

**MASSACHUSETTS WATER RESOURCES AUTHORITY
CONTRIBUTORY RETIREMENT SYSTEM**

Actuarial Valuation Report

January 1, 2009

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Report Summary:

<u>Highlights</u>	<u>January 1, 2007</u>	<u>January 1, 2009</u>
<u>Contributions</u>		
Funding Schedule FY 2010	\$5,586,768	\$5,586,768
Funding Schedule FY 2011	5,785,560	9,158,041
<u>Funded Ratios</u>		
GAS No. 25	82.7%	73.8%
<u>Participants</u>		
Actives	1,127	1,135
Retirees and Beneficiaries	236	244
Inactives	150	129
Disabled	<u>31</u>	<u>44</u>
Total	1,544	1,552
<u>Payroll</u>		
Payroll of Active Members	\$75,444,127	\$82,313,885
Average Payroll	66,942	72,523
<u>Normal Cost</u>		
Employer	1,415,227	1,392,754
Employee	6,527,514	7,150,269
Administrative Expenses	<u>0</u>	<u>0</u>
Total	7,942,741	8,543,023
<u>Actuarial Accrued Liabilities</u>		
Actives	186,408,780	227,050,223
Retirees, Beneficiaries, Disabilities and Inactives	<u>69,552,919</u>	<u>74,602,181</u>
Total	255,961,699	301,652,404
<u>Actuarial Value of Assets</u>	<u>211,715,711</u>	<u>222,477,110</u>
<u>Unfunded Actuarial Accrued Liabilities</u>	\$44,245,988	\$79,175,294

Introduction

This report presents the findings of an actuarial valuation as of January 1, 2009, of the Massachusetts Water Resources Authority Contributory Retirement System.

The actuarial valuation is based on:

- Provisions Chapter 32 of the Massachusetts General Laws, "M.G.L", as of January 1, 2009.
- Employee data provided by the Retirement Board
- Asset information reported to the Public Employee Retirement Administration Commission by the Massachusetts Water Resources Authority Contributory Retirement System
- Actuarial assumptions approved by the Retirement Board

The valuation and appropriation forecast are prepared in accordance with Chapter 32 of the M.G.L. as of January 1, 2009.

The valuation and forecast do not account for:

- Any subsequent changes in the law
- Chapter 32 of the M.G.L., Section 3(8)(c) transfers between systems
- State-mandated benefits
- Cost-of-living increases granted to retired members between 1982 and 1997. The cost of these benefits has been assumed by the State under Proposition Two and One-Half.

Actuarial Experience

In performing the actuarial valuation, various assumptions are made regarding such factors as mortality, retirement, disability, and withdrawal rates as well as both payroll, salary increases, and investment returns. A comparison of the current valuation and the prior valuation is made to determine how closely actual experience corresponded to anticipated occurrences. This analysis of the system provides insight into the overall quality of the actuarial assumptions and helps explain any change in the annual appropriation.

During the last two years, the total unfunded actuarial accrued liability under the entry age normal cost method increased by 78.9% to \$79,175,294. The increase is the result of unfavorable investment results during the preceding two years. The sources of the (gain)/loss are as follows:

Investment	45,419,226
Salary Increases	(3,184,565)
New Participants	1,582,492
Active - Retirements	(1,872,345)
Active - Terminations	2,283,449
Active - Mortality	154
Active - Disabilities	2,204,812
Inactive - Mortality and data adjustments	215,874
Total Contributions	(10,579,635)
Other, including service buybacks	(1,783,236)
Total (gain)/loss	34,286,226

Actuarial Costs and Liabilities:

Normal Costs

The normal cost is the sum of the individual normal costs determined for each member as if the assumptions underlying the cost determinations had been exactly realized. An individual normal cost represents that part of the cost of a member's future benefits which 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 terminations) are included in this calculation. Anticipated employee contributions to be made during the year are subtracted from the total normal cost to determine employer normal cost. The total normal cost is divided by total payroll to determine the normal cost as a percent of pay. The normal cost is shown in Table I.

Table I

	<u>January 1, 2007</u>	<u>January 1, 2009</u>
Superannuation	\$6,068,566	\$6,688,565
Termination	827,067	731,267
Death	541,671	576,420
Disability	505,437	546,771
Administrative Expenses	<u>0</u>	<u>0</u>
Total Normal Cost	7,942,741	8,543,023
% of Pay	10.5%	10.4%
Employee Contributions	6,527,514	7,150,269
% of Pay	8.7%	8.7%
Employer Normal Cost	\$1,415,227	\$1,392,754
% of Pay	1.9%	1.7%

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Present Value of Actuarial Accrued Liabilities

The actuarial accrued liabilities (AAL) represents today's value of all benefits based on the past service of the actives and inactive. The AAL can be compared to the assets to determine the funded status of the Plan. The value of these earned benefits is shown in Table II below.

