NEW HAMPSHIRE RETIREMENT SYSTEM
ACTUARIAL VALUATION REPLICATION
JUNE 30, 2005

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SECTION A

INTRODUCTORY LETTER

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February 12, 2007

The Retirement Board
New Hampshire Retirement System
Concord, New Hampshire

Attention: Mr. Robert Leggett
Executive Director

Dear Board Members:

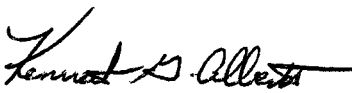
Submitted in this report are the results of Replication and Review valuations for the New Hampshire Retirement System NHRS.

The purpose of this report was to gain an overall understanding of the valuation model used by the prior actuary, the benefits provided by NHRS and the methods and assumptions employed by the prior actuary and make comments and display alternatives where appropriate. A complete valuation audit was not performed, nor was a complete experience study audit performed. However, GRS did attempt to reproduce most valuation results and review major assumptions. Since deferred liabilities do not have a major impact on results, calculations for these liabilities made by the prior actuary were accepted and estimation techniques were used to modify these liabilities where needed to model alternate methods and assumptions. Active members and annuitant members were valued directly by GRS in all cases.

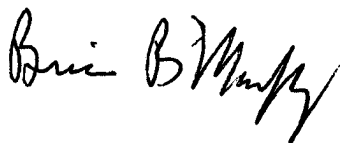
Member data and asset information was provided by the prior actuary, through NHRS staff. Reported data and asset values are as of June 30, 2005.

Except where noted, actuarial assumptions and methods were the same as those used by the prior actuary. These assumptions and methods are described in the prior actuary's last valuation report, as of June 30, 2005.

Respectfully Submitted,



Kenneth G. Alberts



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SECTION B

VALUATION DATA

VALUATION DATA

Data for the June 30, 2005 valuation was collected from the prior Actuary through retirement system staff. Replication was primarily focused on the active and retired members. The chart below indicates the number of members and payroll by division for the usable data.

	Employees			Teachers			Police			Fire		
	GRS	Prior Actuary	Ratio	GRS	Prior Actuary	Ratio	GRS	Prior Actuary	Ratio	GRS	Prior Actuary	Ratio
Actives Valued	26,395	26,414	99.9%	18,464	18,474	99.9%	4,573	4,573	100.0%	1,599	1,599	100.0%
Payroll ($Mill.)	$ 879.40	$ 879.42	100.0%	$ 851.62	$ 851.66	100.0%	$ 221.46	$ 221.46	100.0%	$ 91.03	$ 91.03	100.0%
Annuitants Valued	9,972	9,973	100.0%	5,903	5,904	100.0%	2,011	2,012	100.0%	1,060	1,061	99.9%
Annual Benefits ($Mill.)	$ 100.86	$ 100.86	100.0%	$ 108.86	$ 108.89	100.0%	$ 55.76	$ 55.79	99.9%	$ 30.79	$ 30.81	99.9%

Minor differences in the results above occurred because each actuarial valuation system contains different criteria for determining defective data. These differences are not material, as can be seen by the ratios. Essentially, this chart indicates a match between the member records value by the prior actuary and the member records valued by GRS. Twenty-six members on the retiree and beneficiary file were reported with a retirement date after June 30, 2005 (as much as 6 months after). The prior actuary valued these members as having been retired on the valuation date. GRS followed this procedure.

In the course of the replication valuation, it was determined that data reported by the retirement system did not accurately reflect the changing benefit for Group I retired members who were currently under age 65. GRS has discussed this with NHRS staff and requested that this information be provided on future valuation data files. For purposes of the replication valuation, GRS valued these members in the same manner as the prior actuary.

It was also determined that the prior actuary assumed that 100% of currently retired Group II members who retired with age and service benefits would have a beneficiary eligible for the automatic spousal benefit upon death, even if the reported data did not contain beneficiary information. NHRS staff has indicated that the occurrence of beneficiary data on the file accurately reflects the existence of a spouse entitled to the automatic survivor benefit.

