITY RETIREMENT

a. Eligibility

Non-job related disability after completion of 10 years of credited service.

b. Retirement Allowance

Determined in the same manner as "Service Retirement" section and calculated as if the member had attained age 55 (or age 57 for those hired after April 1, 2012), if younger. Veterans receive 50% of pay (during final year) plus an annuity based on accumulated member contributions with interest.

8. ACCIDENTAL DISABILITY RETIREMENT

a. Eligibility

Disabled as a result of an accident in the performance of duties. No age or service requirement.

b. Retirement Allowance

72% of pay plus an annuity based on accumulated member contributions with interest. Also, a dependent's allowance per year for each child. Total allowance not to exceed 100% of pay (75% for members hired after 1987).

9. NON-OCCUPATIONAL DEATH

a. Eligibility

Dies while in active service, but not due to occupational injury. 2 years of service.

b. Retirement Allowance

Benefit as if Option C had been elected (see below) and member had attained age 55 (or age 57 for those hired after April 1, 2012) if younger. Minimum monthly benefits provided as follows: spouse - $500, first child - $120, each additional child - $90

10. OCCUPATIONAL DEATH

a. Eligibility

Dies as a result of an occupational injury.

b. Benefit Amount

72% of pay plus refund of annuity savings fund balance. In the case of an accidental disability retiree who dies of the same cause, the beneficiary receives 72% of the last 12 months salary or the current pension amount, whichever is greater.

Summary of Principal Provisions
(Continued)

11. COST-OF-LIVING INCREASES

An increase of up to 3% applied to the first $13,000 of annual benefit. Funded by the Employer from Fiscal Year 1999. Percentage increase is voted on each year by the Retirement Board. Cost-of-living increases granted during Fiscal Year 1982 through Fiscal 1998 are reimbursed by the Commonwealth.

12. OPTIONAL FORMS OF PAYMENT

- Option A

Allowance payable monthly for the life of the member.

- Option B

Allowance payable monthly for the life of the member with a guarantee of remaining member contributions with interest.

- Option C

Allowance payable monthly for the life of the member with 66-2/3% continuing to the member's beneficiary upon the member's death. If the beneficiary predeceases the member, the allowance amount "pops up" to the non-reduced amount.

Glossary of Terms

- Actuarial Accrued Liability

  The portion of the Present Value of Benefits that is attributable to past service.

- Actuarial Assets

  Market value of assets (adjusted by payables and receivables) adjusted to phase in investment gains or losses above or below the expected rate of investment return over a four-year rolling period. The phase-in is 25% for year one, 50% for year two, 75% for year three and finally 100% for year four. The actuarial value of assets may be no less than 90%, or more than 110% of the market value of assets plus payables and receivables.

- Actuarial Assumptions

Estimates are made as to the occurrence of certain events that determine the level of benefits to be paid and how long they will be provided. The more important actuarial assumptions include the investment return on assets, salary increases and the rates of turnover, disability, retirement and mortality.

- Actuarial Cost Method

The procedure that is used to allocate the present value of benefits between the liability that is attributable to past service (Actuarial Accrued Liability) and that attributable to future service.

- GASB

Government Accounting Standards Board (issues guidance for disclosure of retirement system liabilities).

- Normal Cost

The portion of the Present Value of Benefits that is attributable to benefits to be earned in the coming year.

- PERAC

Public Employee Retirement Administration Commission, a division of the State government which has regulatory authority over the administration of the retirement system.

- Present Value of Benefits

Represents the dollar value today of all benefits expected to be earned by current members if all actuarial assumptions are exactly realized.

- PRIT

Pension Reserves Investment Trust Fund is the state controlled and administered fund for the investment of assets for members of the retirement system.

- Unfunded Actuarial Accrued Liability

That portion of the Actuarial Accrued Liability not covered by System Assets.