Table II

	<u>January 1, 2007</u>	<u>January 1, 2009</u>
Actives		
Superannuations	\$167,572,799	\$207,157,714
Termination	4,006,031	3,207,659
Death	8,631,532	9,995,273
Disability	6,198,418	6,689,577
Retirees and Inactives		
Retirees and Beneficiaries	53,780,178	54,540,927
Terminated (Refund)	5,263,118	5,003,812
Disabled	<u>10,509,623</u>	<u>15,057,442</u>
Total	<u>\$255,961,699</u>	<u>\$301,652,404</u>

Present Value of Future Benefits

The present value of future benefits represents today's value of all benefits earned by the inactive participants as well as all benefits earned and expected to be earned in the coming years by the active participants. The difference between the present value of future benefits and the present value of actuarial accrued liabilities is the value of benefits to be earned in the coming years. The value of the total expected benefits is shown in Table III.

Table III

	<u>January 1, 2007</u>	<u>January 1, 2009</u>
Actives		
Superannuation	\$221,136,907	\$261,676,275
Termination	7,249,919	6,105,388
Death	13,219,282	14,616,219
Disability	10,714,019	11,248,952
Retirees and Inactives		
Retirees and Beneficiaries	53,780,178	54,540,927
Terminated (Refund)	5,263,118	5,003,812
Disabled	<u>10,509,623</u>	<u>15,057,442</u>
Total	\$321,873,046	\$368,249,015

Funded Status and Appropriations:

Market Value of Plan Assets

The trust fund composition on a market value basis is shown in Table IV.

Table IV

	<u>January 1, 2007</u>	<u>January 1, 2009</u>
Cash equivalents	\$3,451,612	\$1,881,703
Short term investments	0	0
Fixed income securities	76,692,620	66,158,536
Equities	80,260,779	46,867,348
International	39,701,312	47,093,965
Real Estate	10,714,547	12,098,660
Venture Capital	0	0
Other	14,375,189	28,382,121
Accounts receivable	163,341	38,632
Accounts payable	(318,407)	(270,005)
Accrued income	<u>13,930</u>	<u>958</u>
Total Market Value	\$225,054,924	\$202,251,918
Total Actuarial Value	\$211,715,711	\$222,477,110

Actuarial Value of Assets

The actuarial value of assets is determined by projecting the market value of assets as of the beginning of the prior plan year with the assumed rate of return during that year (8.0%) and accounting for deposits and disbursements with interest at the assumed rate of return. An adjustment is then applied to recognize the difference between the actual investment return and expected return over a five year period. This preliminary actuarial value is not allowed to differ from the market value of assets by more than 10%. The calculation of the actuarial value of assets as of January 1, 2009 is presented in Table V.

Table V

	<u>January 1, 2009</u>
(1) Market value at January 1, 2008	\$246,848,886
(2) 2008 Contributions	\$23,434,645
(3) 2008 Payments	(\$8,267,298)
(4) Net interest adjustment at 8.0% on (1), (2), and (3) to December 31, 2008	\$20,354,605
(5) Expected market value on January 1, 2009	\$282,370,837
(1) + (2) + (3) + (4)	
(6) Actual market value on January 1, 2008	\$202,251,918
(7) 2008 (Gain) / Loss	\$80,118,919
(8) 80% of 2008 (Gain) / Loss	\$64,095,135
(9) 2007 (Gain) / Loss	\$441,031
(10) 60% of 2007 (Gain) / Loss	\$264,619
(11) 2006 (Gain) / Loss	(\$10,220,017)
(12) 40% of 2006 (Gain) / Loss	(\$4,088,007)
(13) 2005 (Gain) / Loss	\$249,195
(14) 20% of 2005 (Gain) / Loss	\$49,839
Actuarial value on January 1, 2009, (6) + (8) + (10) + (12) + (14)	
(15) but not less than 90% nor greater than 110% of (6)	\$222,477,110
(16) Ratio of actuarial value to market value	110.00%
(17) Actuarial Value Return for 2007	11.56%
(18) Actuarial Value Return for 2008	-13.37%
(19) Market Value Return for 2007	7.81%
(20) Market Value Return for 2008	-23.49%

Unfunded Actuarial Accrued Liabilities

Under the Entry Age Normal Actuarial Cost Method, the Actuarial Accrued Liability represents what the accumulated assets would have been as of the valuation date if:

- current plan provisions and assumptions had always been in effect,
- experience conformed exactly to assumptions, and
- the normal cost had been contributed each year since inception.

The actuarial value of the Fund's assets as of the end of the prior year are subtracted from the Actuarial Accrued Liability (AAL) to determine the Unfunded Actuarial Accrued Liability (UAAL) as of the valuation date. Over time, annual pension contributions will accumulate Plan assets equal to the AAL, and the UAAL will be eliminated. Thereafter, annual contributions equal to the normal cost will keep the Plan's assets and liabilities in balance. The UAAL is developed in Table VI.