While both of these data issues would lower estimates of system costs, we believe that there are other needed changes to methods and assumptions that will more than offset these changes. This, in combination with the current funded status of the plan, leads GRS to recommend that NHRS not lower the currently established contributions as a result of these issues.

Post Retirement Medical Data for Members Currently Receiving Subsidy Benefits

Data provided on the file contains both a subsidy amount and a coverage type. We found several examples of conflicting information between these two fields, such as single person subsidy amounts for members with multiple person coverage types and visa-versa. GRS will work with staff to better understand the data provided and recommend changes where necessary.

SECTION C

BENEFITS

BENEFITS

In our review of the benefits, the following issues arose:

1) For Group I members who retire before age 65 and elect a 100% J&S option (option 2), we understand that if the beneficiary out lives the member, the beneficiary will receive 100% of the member's reduced pre-65 benefit for life, regardless of the age of the member at death. Essentially, if we understand the operation correctly, the system will pay out higher benefits after the member's death (in this case) than before, should the member die after age 65.

2) Option factors for disabled members are different than option factors for healthy members.

3) When NHRS reimburses an employer for the health subsidy for a member who is eligible under the provisions of the plan, it is not clear whether or not NHRS actually confirms that the member is actually participating in the employer's medical plan.

Each of these administrative practices is unusual and we recommend that the NHRS compliance officer review each for compliance with federal regulations. The review should include both IRC 401(a)(9) and the Americans with Disabilities Act (ADA).

SECTION D

REPLICATION RESULTS

Valuation Results June 30, 2005
Current Methods and Assumptions, Including
8.5% Interest; No COLA; Open Group Aggregate Normal Cost

	Employees			Teachers		
	GRS	Prior Actuary	Ratio	GRS	Prior Actuary	Ratio
Present Value of Benefits for						
A. Retirees & Beneficiaries	$ 866.32	$ 882.68	98.1%	$ 995.78	$ 1,013.68	98.2%
B. Current Active	1,925.80	1,905.72	101.1%	2,147.77	2,153.69	99.7%
C. Deferred	17.32	17.32	100.0%	21.63	21.63	100.0%
D. New Entrants	1,548.72	1,515.25	102.2%	1,172.70	1,147.42	102.2%
E. Total (A+B+C+D)	4,358.16	4,320.98	100.9%	4,337.87	4,336.42	100.0%
F. UFIL	0.03	0.03	100.0%			
G. Assets	1,140.87	1,140.87	100.0%	1,480.71	1,480.71	100.0%
H. Present Value of Future Normal Cost (E - F - G)	3,217.26	3,180.07	101.2%	2,857.17	2,855.71	100.1%
I. Total Present Value of Future Salary (Current Actives + New Entrants)	25,622.08	25,013.78	102.4%	22,676.93	22,319.43	101.6%
J. Total Normal Cost Rate (H/I)	12.56%	12.71%	98.8%	12.60%	12.79%	98.5%
K. Employee Rate	5.00%	5.00%	100.0%	5.00%	5.00%	100.0%
L. Employer Rate (J-K)	7.56%	7.71%	98.0%	7.60%	7.79%	97.5%

The results on this page indicate that GRS has substantially reproduced the prior actuary's valuation method as applied to the Employees and Teachers divisions.

Valuation Results June 30, 2005
Current Methods and Assumptions, Including
8.5% Interest; No COLA; Open Group Aggregate Normal Cost