Table VI

	<u>January 1, 2007</u>	<u>January 1, 2009</u>
Actuarial Accrued Liability	\$255,961,699	\$301,652,404
Actuarial Assets	<u>211,715,711</u>	<u>222,477,110</u>
Unfunded Actuarial Accrued Liability	\$44,245,988	\$79,175,294
Funded Status	82.7%	73.8%

Appropriations

The pension appropriation for the upcoming fiscal years have been calculated in accordance with the requirements set forth in Section 22D of Chapter 32 of the Massachusetts General Laws. These amounts were calculated to comply with the June 30, 2028, full funding mandate for all accrued liabilities. The pension appropriation is the sum of the:

- Employer normal cost,
- Increasing amortization of the unfunded actuarial accrued liability by June 30, 2024
 \$ 79,175,294 over 15 years with 4.5% increasing payments
- Interest adjustment for payments contributed monthly over fiscal year.

The pension appropriation is shown in Table VII.

Table VII

	<u>January 1, 2007</u>	<u>January 1, 2009</u>
Normal cost	\$1,415,227	\$1,392,754
Amortization payment of the unfunded accrued liability	<u>3,343,823</u>	<u>6,580,523</u>
Total cost	\$4,759,050	\$7,973,277
% of Pay	6.3%	9.7%
Fiscal 2010 cost	\$5,586,768	\$5,586,768
Fiscal 2011 cost	\$5,785,560	\$9,158,041

Appropriation Forecast

The following exhibit forecasts employer and employee contributions over the next 32 years under the adopted funding schedule.

Note that the forecast is based upon an "open group" method. This method assumes that sufficient employees will be hired each year to keep the number constant. The total payroll of the system is expected to increase 4.5% per year. The employee contribution rate is expected to increase to 10.5% by 2028 as members contributing base percentages 5%, 7%, and 8% are replaced by new members, whose base contribution is 9%. Payments are assumed to be made at the beginning of the year.

The employer total cost is expected to increase during the next 15 years until the unfunded liabilities are completely paid off, at which time only the normal cost will remain. The total FYE11 cost represents 10.6% of payroll, decreasing to 0.2% by the time the unfunded liabilities are fully paid off. The decrease in the cost as a percentage of payroll is a result of the increase in member deductions.

Appropriation Forecast

Fiscal Year Ending	Payroll*	Employee Contribution	Employer Normal Cost with Interest	Amortization Payments with Interest	Employer Total Cost with Interest	Employer Total Cost % of Payroll	Funded Ratio %**
2010	\$82,313,885	\$7,150,269	\$1,498,991	\$4,087,777	\$5,586,768	6.8	73.8
2011	\$86,018,010	\$7,558,690	\$1,473,177	\$7,684,864	\$9,158,041	10.6	74.9
2012	\$89,888,820	\$7,989,390	\$1,442,003	\$8,030,683	\$9,472,686	10.5	77.0
2013	\$93,933,817	\$8,443,546	\$1,405,041	\$8,392,063	\$9,797,104	10.4	79.0
2014	\$98,160,839	\$8,922,398	\$1,361,833	\$8,769,706	\$10,131,539	10.3	80.9
2015	\$102,578,077	\$9,427,248	\$1,311,890	\$9,164,343	\$10,476,233	10.2	82.8
2016	\$107,194,090	\$9,959,467	\$1,254,695	\$9,576,738	\$10,831,433	10.1	84.5
2017	\$112,017,824	\$10,520,495	\$1,189,696	\$10,007,692	\$11,197,388	10.0	86.3
2018	\$117,058,626	\$11,111,848	\$1,116,305	\$10,458,038	\$11,574,343	9.9	88.0
2019	\$122,326,264	\$11,735,119	\$1,033,901	\$10,928,650	\$11,962,551	9.8	89.7
2020	\$127,830,946	\$12,391,983	\$941,820	\$11,420,439	\$12,362,259	9.7	91.4
2021	\$133,583,339	\$13,084,200	\$839,358	\$11,934,359	\$12,773,717	9.6	93.0
2022	\$139,594,589	\$13,813,624	\$725,767	\$12,471,405	\$13,197,172	9.5	94.7
2023	\$145,876,346	\$14,582,200	\$600,253	\$13,032,618	\$13,632,871	9.3	96.4
2024	\$152,440,781	\$15,391,976	\$461,973	\$13,619,086	\$14,081,059	9.2	98.2
2025	\$159,300,616	\$16,245,102	\$310,033	\$0	\$310,033	0.2	100.0
2026	\$166,469,144	\$17,143,841	\$143,482	\$0	\$143,482	0.1	100.0
2027	\$173,960,256	\$18,090,571	(\$38,686)	\$0	(\$38,686)	0.0	100.0
2028	\$181,788,467	\$19,087,789	(\$237,539)	\$0	(\$237,539)	-0.1	100.0
2029	\$189,968,948	\$19,946,740	(\$248,228)	\$0	(\$248,228)	-0.1	100.0
2030	\$198,517,551	\$20,844,343	(\$259,399)	\$0	(\$259,399)	-0.1	100.0
2031	\$207,450,841	\$21,782,338	(\$271,072)	\$0	(\$271,072)	-0.1	100.0
2032	\$216,786,129	\$22,762,543	(\$283,270)	\$0	(\$283,270)	-0.1	100.0
2033	\$226,541,504	\$23,786,858	(\$296,017)	\$0	(\$296,017)	-0.1	100.0
2034	\$236,735,872	\$24,857,267	(\$309,338)	\$0	(\$309,338)	-0.1	100.0
2035	\$247,388,986	\$25,975,844	(\$323,258)	\$0	(\$323,258)	-0.1	100.0
2036	\$258,521,491	\$27,144,757	(\$337,805)	\$0	(\$337,805)	-0.1	100.0
2037	\$270,154,958	\$28,366,271	(\$353,006)	\$0	(\$353,006)	-0.1	100.0
2038	\$282,311,931	\$29,642,753	(\$368,891)	\$0	(\$368,891)	-0.1	100.0
2039	\$295,015,968	\$30,976,677	(\$385,491)	\$0	(\$385,491)	-0.1	100.0
2040	\$308,291,686	\$32,370,627	(\$402,838)	\$0	(\$402,838)	-0.1	100.0

* Calendar basis

** Beginning of Fiscal Year

GASB Statements No. 25 and No. 27

Effective for periods beginning after June 15, 1997, the Governmental Accounting Standards Board (GASB) requires the disclosure of pension related liabilities for public employer financial statements in accordance with Statements 25 and 27. These statements, which replace GASB Statement No. 5, must be adhered to by any public employee retirement system that follows Generally Accepted Accounting Principles (GAAP).

These disclosures are intended to establish a reporting framework that distinguishes between:

- current financial information about plan assets and financial activities,
- actuarially determined information from a long-term perspective,
- the funded status of the plan, and
- progress being made in accumulating sufficient assets to pay benefits when due.

Footnote disclosures required by GASB Statement No. 25 and 27 include a description of the plan, a summary of significant accounting policies, and information about contributions, legally required reserves, and investment concentrations. As a result of the oversight of the Public Employees Retirement Administration Commission (PERAC) and the conversion of unpaid contributions to pension related debt, the Net Pension Obligation (NPO) as required by Statement No. 27 will effectively always be equal to \$0. The required disclosure information is shown in Table VIII.

Table VIII

	<u>January 1, 2007</u>	<u>January 1, 2009</u>
(1) Actuarial Accrued Liability	\$255,961,699	\$301,652,404
(2) Actuarial Value of Assets	<u>211,715,711</u>	<u>222,477,110</u>
(3) Unfunded Actuarial Accrued Liability	44,245,988	79,175,294
(4) Funded Ratio (2)/(1)	82.7%	73.8%
(5) Covered Payroll	\$75,444,127	\$82,313,885
(6) UAAL as a percentage of payroll: (3)/(5)	58.6%	96.2%
(7) Annual Required Contribution (ARC)	\$4,233,329	\$5,586,768
(8) Net Pension Obligation	\$0	\$0

PERAC Annual Statement
APPENDIX PAGE 3
ACTUARIAL VALUATION AND ASSUMPTIONS

The most recent actuarial valuation of the System was prepared by Buck Consultants as of January 1, 2009.

The normal cost for employees on that date was:	\$7,150,269	8.7% of pay
The normal cost for the employer was:	1,392,754	1.7% of pay
The actuarial liability for active members was:		\$227,050,223
The actuarial liability for retired and inactive members was:		74,602,181
Total actuarial accrued liability:		301,652,404
System assets as of that date:		222,477,110
Unfunded actuarial accrued liability:		\$79,175,294
The ratio of system's assets to total actuarial liability was		73.8%

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

Investment Return:		8.0%
Rate of Salary Increase:		4.75%

SCHEDULE OF FUNDING PROGRESS (\$,000)

Actuarial Valuation Date	Actuarial Value of Assets	Actuarial Accrued Liability	Unfunded Actuarial Accrued Liability	Funded Ratio	Covered Payroll	UAAL as a percent of Covered Payroll
	(a)	(b)	(b-a)	(a/b)	(c)	(b-a)/c
01/01/09	\$222,477	\$301,652	\$79,175	73.8%	\$82,314	96.2%
01/01/07	211,716	255,962	44,246	82.7%	75,444	58.6%
01/01/05	172,512	172,512	0	100.0%	65,790	0.0%
01/01/03	146,188	146,188	0	100.0%	66,711	0.0%
01/01/02	141,069	141,069	0	100.0%	66,322	0.0%
01/01/01	128,385	128,385	0	100.0%	65,955	0.0%
01/01/99	96,318	96,318	0	100.0%	66,782	0.0%