	Police			Fire		
	GRS	Prior Actuary	Ratio	GRS	Prior Actuary	Ratio
Present Value of Benefits for						
A. Retirees & Beneficiaries	$ 541.02	$ 550.85	98.2%	$ 296.78	$ 298.11	99.6%
B. Current Active	913.37	912.98	100.0%	503.71	479.95	105.0%
C. Deferred	5.80	5.80	100.0%	4.45	4.45	100.0%
D. New Entrants	688.43	720.00	95.6%	351.52	291.06	120.8%
E. Total (A+B+C+D)	2,148.62	2,189.63	98.1%	1,156.46	1,073.57	107.7%
F. UFIL						
G. Assets	679.81	679.81	100.0%	333.88	333.88	100.0%
H. Present Value of Future Normal Cost (E - F - G)	1,468.81	1,509.82	97.3%	822.58	739.70	111.2%
I. Total Present Value of Future Salary (Current Actives + New Entrants)	5,894.34	5,797.23	101.7%	2,806.23	2,681.25	104.7%
J. Total Normal Cost Rate (H/I)	24.92%	26.04%	95.7%	29.31%	27.59%	106.3%
K. Employee Rate	9.30%	9.30%	100.0%	9.30%	9.30%	100.0%
L. Employer Rate (J-K)*	15.62%	16.74%	93.3%	20.01%	18.29%	109.4%

** The rate published in the prior actuary's report for Fire was 18.27%, however, the math, using the prior actuary's numbers indicates 18.29%.*

The results on this page indicate an acceptable reproduction of the prior actuary's process for the Police Division. Certain results of the Fire division are outside usually acceptable ranges.

The prior actuary also set a floor contribution based on a Target of 115% of Accumulated Benefit Obligation in 30 years, in accordance with Statute. The prior actuary's report contained no details of this calculation, only the resulting contribution. GRS was therefore unable to independently determine the precise calculation used by the prior actuary. Instead, GRS created a process, based on the brief description of the method contained in the valuation report, and then adjusted the process as necessary to reproduce the prior actuary's results. GRS has not seen this method in use by any other public sector plans.

Valuation Results June 30, 2005
8.0% Interest; No COLA; Target Funding Method

Determined by prior actuary	Employees	Teachers	Police	Fire
Current Total Rate	13.74%	13.93%	27.51%	33.79%
Member Rate	5.00%	5.00%	9.30%	9.30%
Current Employer Rate	8.74%	8.93%	18.21%	24.49%

Determined by GRS	Employees	Teachers	Police	Fire
Current Total Rate	13.74%	13.93%	27.51%	33.79%
Member Rate	5.00%	5.00%	9.30%	9.30%
Current Employer Rate	8.74%	8.93%	18.21%	24.49%

The methods currently in use (Greater of Open Group Aggregate and Target Funding of ABO) are not designed to fund benefits over the working lifetime of the members. As such, we believe contribution rates determined under these methods misstate the long term cost of the NHRS. The long-term costs (given the current assumptions) are more appropriately represented by the Entry-Age Normal Cost method with a 30-year amortization of unfunded actuarial accrued liabilities (UAAL).

One issue that is discussed in the next section is the appropriate payroll growth assumption to be used. While the payroll growth assumption does not directly affect the computations of contribution rates under the current methods, it does affect the computation under the Entry-Age Normal Cost method. This occurs because, under Entry-Age Normal Cost, GRS typically funds unfunded liability as a level percent of payroll. The results shown in this section of the report are based on a 5.50% payroll growth assumption because that appeared to be consistent with the prior actuary's other assumptions. Results under an alternate payroll growth assumption are shown in subsequent sections.

Valuation Results June 30, 2005
Revised Methods and/or Assumptions, Including
8.5% Interest; 5.5% Payroll Growth; No COLA; Entry Age Normal Cost

	Employees	Teachers	Police	Fire
Total Normal Cost	9.78%	8.72%	19.19%	22.78%
Member Contributions	5.00%	5.00%	9.30%	9.30%
Employer Normal Cost	4.78%	3.72%	9.89%	13.48%
30 Year amortiztion of UAAL	4.94%	6.03%	9.43%	13.49%
Total Employer Rate	9.72%	9.75%	19.32%	26.97%
Percent Funded	57.1%	59.3%	62.2%	57.9%

A payroll growth assumption of 5.50% is relatively high and produces a lower contribution rate than would be the case using a more modest assumption.

An 8.50% rate of return is practically unattainable for NHRS over the long-term because of the gain sharing that occurs under the operation of the special account.