EXHIBITS

Age/Service Distribution with Salary as of January 1, 2009

Attained Age	Average Salary	<5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
< 20	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
20-24	2	0	0	0	0	0	0	0	0	0	2
	36,791	0	0	0	0	0	0	0	0	0	36,791
25-29	12	3	0	0	0	0	0	0	0	0	15
	45,741	56,988	0	0	0	0	0	0	0	0	47,991
30-34	15	10	3	1	0	0	0	0	0	0	29
	46,257	56,321	57,306	45,818	0	0	0	0	0	0	50,855
35-39	21	14	25	14	1	0	0	0	0	0	75
	54,333	63,269	64,841	70,442	59,664	0	0	0	0	0	62,582
40-44	19	16	39	55	34	0	0	0	0	0	163
	60,556	60,215	63,999	67,491	60,282	0	0	0	0	0	63,629
45-49	21	22	36	84	77	8	0	0	0	0	248
	53,056	63,150	73,533	71,676	72,282	68,334	0	0	0	0	69,693
50-54	18	21	38	68	73	7	5	0	0	0	230
	65,999	62,757	74,594	73,976	72,353	107,420	92,199	0	0	0	73,328
55-59	16	15	35	52	66	7	2	1	0	0	194
	61,465	69,806	74,936	66,749	75,601	83,786	92,467	64,671	0	0	71,907
60-64	6	6	22	34	40	11	8	1	0	0	128
	67,989	59,416	67,535	77,857	76,194	78,550	89,746	59,780	0	0	74,898
65-69	1	4	7	11	15	1	0	0	1	0	40
	72,965	54,629	52,729	71,933	64,103	82,412	0	0	106,869	0	65,067
70+	0	1	4	2	2	0	1	0	1	0	11
	0	81,948	64,981	54,189	50,770	0	95,941	0	145,927	0	72,150
Total Employees	131	112	209	321	308	34	16	2	2	2	1,135
Average Salary	56,293	62,452	69,417	71,068	71,614	83,282	91,240	62,226	126,398	69,090	

Retiree Distribution as of January 1, 2009

Attained Age	Number of Employees			Total Payments		
	Male	Female	Total	Male	Female	Total
< 20	0	0	0	0	0	0
20-24	0	0	0	0	0	0
25-29	0	0	0	0	0	0
30-34	0	0	0	0	0	0
35-39	0	0	0	0	0	0
40-44	0	0	0	0	0	0
45-49	0	0	0	0	0	0
50-54	1	6	7	25,847	103,262	129,109
55-59	7	10	17	181,084	133,238	314,322
60-64	48	23	71	1,379,717	461,586	1,841,303
65-69	38	26	64	908,768	455,816	1,364,584
70-74	33	15	48	851,440	203,812	1,055,253
75-79	19	11	30	434,862	195,355	630,217
80-84	5	1	6	84,162	9,644	93,806
85-89	1	0	1	20,778	0	20,778
90-94	0	0	0	0	0	0
95-99	0	0	0	0	0	0
Total	152	92	244	3,886,658	1,562,714	5,449,372
Average (Age/Payment)	68.4	66.2	67.6	25,570	16,986	22,333
Frequency Percent	62.3	37.7	100	71.3	28.7	100

Disabled Retiree Distribution as of January 1, 2009

Attained Age	Number of Employees			Total Payments		
	Male	Female	Total	Male	Female	Total
< 20	0	0	0	0	0	0
20-24	0	0	0	0	0	0
25-29	0	0	0	0	0	0
30-34	0	0	0	0	0	0
35-39	0	0	0	0	0	0
40-44	4	2	6	103,288	68,295	171,583
45-49	6	1	7	155,862	23,808	179,670
50-54	5	2	7	158,586	42,875	201,461
55-59	7	1	8	201,084	48,478	249,562
60-64	7	3	10	217,255	57,027	274,282
65-69	5	0	5	164,356	0	164,356
70-74	0	0	0	0	0	0
75-79	1	0	1	24,549	0	24,549
80-84	0	0	0	0	0	0
85-89	0	0	0	0	0	0
90-94	0	0	0	0	0	0
95-99	0	0	0	0	0	0
Total	35	9	44	1,024,980	240,483	1,265,464
Average (Age/Payment)	56.2	53.3	55.6	29,285	26,720	28,761
Frequency Percent	79.5	20.5	100	81	19	100

EXHIBIT 4 - CASHFLOW FORECAST:

The following is a 30 year forecast of benefit payments net of state reimbursable COLA payments, Contribution Income and Investment Returns.