Post Retirement Medical Subsidy

The prior actuary assumed that 80% of Group I members who terminated with vested benefits would take a refund of contributions and forfeit pension and health benefits for purposes of valuing the post retirement medical subsidy program. This same assumption was not used in the valuation of pension benefits. This appears to be inconsistent and we recommend using the same assumption in both the health subsidy valuation and the pension valuation. We further recommend that this assumption be reviewed in the next experience study.

REPLICATION RESULTS

Assumptions regarding the treatment of members who were currently receiving subsidy benefits for dependents (other than a spouse) were not disclosed by the prior actuary. GRS will need to review this information with staff and make a recommendation to the Board.

GRS was not able to replicate the prior actuary's liabilities for the post retirement medical subsidy within acceptable tolerances. Given the brevity of information regarding the post-retirement medical subsidy in the prior actuary's report, special study would be required to determine exactly how the prior actuary modeled this program. This study would involve collecting more information from the prior actuary and would likely result in additional fees from the prior actuary. GRS does not recommend undertaking this study. Instead we recommend continuing to work with staff to ensure that we have a correct understanding of the program and to refine our valuation of the program to provide the additional useful information the NHRS needs with regard to this program.

SECTION E

REVIEW METHODS AND ASSUMPTIONS

REVIEW METHODS AND ASSUMPTIONS

A complete audit of the experience study was not performed. However, we have reviewed assumptions in general. Our comments and recommendations follow.

Decrement Timing

Decrements are all assumed to occur mid-year. While this is generally acceptable and common, it does not mesh well with the typical practice of retirements in Teacher plans. We recommend modifying the assumed timing of retirements for Teachers (only) to beginning of the plan year (July). This assumption needs to be coordinated with the reported data. Teachers are unique because they typically retire in June, but their replacements are not typically reported until fall. With June 30 valuations, it is important to include June retirees in the active database (with the assumption that they will retire on July 1) so as not to understate the active member payroll. GRS will work with staff on the data reporting regarding this issue.

Decrement Rates

Rates of decrements (death, disability, terminations, retirement) have been studied by the prior actuary and appear to be reasonably based on actual observations.

Loads

Loads for lump sums payable at retirement (severance pay) do not appear to have been studied in the last actuarial report. We understand that these loads were established in accordance with an earlier study, but GRS has not seen the details of that study. We recommend a study be undertaken at this time to review the severance pay assumption and that, in the future, this assumption be reviewed as part of the 5-year experience study.

Option Factor Subsidy

Option factors appear to be subsidized (especially in consideration of the COLA). This potential subsidy does not appear to have been studied in the last experience study. We recommend that a study be undertaken to determine the extent of the subsidy and to develop a load to include in the regular valuation. We further recommend that, in the future, this assumption be reviewed as part of the 5-year experience study.

Marriage Assumption

The marriage assumption does not appear to have been reviewed in the last 5-year experience study. This assumption affects expected survivor benefits payable. We recommend a study be undertaken to update this assumption. We further recommend that this assumption be reviewed as part of the 5-year experience study.

Rates of Salary Increases

Salary increases were studied in the last experience study. However, the study did not separate merit and longevity increases from inflationary increases. The increases, in total, appear to be slightly high. Typically the inflationary increases relate to the wage inflation/payroll growth assumption.

The wage inflation/payroll growth assumption is not directly used under the current valuation methods. Under the target funding method, new entrant pays are assumed to increase by 5.0% per year. In addition, the assumed rates of salary increases level out at a rate that is 5.89% for employees; 4.50% for teachers; 5.75% for Police and 6.25% for Fire. It is common for the wage growth assumption to be relatively close to the value at which pay increases level off. The thought process is that the oldest people are no longer receiving promotional increases, just inflationary increases. Therefore, for purposes of our initial testing, we have assumed a wage growth assumption of 5.5% for consistency with these other assumptions. However, 5.5% payroll growth is an aggressive assumption and a key assumption in more traditional funding methods. The prior actuary indicates that they assumed 3% price inflation. Combined with the other assumptions, this results in a real wage growth of over 2% (wage inflation less price inflation). A more common assumption for real wage growth would be from 0.5% to 1.5%. According to the public funds survey, the average wage growth assumption used by public pension funds is 4.0%. We recommend a reconsideration of the entire salary increase assumption.