Plan Year Ending	Benefit Payments	Employee Contributions	Employer Contributions	Investment Returns	Net change in plan assets
2009	\$9,295,764	\$7,150,269	\$5,586,768	\$17,795,610	\$21,236,883
2010	10,580,071	7,558,690	9,158,041	19,740,132	25,876,792
2011	12,098,644	7,989,390	9,472,686	21,787,223	27,150,655
2012	13,628,468	8,443,546	9,797,104	23,937,735	28,549,918
2013	15,332,910	8,922,398	10,131,539	26,195,393	29,916,421
2014	17,098,823	9,427,248	10,476,233	28,562,125	31,366,783
2015	18,952,936	9,959,467	10,831,433	31,043,700	32,881,665
2016	20,955,600	10,520,495	11,197,388	33,643,033	34,405,315
2017	23,191,987	11,111,848	11,574,343	36,357,608	35,851,812
2018	25,677,755	11,735,119	11,962,551	39,180,769	37,200,683
2019	28,252,566	12,391,983	12,362,259	42,111,133	38,612,809
2020	30,860,333	13,084,200	12,773,717	45,156,106	40,153,689
2021	33,585,093	13,813,624	13,197,172	48,322,843	41,748,546
2022	36,435,918	14,582,200	13,632,871	51,615,466	43,394,619
2023	39,359,260	15,391,976	14,081,059	55,040,340	45,154,115
2024	42,411,267	16,245,102	310,033	58,515,091	32,658,959
2025	45,472,863	17,143,841	143,482	61,079,023	32,893,483
2026	48,490,323	18,090,571	(38,686)	63,667,234	33,228,796
2027	51,290,733	19,087,789	(237,539)	66,294,765	33,854,282
2028	54,252,872	19,946,740	(248,228)	68,955,581	34,401,220
2029	57,386,080	20,844,343	(259,399)	71,656,531	34,855,395
2030	60,700,238	21,782,338	(271,072)	74,389,946	35,200,974
2031	64,205,794	22,762,543	(283,270)	77,146,873	35,420,353
2032	67,913,803	23,786,858	(296,017)	79,916,936	35,493,974
2033	71,835,956	24,857,267	(309,338)	82,688,172	35,400,145
2034	75,984,622	25,975,844	(323,258)	85,446,868	35,114,832
2035	80,372,881	27,144,757	(337,805)	88,177,364	34,611,435
2036	85,014,570	28,366,271	(353,006)	90,861,851	33,860,546
2037	89,924,326	29,642,753	(368,891)	93,480,146	32,829,682
2038	92,942,513	30,976,677	(385,491)	96,094,772	33,743,445

amounts in thousands

EXHIBIT 5 – SUMMARY OF PLAN PROVISIONS:

This summary is prepared in accordance with Chapter 32 as of January 1, 2009, and does not take into account any subsequent changes.

1. Administration

Each of the 107 contributory retirement systems for public employees of the Commonwealth of Massachusetts are guided by the applicable provisions of Chapter 32 of the Massachusetts General Laws and other applicable statutes. Although these boards operate semi-independently, there is a uniform set of rules governing benefits, eligibility, contributions, financing, and accounting.

2. Participation

Participation is mandatory for all full-time employees whose employment commences prior to age 65. Eligibility with respect to part-time, professional, temporary, or intermittent employment is governed by the local board. Membership is optional for certain elected officials, State officials appointed by the Governor, and certain hospital interns.

There are four classes of membership as follows:

- (i) Group 1: Most general employees in State and local government
- (ii) Group 2: Certain specified hazardous duty positions
- (iii) Group 3: State police officers and inspectors
- (iv) Group 4: Local police officers, firefighters, and designated employees of the municipal light department.

For members in more than one group, participation will be proportional.

3. **Salary**

Salary is defined as gross regular compensation. Salary does not include bonuses, overtime, severance pay, unused sick leave credit, or other similar compensation.

4. **Member Contributions**

Member contributions vary depending upon date hired as follows:

<u>Date of Hire</u>	<u>Member Contribution Rate</u>
Prior to 1975	5.0% of Salary
1975 to 1983	7.0% of Salary
1984 to 1996	8.0% of Salary
1996 and Later plus	9.0% of Salary
1979 and Later	2.0% of Salary in excess of \$30,000

5. **Average Salary**

Average salary is used to determine a participant's benefit. It is defined as the average salary during the three consecutive-year period that produces the highest average. (Alternatively, if a greater amount results, it is the average rate of salary earned during the period or periods, whether or not consecutive, that constitutes the last three years preceding retirement.)

6. **Creditable Service**

In general, creditable service is awarded during the period in which a member contributes to the retirement system.