Interest Rate Assumption

The interest rate assumption of 8.5% is aggressive when considered in isolation. However, when coupled with the gain sharing that occurs with the special accounts, it is likely unachievable over a sustained period. Unfortunately, the current statute would increase the gain sharing if the assumption was lowered. Based on some simplistic testing, we believe that the current structure of the gain sharing with the special accounts will lower the long-term rate of return recognized for funding pensions by 1.5% to 2.0%. We have therefore shown cost estimates on the current assumptions as well as a 7% interest rate assumption. We recommend that a study be undertaken to determine the appropriate rate of return to use. This study should be done in cooperation with the Board's investment consultant.

The current funding method is not designed to fund benefits as they accrue. Contribution rates under these methods are less than the contributions needed to fund benefits as they accrue. Therefore, as the system matures, the assets of the system will not grow as rapidly as they would under other more traditional methods. In addition, the funding of benefits is spread over a period longer than the expected working lifetime of the members. While the funding method is possibly in compliance with actuarial standards of practice, it is out of favor with proposed accounting rules and current industry best practices.

We therefore recommend a more traditional approach to funding of pension benefits. Such as the entry age normal cost method. Costs under the Entry-Age Normal Cost method are shown in the next section.

Funding of COLAs

Currently, COLAs are funded through "excess investment earnings." While many public plans have some kind of gain sharing in place, the gain sharing that is in place in NHRS greatly limits the contributions to the system by the market. By siphoning off the return above 9.00% and maintaining an 8.50% interest assumption, the process is really understating the true cost of the system. We believe that a better approach would be to directly fund the COLA by assuming an average COLA

payment in the valuation model. In the following section are estimates of the NHRS pension contributions based on 8% interest, 2% COLA, 4.5% payroll growth, and inclusion of special account assets in pension assets.

Another approach would be to leave the gain sharing in place, but lower the assumed rate of return in the pension valuation model to the average income rate of return after reflection of the gain sharing without lowering the gain sharing threshold (currently 9.0%). We have estimated that this rate of return is between 6.5% and 7%. For illustrative purposes, we have shown the pension contribution calculations based on a 7% interest assumption, no COLA and all other current assumptions in the next section.

Funding of Post-Retirement Medical Subsidy

Currently, the Post Retirement medical subsidy contribution is determined by setting the contribution rate to the maximum allowable under federal regulations (health contributions cannot be more than 33⅓% of the pension contribution actually paid for normal cost). This process does not indicate what the true cost of the program is. This program was (theoretically) terminally funded from "excess investment earnings." However, the true cost of this program is not regularly computed. We recommend that the post retirement subsidy be directly funded or at least directly measured. Below is our estimate of the cost of this program, based on the current assumptions.

DRAFT Valuation Results June 30, 2005
Post Retirement Medical Subsidy
8.5% Interest; 4.5% Payroll Growth; 8% COLA; Entry Age Normal Cost

	Employees*	Teachers	Police	Fire
Total Employer Rate	3.33%	3.18%	13.54%	16.54%

* *Financed over a Political Subdivision Payroll of $477,687,161.*

It is important to note that the costs shown above are in excess of the federal limits for some of the divisions for the current funding vehicle (a sub-trust as defined in IRC 401(h)). Therefore, other funding vehicles will be required in order to adequately fund these benefits.

Actuarial Value of Assets

The Academy of Actuaries is in the process of developing a standard for the actuarial value of asset methods. Based on the current exposure draft, the current method is not likely to be in compliance, once the standard is issued. We recommend that a more traditional method be used that credits the assumed return and spreads the difference between the assumed income and the actual income over a period of 3 to 5 years. An example of this method is shown in the next section.