7. Service Retirement

a. Eligibility:

For an employee to be eligible for service retirement (also referred to as superannuation), one of the following conditions must be met:

- (i) completion of 20 years of service
- (ii) for an employee hired prior to January 1, 1978, attainment of age 55 as an active member
- (iii) for an employee hired on or after January 1, 1978, attainment of age 55 as an active member and completion of ten years of service

b. Benefit Amount:

The retirement allowance is determined as a product of the participant's Benefit Rate times Average Salary times Creditable Service, where Benefit Rate is determined from the following table:

<u>Age at Retirement</u>	<u>Percentage of Average Salary</u>		
	<u>Group 1</u>	<u>Group 2</u>	<u>Group 4</u>
65 or Over	.025	.025	.025
64	.024	.025	.025
63	.023	.025	.025
62	.022	.025	.025
61	.021	.025	.025
60	.020	.025	.025
59	.019	.024	.025
58	.018	.023	.025
57	.017	.022	.025
56	.016	.021	.025
55	.015	.020	.025
54	.014	.014	.024
53	.013	.013	.023
52	.012	.012	.022
51	.011	.011	.021
50	.010	.010	.020
49	.009	.009	.019
48	.008	.008	.018
47	.007	.007	.017
46	.006	.006	.016
45	.005	.005	.015
44	.004	.004	.004
43	.003	.003	.003
42	.002	.002	.002
41	.001	.001	.001

8. Deferred Vested Retirement

a. Eligibility:

A participant who has completed ten or more years of creditable service is eligible for a deferred vested retirement benefit. If termination is involuntary, the participant is vested after six years.

b. Benefit Amount:

The participant's accrued benefit is payable commencing at age 55, or may be deferred until later at the employee's option.

c. Refund of Contributions:

In lieu of the deferred pension benefit, a member may elect to receive a refund of their accumulated contributions. Members with ten or more years of service are entitled to 100% of the credited interest on their contributions. Members with five to ten years of service are entitled to 50% of the credited interest on their contributions. No credited interest is provided for members with less than five years of service.

9. Accidental Disability

a. Eligibility:

Participants are eligible for an accidental disability benefit, regardless of service or age, if they become permanently and totally incapacitated for further duty as a result of personal injury sustained while in the performance of duties.

b. Benefit Amount:

The accidental disability amount is 72% of annual salary plus \$648.48 per year for each child plus an additional annuity based upon accumulated Member Contributions with credited interest.

10. Ordinary Disability**a. Eligibility:**

An ordinary disability occurs when a member becomes permanently and totally disabled due to sickness or injury that is not job related. In order to be eligible for an ordinary disability benefit, a member must have ten years of service (and be less than age 55).

b. Benefit Amount:

The ordinary disability amount is equal to the accrued retirement benefit as if the member were age 55. If the member was a veteran, the benefit is 50% of the member's final rate of Salary during the preceding 12 months, plus an annuity based upon accumulated Member Contributions plus credited interest. If the participant is over age 55, he will receive not less than the superannuation allowance to which he is entitled.

11. Survivor Benefits**a. Occupational Death:**

The survivors of a member who dies due to an occupational injury will be entitled to a lump sum return of contributions plus a pension benefit equal to 72% of the participant's annual Salary.

b. Non-Occupational Death:

Upon the death of a member other than due to an occupational injury, the designated beneficiary will be entitled to a retirement benefit as if Option C had been elected with a minimum of \$250 per month to the surviving spouse, plus \$120 for the first child, plus \$90 for each additional child. If no beneficiary is designated and if the employee worked two years, and is married at least one year, the spouse may elect benefits. If there is no designated beneficiary or surviving spouse, then member contributions are returned. If there are dependent children but no surviving spouse, they may elect minimum survivor benefits of \$250 per month plus \$120 for the first child and \$90 for each additional child.

c. Refund of Contributions:

Upon the death of a member not entitled to survivor benefits, the beneficiary is entitled to a refund of all member contributions with interest.

12. Cost-of-Living Increases

In accordance with the adoption of Chapter 17 of the Acts of 1997, the granting of a cost-of-living adjustment will be determined by an annual vote by the Retirement Board. The amount of increase will be based upon the Consumer Price Index, limited to a maximum of 3.0%, beginning on July 1. All retirees, disabled retirees, and beneficiaries who have been receiving benefits payments for at least one year as of July 1 are eligible for the adjustment. The maximum amount of pension benefit subject to a COLA is \$12,000. All COLAs granted to members after 1981 and prior to July 1, 1998 are deemed to be an obligation of the State and are not the liability of the Retirement System.

13. Postretirement Death Benefits

Any benefits following the death of a member after retirement are based upon the form of benefit the participant elected at the time of retirement. There are three available forms as follows:

- (i) Option A - Life annuity
- (ii) Option B - Life annuity with death benefit equal to excess of member contributions plus credited interest to retirement over annuity benefit paid to member
- (iii) Option C - Life annuity with 66-2/3% of benefit continued after death of member to designated joint annuitant

EXHIBIT 6 – ACTUARIAL METHODS AND ASSUMPTIONS:

The actuarial cost method, factors, and assumptions used in determining cost estimates are presented below.

1. Member Data

The member data used in the determination of cost estimates consist of pertinent information with respect to the active, inactive, retired, and disabled members of the employer as supplied by the employer to the actuary.

2. Valuation Date

January 1, 2009.

3. Actuarial Cost Method

The costs of the Plan have been determined in accordance with the individual entry age normal actuarial cost method.

4. Rate of Investment Return

It is assumed that the assets of the fund will accumulate at a compound annual rate of 8.0% per annum.

5. Cost-of-Living Increases

Cost-of-living increases have been assumed to be 3.0% of the lesser of the pension amount and \$12,000 per year.

6. Salary Scale

The assumed annual rates for salary increases including longevity are illustrated by the following rates:

Years of Service	Salary Scale
0	7.00%
1	6.50
2	6.50
3	6.00
4	6.00
5	5.50
6	5.50
7	5.00
8	5.00
9+	4.75

7. Value of Investments

Assets held by the fund are valued at market value as reported by the Public Employees' Retirement Administration Commission (PERAC). The actuarial value of assets is determined using a five-year smoothing of asset returns greater than or less than the assumed rate of return.

8. Annual Rate of Withdrawal Prior to Retirement

Based on an analysis of experience, the assumed annual rates of withdrawal may best be illustrated by the following rates at the following ages:

<u>Service</u>	<u>General Employees</u>
0	0.1500
10	0.0540
20	0.0200
30	0.0000

9. Annual Rate of Mortality

It is assumed that both pre-retirement and post retirement mortality are represented by the RP-2000 Mortality Table for males and females. Mortality for disabled members is represented by the RP-2000 Mortality Table set forward two years for all disabled members.

10. Service Retirement

Based on an analysis of experience, the assumed annual retirement rates are illustrated at the following ages:

<u>Age</u>	<u>Male General Employees</u>	<u>Female General Employees</u>
50	0.0100	0.0150
51	0.0100	0.0150
52	0.0100	0.0200
53	0.0100	0.0250
54	0.0200	0.0250
55	0.0200	0.0550
56	0.0250	0.0650
57	0.0250	0.0650
58	0.0500	0.0650
59	0.0650	0.0650
60	0.1200	0.0500
61	0.2000	0.1300
62	0.3000	0.1500
63	0.2500	0.1250
64	0.2200	0.1800
65	0.4000	0.1500
66	0.2500	0.2000
67	0.2500	0.2000
68	0.3000	0.2500
69	0.3000	0.2000
70	1.0000	1.0000

11. Annual Rate of Disability Prior to Retirement

Based on an analysis of experience, the assumed annual rates of disability may best be illustrated by the following probabilities at the following ages:

<u>Attained Age</u>	<u>General Employees</u>
20	0.0001
30	0.0003
40	0.0010
50	0.0019

In addition, it is assumed for the general employees that 45% of all disabilities are ordinary (55% are service connected).

12. Family Composition

It is assumed that 80% of all members will be survived by a spouse and that females (males) are three years younger (older) than members.

13. Administrative Expenses

No provision is made for anticipated administrative expenses.

EXHIBIT 7 – GLOSSARY OF TERMS:

This glossary summarizes the technical terms contained in this report.

1. Actuarial Accrued Liability

That portion of the Actuarial Present Value of plan benefits that is not provided for by future employer Normal Costs or employee contributions.

2. Actuarial Assumptions

Assumptions as to the occurrence of future events affecting the Retirement System such as:

- Rates of investment returns
- Increases in a member's salary
- Inflation
- The probability of mortality, turnover, disablement
- Retirement at each age and other relevant items

3. Actuarial Cost Method

A procedure for allocating the Actuarial Present Value of pension plan benefits between Normal Cost and Actuarial Accrued Liability.

4. Actuarial Present Value

The single sum amount required at the valuation date that is required to provide for anticipated future events based upon the terms of the plan and the Actuarial Assumptions.

5. Forecast

A projection of future benefit payments or contribution requirements based upon the terms of the plan, the current asset amounts, the Actuarial Assumptions, and additional assumptions as to the replacement of terminating employees with new employees.

6. Normal Cost

That portion of the Actuarial Present Value of future benefits that is assigned to the current year.

7. Unfunded Actuarial Accrued Liability

That portion of the Actuarial Accrued Liability that is not provided for by current actuarial value of assets.

8. Valuation Method

The method used to divide the cost of future benefits among the Actuarial Accrued Liability, the current year's Normal Costs, and future years' Normal Costs. The resulting current funding requirement is then determined as the current year's Normal Cost plus the payment necessary to amortize the Unfunded Actuarial Liability.

9. Vested Liability

That portion of the Actuarial Present Value of Accrued Benefits that a member would be entitled to if the member terminated employment with the employer as of the valuation date.

CERTIFICATION:

This report fairly represents the actuarial position of the Massachusetts Water Resources Authority Retirement System contributing as of January 1, 2009, in accordance with generally accepted actuarial principles applied consistently with the preceding valuation. In our opinion, the actuarial assumptions used to compute actuarial accrued liability and normal cost are reasonably related to plan experience and to reasonable expectations, and represents our best estimate of anticipated plan experience.

Buck Consultants, LLC

Daniel W. Sherman, ASA, MAAA
Enrolled Actuary No. 08-4086

September 2009