SECTION F

Estimated Contribution Rate after Consideration of Alternate Methods and Assumptions

ESTIMATED CONTRIBUTION RATES AFTER CONSIDERATION OF ALTERNATE METHODS AND ASSUMPTIONS

Valuation Results June 30, 2005
Revised Methods and/or Assumptions, Including
8.5% Interest; 4.5% Payroll Growth; No COLA; Entry Age Normal Cost

	Employees	Teachers	Police	Fire
Total Normal Cost	9.78%	8.72%	19.19%	22.78%
Member Contributions	5.00%	5.00%	9.30%	9.30%
Employer Normal Cost	4.78%	3.72%	9.89%	13.48%
30 Year amort of UAAL	5.54%	6.77%	10.58%	15.13%
Total Employer Rate	10.32%	10.49%	20.47%	28.61%
Funded Percent	57.1%	59.3%	62.2%	57.9%

Valuation Results June 30, 2005
Revised Methods and/or Assumptions, Including
7.0% Interest; 4.5% Payroll Growth; No COLA; Entry Age Normal Cost

	Employees	Teachers	Police	Fire
Total Normal Cost	12.64%	11.74%	24.83%	30.14%
Employee Contribution Rate	5.00%	5.00%	9.30%	9.30%
Employer Normal Cost	7.64%	6.74%	15.53%	20.84%
30-year Amort of UAAL	6.50%	8.10%	12.87%	18.00%
Total Employer Contribution Rate	14.14%	14.84%	28.40%	38.84%
Percent Funded	48.7%	50.5%	53.2%	49.2%

Valuation Results June 30, 2005
Revised Methods and/or Assumptions, Including
8.0% Interest; 4.5% Payroll Growth; 2.0% COLA; Entry Age Normal Cost
Inclusion of Special Account Assets in Pension Assets

	Employees	Teachers	Police	Fire
Total Normal Cost	12.21%	11.19%	24.77%	30.01%
Employee Contribution Rate	5.00%	5.00%	9.30%	9.30%
Employer Normal Cost	7.21%	6.19%	15.47%	20.71%
30-year Amort of UAAL	7.41%	9.41%	16.04%	21.14%
Total Employer Contribution Rate	14.62%	15.60%	31.51%	41.85%
Percent Funded	50.4%	51.7%	52.1%	51.0%
Special Account Assets ($Mill. as of 7/1/2006)	$ 92.5	$ 116.1	$ 39.4	$ 39.9

This is the method that, in our opinion, gives the most accurate representation of system costs.

Proposed Actuarial Value of Assets Method

		Year 1	Year 2	Year 3	Year 4
A.	Funding Value Beginning of Year	$3,000,000,000	$3,317,031,875	$3,614,794,782	$4,085,557,960
B.	Market Value End of Year	3,500,000,000	3,600,000,000	4,500,000,000	6,500,000,000
C.	Market Value Beginning of Year	3,000,000,000	3,500,000,000	3,600,000,000	4,500,000,000
D.	Non-Investment Net Cash Flow	1,000,000	400,000	(100,000)	(600,000)
E.	Investment Income:				
	E1. Market Total: B - C - D	499,000,000	99,600,000	900,100,000	2,000,600,000
	E2. Amount for Immediate Recognition	255,042,500	281,964,709	307,253,306	347,246,927
	E3. Amount for Phased-In Recognition E1-E2	243,957,500	(182,364,709)	592,846,694	1,653,353,073
F.	Phased-In Recognition of Investment Income:				
	F1. Current Year: 0.25 x E3	60,989,375	(45,591,177)	148,211,674	413,338,268
	F2. First Prior Year	-	60,989,375	(45,591,177)	148,211,674
	F3. Second Prior Year	-	-	60,989,375	(45,591,177)
	F4. Third Prior Year	-	-	-	60,989,375
	F5. Total Recognized Investment Gain	60,989,375	15,398,198	163,609,872	576,948,140
G.	Preliminary Funding Value End of Year: A + D + E2 + F5	3,317,031,875	3,614,794,782	4,085,557,960	5,009,153,027
H.	Final Funding Value after 20% Corridor Test	$3,317,031,875	$3,614,794,782	$4,085,557,960	$5,200,000,000